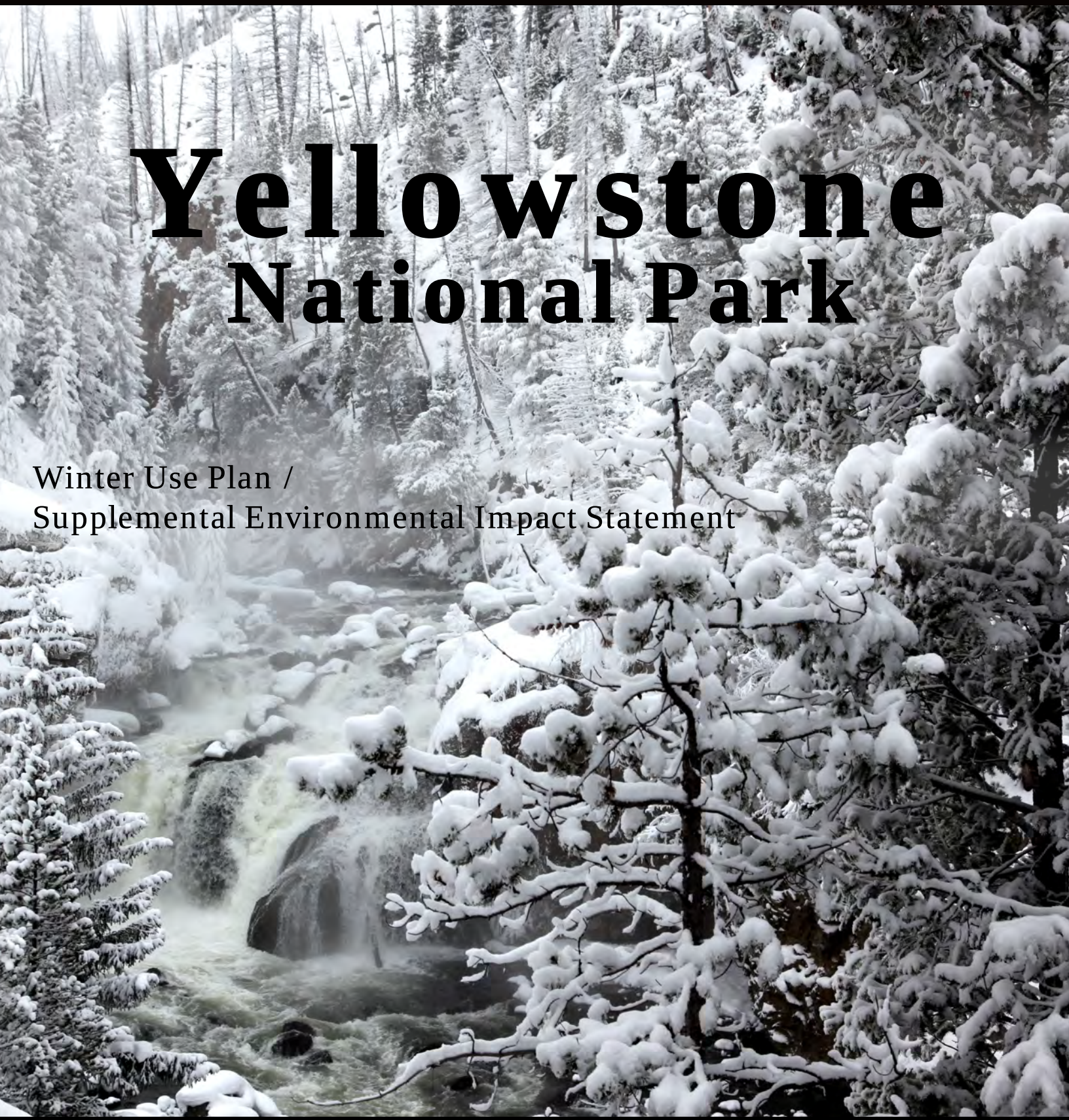
Yellowstone National Park
Winter Use Plan /
Supplemental Environmental Impact Statement
Wyoming, Montana, Idaho

National Park Service
U.S. Department of the Interior



Yellowstone National Park

Winter Use Plan / Supplemental Environmental Impact Statement

February 2013

UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE
YELLOWSTONE NATIONAL PARK
WINTER USE PLAN / SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT

Lead Agency: National Park Service (NPS), U.S. Department of the Interior

This Yellowstone National Park Winter Use Plan / Supplemental Environmental Impact Statement (plan/SEIS) evaluates the impacts of a range of alternatives for managing winter use in the interior of Yellowstone National Park (Yellowstone or the park) in a manner that protects and preserves natural and cultural resources and natural processes, provides a variety of visitor use experiences while minimizing conflicts among various users, and promotes visitor and employee safety. Upon conclusion of the plan/SEIS and decision-making process, the alternative selected for implementation will become the winter use plan, which will specifically address the issue of oversnow vehicle (OSV) use in the interior of the park. It will also form the basis for a special regulation to manage OSV use in the park should an alternative be selected that allows OSV use to continue.

This plan/SEIS evaluates the impacts of the no-action alternative (alternative 1) and three action alternatives (alternatives 2, 3, and 4). Alternative 1 would not permit public OSV use in Yellowstone because the interim regulations in effect from 2009 to 2013 would have expired, but would allow for approved non-motorized use to continue. Alternative 1 has been identified as the NPS environmentally preferable alternative. Alternative 2 would manage OSV use at the same levels as the interim regulations in effect from 2009 to 2013 (up to 318 snowmobiles and 78 snowcoaches per day). Alternative 3 would initially allow for the same level of use as alternative 2, but would provide for a three year transition to snowcoaches starting in the 2017/2018 winter season, when all snowcoaches would be required to have best available technology (BAT). Upon completion of the transition (by the winter season 2020/2021), there would be zero snowmobiles and up to 120 snowcoaches per day in the park. Alternative 4, the NPS preferred alternative, would manage OSV use by transportation events, with 110 total events each day. Up to 50 events would be allocated for snowmobiles and the remaining 60 for snowcoaches. This alternative would be implemented after a one-season transition period. Non-commercially guided snowmobile access would also be allowed under this alternative. Snowcoaches would be required to meet BAT standards as described above. New BAT standards for snowmobiles would be required no later than December 2017. Voluntary E-BAT (enhanced) standards would be available to allow commercial tour operators to increase their daily average event size. The plan/SEIS analyzes impacts of these alternatives in detail for wildlife and wildlife habitat, air quality, soundscapes and the acoustic environment, visitor use and experience (including visitor accessibility), health and safety, socioeconomic values, and park operations and management.

The NPS notice of availability for the draft plan/SEIS was published in the Federal Register and on-line at the NPS PEPC website at http://parkplanning.nps.gov/yell on June 29, 2012. The U.S. Environmental Protection Agency (EPA) notice of availability for the draft plan/EIS was also published on June 29, 2012, which opened the public comment period and established the closing date of August 13, 2012, for comments. The public comment period was then extended until October 9, 2012. Responses to public and agency comments received on the draft plan/SEIS are included as appendix G and, where needed, as text changes in this final plan/SEIS. The publication of the EPA notice of availability of this final plan/SEIS in the Federal Register will initiate a 30-day waiting period before the Regional Director of the Intermountain Region will sign the Record of Decision, documenting the selection of an alternative to be implemented. After the NPS publishes a notice in the Federal Register announcing the availability of the signed Record of Decision, implementation of the alternative selected in the Record of Decision can begin.

For further information, visit http://parkplanning.nps.gov/yell or contact:
Yellowstone National Park
Winter Use Plan/SEIS
Box 168 Yellowstone National Park
Wyoming 82190

National Park Service
U.S. Department of the Interior

Yellowstone National Park
Wyoming, Montana, Idaho

YELLOWSTONE NATIONAL PARK

WINTER USE PLAN / SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT

February 2013

EXECUTIVE SUMMARY

This Yellowstone National Park Winter Use Plan / Supplemental Environmental Impact Statement (plan/SEIS) analyzes a range of alternatives for the management of winter use at Yellowstone National Park (Yellowstone or the park). The plan/SEIS assesses the impacts that could result from implementation of any of the three action alternatives, and assesses the impacts that would occur if the park were to take no action at all ("no-action" alternative).

Upon conclusion of the plan/SEIS and decision-making process, the alternative selected for implementation will become the winter use plan, which will specifically address the issue of oversnow vehicle (OSV) use in the interior of the park. It will also form the basis for a special regulation to manage OSV use in the park should an alternative be selected that allows OSV use to continue.

BACKGROUND

Winter use in Yellowstone, specifically issues related to OSVs, has been the subject of debate for more than 75 years. At least 12 times since 1930, the NPS and park stakeholders have discussed winter use in Yellowstone. Interest in accessing the park in the winter began in the early 1930s and grew throughout the years. In the 1970s, 1980s, and early 1990s, snowmobile use in the park grew consistently, with the use of snowcoaches following in popularity. Historically, the increase in the use of these vehicles (collectively known as OSVs) to access the park, brought unanticipated problems including air and noise pollution, wildlife harassment, and conflicts with other users, as documented in past planning efforts. To address these problems, planning for the management of OSV use began with the Master Plan in 1974 (NPS 1974). Since then, a series of planning processes have examined winter use in Yellowstone. A detailed description of these processes can be found on the park's winter use website at http://www.nps.gov/yell/planyourvisit/winteruse.htm.

In 2009, following litigation over a 2007 plan and rule, the NPS completed a new Interim Winter Use Plan Finding of No Significant Impact (FONSI) and promulgated an interim rule. The interim plan and rule allowed access for up to 318 snowmobiles and 78 snowcoaches into Yellowstone per day during the 2009/2010 and 2010/2011 winter seasons. It continued to require all snowmobiles and snowcoaches to be 100 percent guided, and required snowmobiles to meet best available technology (BAT) requirements.

In addition, the rule provided for motorized OSV travel over Sylvan Pass and Yellowstone's East Entrance Road as agreed to by the Sylvan Pass Working Group (the NPS, State of Wyoming, Park County, Wyoming, and the City of Cody). The interim plan and rule did not allow snowmobile and snowcoach use after March 2011.

The 2009 interim plan and rule were challenged by the State of Wyoming and Park County, Wyoming. On September 17, 2010, the Wyoming court issued a ruling in favor of the NPS on the interim plan and rule, which expired on March 15, 2011, following the close of the 2010/2011 winter season. This ruling was affirmed by the 10th Circuit Court of Appeals in February 2012.

In May 2011, the NPS released the 2011 Draft Winter Use Plan/Environmental Impact Statement (EIS). Following the public comment period on the draft, the NPS determined that additional study was needed prior to putting a long-term plan in place. As a result, in November 2011 the NPS released the final 2011 Winter Use Plan/EIS with a preferred alternative applicable only for the 2011/2012 winter season, for which the park would operate under the same rules and restrictions in place during the previous two seasons. In December 2011, a Record of Decision (ROD) and final regulation implementing the preferred alternative were issued.

The Notice of Intent for this long-term plan/SEIS for winter use was published on February 8, 2012. On June 29, 2012, the NPS released a draft plan/SEIS and published a Notice of Availability in the *Federal Register* (77 FR 38824). Public comment on the draft plan/SEIS closed on August 20, 2012. Numerous commenters requested additional time to consider the new management concept presented in the draft plan/SEIS and respond substantively to it. Accordingly, the NPS decided to reopen public comment on the draft plan/SEIS for an additional 30 days. Mindful of the short amount of time left before the December 15, 2012, opening of the 2012/2013 winter season and desiring to take the time necessary to make a reasoned, sustainable long-term decision on winter use, the NPS amended the December 2011 ROD. Using the analyses contained in alternative 2 in the final 2011 Winter Use Plan/EIS and updated information gathered during the 2011/2012 winter season, the NPS promulgated a new rule to extend for one additional winter season the 2011/2012 daily entry limits and operating requirements. As of March 15, 2013, no motorized OSVs use can be allowed in the park unless a new ROD is signed and a new regulation is issued.

The NPS intends to make a decision regarding future winter use prior to the 2013/2014 winter season.

PURPOSE OF THE PLAN

The purpose of this plan/SEIS is to establish a management framework that allows the public to experience the unique winter resources and values at Yellowstone National Park. This plan/SEIS will be used to determine whether motorized winter use in the interior of the park is appropriate, and if so, the type, extent, and location of this use.

NEED FOR ACTION

The NPS provides opportunities for people to experience the park in the winter, but access to most of the park in the winter is limited by distance and the harsh winter environment, which presents challenges to safety and park operations. The park offers unique winter experiences that are distinct from other times of the year. In the past, the park has provided access to OSV users; however, the legal authority for OSV use (snowmobiles and snowcoaches) at Yellowstone expires on March 15, 2013. Therefore the park is developing this plan because a decision is needed about whether OSV use should continue, and if so, how to direct use to protect resources and values, and how to provide for visitor use and enjoyment.

OBJECTIVES IN TAKING ACTION

Under Director's Order 12 Handbook (NPS 2001), objectives must be achieved to a large degree in order for an action to be considered successful. All alternatives selected for detailed analysis in this plan/SEIS meet the objectives to a large degree and resolve the purpose of and need for action. Objectives for managing winter use at Yellowstone are grounded in the park's enabling legislation, purpose, significance, and the goals of the park as stated in planning documents. Objectives are also compatible with direction and guidance provided by the park's strategic plan, 1995 Natural Resources Management Plan, 1974 Master Plan, and other management guidance. The objectives for managing winter use at Yellowstone are stated below.

VISITOR USE, EXPERIENCE, AND ACCESSIBILITY

- Provide the opportunity for visitors to experience and be inspired by Yellowstone's unique winter resources and values while ensuring resource protection.
- Increase visitor understanding and appreciation of the park's winter resources.
- Provide access for winter opportunities in the park that are appropriate and universally accessible.

RESOURCES

- Wildlife: Manage winter use so that it does not disrupt the winter wildlife ecology, including sensitive species.
- Sound: Manage winter use to protect naturally occurring sounds, and to minimize human-caused sounds.
- Air Quality: Manage winter use to minimize impacts on resources that may be affected by air pollution, including visibility and aquatic systems.
- Wilderness: Manage winter use to protect wilderness character and values.
- Develop and implement an adaptive management program that includes monitoring the condition of resources.

HEALTH AND SAFETY

- Manage access in the winter for the safety of all visitors and employees, including limiting impacts from emissions, noise, and known hazards.

COORDINATION AND COOPERATION

- Improve coordination and communication regarding winter use management with park partners, gateway communities, and other stakeholders.

PARK OPERATIONS AND MANAGEMENT

- Promote advances in OSV technology that will reduce impacts and facilitate continuous improvement of technology over time.
- Provide for winter use that is consistent with the park priority to provide critical visitor services at core locations.

PURPOSE AND SIGNIFICANCE OF YELLOWSTONE NATIONAL PARK

National park system units are established by Congress to fulfill specified purposes. A park's purpose provides the foundation for decision-making as it relates to the conservation of park resources and providing for the "enjoyment of future generations."

Congress established Yellowstone National Park to "dedicate and set apart as a public park or pleasuring-ground for the benefit and enjoyment of the people" and "for the preservation, from injury or spoliation, of all timber, mineral deposits, natural curiosities, or wonders within said park, and their retention in their natural condition" (16 USC 21, 22).The park's purpose and significance are rooted in its enabling

legislation, subsequent legislation, and current knowledge of its natural, cultural, and visual resources. Statements of a park's significance describe why the park is important within a global, national, regional, and ecosystem-wide context and are directly linked to the purpose of the park. Yellowstone is significant for the following reasons:

- It is the world's first national park.
- It preserves geologic wonders, including the world's most extraordinary collection of geysers, hot springs, and the underlying volcanic activity that sustains them. Yellowstone National Park is positioned on a "hot spot" where the earth's crust is unusually thin and molten magma rises relatively close to the surface.
- It preserves abundant and diverse wildlife in one of the largest remaining intact and wild ecosystems on earth, supporting surrounding ecosystems and serving as a benchmark for understanding nature.
- It preserves an 11,000-year continuum of human history, including sites, structures, and events that reflect our shared heritage. This history includes the birthplace of the national park idea—a milestone in conservation history.
- It provides for the benefit, enjoyment, education, and inspiration of this and future generations. Visitors have a range of opportunities to experience the essence of Yellowstone National Park's wonders and wildness in a way that honors the park's value to the human spirit and deepens the public's understanding and connection to it.

ISSUES AND IMPACT TOPICS

Issues associated with implementing a winter use management plan at Yellowstone were initially identified by the Yellowstone Winter Use project team during internal scoping and were further refined through public scoping and consultation with cooperating agencies. Table ES-1 details the issues that were discussed and analyzed in the plan/SEIS.

TABLE ES-1: ISSUES AND IMPACT TOPICS

Issue	Reason for Analysis
Wildlife and Wildlife Habitat, including Rare, Unique, Threatened, or Endangered Species, and Species of Concern	Various elements of the alternatives evaluated (including the use of snowmobiles, snowcoaches, and road grooming) have the potential to impact wildlife in the interior of the park. The species below were selected for detailed analysis in this plan/SEIS: • Elk and bison have been the subject of numerous studies relating to OSV use. These species are potentially subject to encounters and conflicts with OSV users and other winter visitors, and are brought up as species of concern by the public during scoping. • Two species, Canada lynx (*Lynx canadensis*) and gray wolf (*Canis lupus*) are listed or treated (they are species of special concern in the park) as threatened under the Endangered Species Act (ESA) and could be impacted by OSV use and associated actions. • Wolverine (*Gulo gulo*), bald eagle (*Haliaeetus leucocephalus*), and trumpeter swan (*Cygnus buccinator*) could be impacted by OSV use including noise and human presence and have been the subject of several studies related to OSV use.

Issue	Reason for Analysis
Air Quality	Air quality is a key resource in itself as well as a highly prized (and expected) element of the park visitor experience. Potential impacts to air quality from winter use in Yellowstone National Park include air-quality related issues from exhaust as well as visibility (particularly from OSV emissions). During public scoping for this planning effort, as well as past planning efforts, public and cooperating agency comments raised concern about exhaust emissions from the various forms of OSV travel, as well as making suggestions for how air quality should be analyzed in the plan/SEIS (consideration of new technologies, development of an air monitoring protocol, among others).
Soundscapes and the Acoustic Environment	Natural sounds are intrinsic elements of the environment that are vital to the functioning of ecosystems and can be used to determine the diversity and interactions of species within communities. Soundscapes are an important part of park environments, mediating many ecological interactions and affecting the quality of visitor experience. Winter soundscapes in Yellowstone currently include both natural and non-natural sounds. During public scoping for this planning effort and during past planning efforts, public and cooperating agency commenters raised concern about the noise levels of various forms of OSV travel.
Visitor Use, Experience, and Accessibility	The vast majority of winter visitors use OSVs to access the interior of the park. For some, these vehicles are an integral component of their experience. Others perceive negative impacts from OSV use, even if they use OSVs to access the park. Public input from this and past planning efforts has shown that expectations for a winter visitor experience in the interior of Yellowstone vary among visitors. At issue is the nature of visitor enjoyment and its relationship to the management and conservation of park resources and values. It is NPS policy to ensure that all people, including those with disabilities, have the highest reasonable level of accessibility to NPS programs, facilities and services. The plan/SEIS considers and analyzes the potential impacts resulting from changes to accessibility to the interior of the park for the very young, the elderly, and those that are mobility impaired. For these individuals, opportunities to access and experience the park, view wildlife and scenery, exposure to winter weather including cold temperatures and high winds, and the need for protection from these elements were considered.
Health and Safety	Public scoping for this planning effort, as well as past planning efforts, public and cooperating agency comments, indicated concerns about safely operating Sylvan Pass. Health and safety issues associated with some of the actions under consideration in this plan/SEIS include the effect of motorized vehicle emissions and noise on employees and visitors, avalanche hazards, and safety problems where different modes of winter transport are used in the same place or in close proximity.
Socioeconomic Values	During this and past planning efforts, public and cooperating agency commenters indicated concern about the potential economic impacts of changing the management of winter use in the park on local businesses. The gateway communities of the park are dependent, in part, on winter use of the park, and any change in management during the winter use period could impact revenue for local businesses. Concerns have also been voiced over affordable access, diversification of gateway community economies, protection of local business opportunities, and a need for additional socioeconomic surveys.
Park Management and Operations	Any changes in winter use in the park could change the level of park staff and time and other resources required and could increase the commitment of limited NPS resources (staff, money, time, and equipment). During public scoping for this planning effort, as well as past planning efforts, public and cooperating agency comments raised concern about the amount of staff and resources needed to carry out each alternative.

ALTERNATIVES

The National Environmental Policy Act requires federal agencies to explore a range of reasonable alternatives that address the purpose of and need for the action. Action alternatives may originate from the agency proposing the action, local government officials, or members of the public at public meetings or during the early stages of project development. Alternatives may also be developed in response to comments from coordinating or cooperating agencies.

Alternatives analyzed in this document were developed based on the results of internal and public scoping for the 2011 Winter Use Plan/Environmental Impact Statement (EIS) and this Winter Use Plan / Supplemental Environmental Impact Statement (plan/SEIS) process, as well as public comments received on the draft 2011 Winter Use Plan/EIS and the draft 2012 plan/SEIS. Information from the Yellowstone Science Advisory Team (SAT), resource workshops and cooperating agencies, as well as from past planning efforts was also used to inform development of the action alternatives. The alternatives carried forward for detailed analysis meet, to a large degree, the management objectives of the park, while also meeting the overall purpose and need of the plan/SEIS. Alternatives and actions that were considered but are not technically or economically feasible, do not meet the purpose of and need for the project, create unnecessary or excessive adverse impacts to resources, and/or conflict with the overall management of the park or its resources were dismissed from detailed analysis. A complete list of the alternatives considered, as well as those considered but dismissed from further analysis, is provided in chapter 2 of the plan/SEIS.

The elements of all four alternatives are detailed in table ES-2. How each of these alternatives meets the objectives of the plan/SEIS is detailed in table ES-3.

ELEMENTS COMMON TO ALL ALTERNATIVES

The following sections describe elements of the alternatives that are common to all alternatives, including the no-action alternative.

Administrative Use

Non-recreational, administrative use of snowmobiles would be allowed for park personnel or parties duly permitted under the provisions of 36 CFR 1.6, or other applicable permit authority. Permitted parties must use snowmobiles that meet BAT requirements unless specifically authorized otherwise by the park superintendent. Such use would not be subject to commercial or non-commercial guide requirements.

Accessibility

All alternatives would continue implementation of transition and action plans for accessibility. All action alternatives would support the philosophy of universal access in the park. The NPS would continue to make reasonable efforts to ensure accessibility to buildings, facilities, programs, and services.

Plowed Roads

Roads currently open to wheeled vehicles during the winter season would continue to be plowed for travel by private wheeled vehicles. No additional road plowing would occur under any alternative.

Non-motorized Access

Non-motorized uses currently include cross-country skiing, backcountry skiing, hiking, and snowshoeing. Where feasible, the park would continue to set tracks for skiing on snow road edges. Backcountry non-motorized use would continue to be allowed in most of the park (see the exception for sensitive areas in the "Action Alternatives" section below), subject to Yellowstone's Winter Severity Index program.

Emergency Actions

None of the alternatives preclude closures for safety or resource protection. The Superintendent would continue to have the authority to take emergency action to protect park resources or values.

Monitoring

The NPS would continue monitoring park resources; however, this may not be at the same levels or with the same research designs that have occurred in past years. This would provide the NPS with the ongoing information necessary to assess the impacts resulting from implementation of any alternative on park resources and values, visitor access, and to make adjustments, as appropriate, in winter use management.

Education and Outreach

Under all alternatives, the park would continue to focus on education efforts directed at visitors using personal wheeled vehicles along the northern road to Cooke. The Albright Visitor Center in Mammoth Hot Springs would remain open to the public during the winter.

NO-ACTION ALTERNATIVE

The no-action alternative is developed for two reasons. First, a no-action alternative for a management plan represents the continuation of current management into the future, which may represent a viable alternative for meeting the agency's purpose and need. Second, a no-action alternative may serve to set a baseline of existing impacts against which to compare the impacts of the action alternatives. (Director's Order 12, NPS 2011b, Section 2.7). The Council on Environmental Quality (CEQ) requires that the alternatives analysis in an EIS "include the alternative of no action" (40 CFR 1502.14(d)).

As of March 15, 2013, the interim regulation in effect for the 2012/2013 winter season (allowing up to 318 snowmobiles and 78 snowcoaches in the park per day) will expire. Under alternative 1, the park would not take any action to promulgate a new regulation, and therefore no public OSV use would be permitted in Yellowstone. If this alternative were implemented, Yellowstone would be operated like many northern and high elevation national parks (Glacier, Mt. Rainier, Lassen Volcanic, for example) that have limited wheeled vehicle access during the winter. However, non-motorized access and wheeled vehicle use along the northern road would still be allowed. Under the no-action alternative, primary visitor access would be via wheeled vehicles from Yellowstone's North to Northeast Entrances.

Yellowstone would be accessible for skiing and snowshoeing and the backcountry would remain open. Because there would be no motorized use in the interior of the park, the winter use season would begin once enough snow accumulates to allow for non-motorized uses. The East Entrance Road would be managed as backcountry. No administrative OSV travel would be allowed at the East Entrance, and avalanche control operations would not be conducted along Sylvan Pass during the winter season. The park could be closed for wildlife management; for example, during particularly harsh winters certain portions of the park could be closed to skiing and snowshoeing to minimize impacts on wildlife.

ACTION ALTERNATIVES

Elements that are common to all action alternatives include the following:

- **Best Available Technology**—BAT requirements now in place for snowmobiles would continue to be implemented. Individual alternatives may include additional snowmobile BAT requirements, as described below. BAT guidelines would be developed and implemented for snowcoaches by the 2017/2018 season and are described in detail in appendix B. As part of limiting sound and pollution from OSVs, idling would be limited to no more than 3 minutes at any one time.
- **Personal Protective Equipment**—Personal protective equipment is recommended for snowmobilers, and includes a 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 recommended to wear and carry personal protective equipment as appropriate for their winter travel. For all user groups, personal protective equipment including avalanche rescue gear (shovel, probe, and transceiver) is encouraged, but not required.
- **Licensing and Registration**—OSV drivers would be required to possess and carry a state-issued motor vehicle operator's license at all times. A learner's permit would not satisfy this requirement. Snowmobiles would be required to be properly registered and display a valid registration from a state or province in the United States or Canada, respectively.
- **Speed Limits**—Maximum speed for all OSV would be 35 miles per hour (mph), except under alternative 4, which would require a maximum speed for snowcoaches of 25 mph. Speed limits may be lower in more congested areas or wildlife sensitive corridors. For example, between West Yellowstone and Old Faithful. In developed areas, the speed limit would be as posted, but no faster than 25 mph.
- **OSV Routes**—OSV use would continue to be allowed only on designated routes, which are groomed roads that normally carry wheeled vehicles in the summer. No off-road or off-route OSV use would be permitted. Not all routes available for summer use would be groomed and maintained for OSV use in winter.
- **Cave Falls Road**—The snowmobile route to Cave Falls would continue to operate. This route would be approximately one mile into the park to Cave Falls (a dead end). Up to 50 snowmobiles could enter this area per day; these snowmobiles would not be required to meet BAT requirements. This area would be exempt from guiding and BAT requirements because the one-mile, dead-end route does not connect to other snow roads in the park, and these requirements would be not applicable to a one-mile stretch of road. The 50 snowmobile limit for the Cave Fall route would not be part of the snowmobile limits discussed below under the action alternatives.
- **OSV Management**—Early and late entries (before 7:00 a.m. or after 9:00 p.m.) for special tours would not be permitted, including departures from Snow Lodge. Limited exceptions would be allowed for administrative travel and emergencies.
- **Non-motorized Use Areas**—Approximately 35 miles of park road would continue to be groomed for cross-country skiing. These roads are mainly used during the summer, and are closed to OSV use. The roads may be machine groomed for skiing.
- **Adaptive Management**—All action alternatives incorporate adaptive management initiatives that are designed to assist the park in meeting the objectives of this plan/SEIS. See appendix D for more details on adaptive management.

- **Education and Outreach**—All action alternatives would include the continuation of educational efforts in the interior of the park including programs at the warming huts and Snow Lodge, among others.
- **Sylvan Pass Avalanche Control**—For action alternatives that include maintaining Sylvan Pass for OSV access (alternatives 2 and 4), the pass would continue to be operated in accordance with the Sylvan Pass Working Group Agreement. A combination of avalanche mitigation techniques may be used, including forecasting and helicopter and howitzer-dispensed explosives. The results of the most recent safety evaluation of Sylvan Pass by the Occupational Safety and Health Administration (OSHA) and an Operational Risk Management Assessment (ORMA) would be reviewed and the NPS would evaluate additional avalanche mitigation techniques and risk assessment tools to further improve safety and visitor access.

The action alternatives, alternatives 2-4, are as follows:

- **Alternative 2: Continue Snowmobile/Snowcoach Use at 2012/2013 Winter Season Interim Regulation Limits**—Under alternative 2, management of OSVs would allow for snowmobile and snowcoach use levels of up to 318 snowmobiles and 78 snowcoaches per day. All OSV requirements under the 2009 to 2013 interim regulations would continue, including all OSV guide requirements, hours of operation restrictions, and BAT requirements for snowmobiles. BAT requirements would be developed and implemented for snowcoaches.
- **Alternative 3: Transition to Snowcoaches that Meet BAT Requirements Only**—Under alternative 3, OSV access to the park would transition to BAT snowcoaches only. Alternative 3 would initially provide for both snowmobile and snowcoach access under interim regulation levels of up to 318 snowmobiles and 78 snowcoaches per day until the 2017/2018 winter season when all snowcoaches would need to meet BAT requirements. Beginning in 2017/2018, operators would have three years – until the 2020/2021 winter season – to phase out snowmobiles. Once the 3-year phase-out is complete, the East Entrance Road (Sylvan Pass) would be closed to use during the winter season.
- **Alternative 4: Manage OSV Use by Transportation Events**—Under alternative 4, the park would manage OSV use by setting a maximum number of daily transportation events allowed into the park. A transportation event is defined as one snowcoach or a group of seven snowmobiles (averaged seasonally; daily maximum number of 10 snowmobile per event) traveling together within the park, and is based on evidence that, when managed appropriately, New BAT snowmobile and BAT snowcoach transportation events have comparable levels of adverse impacts to park resources and the visitor experience. For a detailed discussion of the relative comparability of impacts of snowmobiles versus snowcoaches, see appendix A.

  The park would permit up to 110 transportation events daily, of which up to 50 daily transportation events may be groups of snowmobiles. Managing by OSV transportation events is an impact-centric OSV management approach that would minimize impacts to park resources, enhance the visitor experience, and permit growth in visitation as new technologies become available. This approach facilitates greater operator flexibility, rewards future OSV technological innovations, and reduces OSV-caused environmental impacts. If OSVs meet enhanced environmental performance standards (described as "E-BAT" in this plan/SEIS), commercial tour operators would be permitted to increase their average transportation event size from one to two snowcoaches and from an average of up to seven to an average of up to eight snowmobiles per transportation event (while keeping snowmobile transportation events at a maximum of 10 snowmobiles per event).

Four transportation events per day (one per gate) would be reserved for non-commercially guided snowmobile access. Each non-commercial snowmobile transportation event could contain up to five snowmobiles and each non-commercial guide would be allowed to lead up to two non-commercial trips per season. Permits for this opportunity would be allocated via an on-line lottery system (see appendix C for more information regarding the non-commercial guiding program).

Alternative 4 would be phased in over several seasons to allow the park and operators adequate time to meet the new requirements and amortize existing OSVs:

– Phase I (winter season 2013/2014): OSV access would be identical to the existing interim regulation levels of up to 318 snowmobiles and 78 snowcoaches per day. Existing BAT standards for snowmobiles would be retained during this season (noise: maximum of 73 dBA via SAE J192 and tailpipe pollutants: 120 g/kW-hr of carbon monoxide (CO) and 15 g/kW-hr of hydrocarbons). Snowcoaches would continue to be exempt from BAT standards for this season.

– Phase II (beginning in the 2014/2015 winter season): OSV use would be managed by transportation events. New snowcoaches placed in service beginning in the 2014/2015 season would need to meet BAT standards for snowcoaches. Adoption of New BAT standards for snowmobiles would be voluntary during Phase II. New BAT standards for snowmobiles are as follows: noise: maximum of 67 dBA via SAE J1161 at cruising speed and tailpipe pollutants: 90 g/kW-hr of CO and 15 g/kW-hr of hydrocarbons.

  For snowmobile commercial tour operators who do not upgrade their fleets to New BAT standards during Phase II, vehicle numbers would be averaged daily. For example, a snowmobile commercial tour operator allocated three transportation events would not be allowed to operate more than seven snowmobiles per transportation event as averaged daily. The operator would be permitted to have up to ten snowmobiles per single event, provided the daily transportation event size average was seven or less. For example, if a commercial snowmobile tour operator is allocated three transportation events, the operator could achieve a daily transportation event size average of seven snowmobiles through a combination of three events of seven snowmobiles each; two events of eight snowmobiles and one event of five snowmobiles; one event of ten, one event of seven, and one event of four, etc. If no commercial tour operators upgrade their fleets during Phase II, the maximum daily number of commercial snowmobiles in the park would be 322.

  For commercial snowmobile tour operators who upgrade at least 10 snowmobiles in their fleets to the New BAT standards for snowmobiles, vehicle numbers would be averaged seasonally for that transportation event allocation. This would allow commercial tour operators to have events with a maximum of 10 snowmobiles each, provided their seasonal transportation event size averages 7 or less. Other snowmobiles in the same operators' fleets that do not meet the New BAT standards would need to be averaged daily, rather than over the season. If all operators upgrade their fleets during this interim period, the maximum daily number of commercial snowmobiles in the park would be 460. The maximum daily average number of commercial snowmobiles in the park if all operators upgrade their fleets during Phase II would be 322.

  Up to four transportation events per day may be non-commercially guided, provided that non-commercially guided snowmobiles meet BAT standards (all non-commercially guided snowmobiles would need to be New BAT-compliant no later than the 2017/2018 winter season). Non-commercially guided transportation events could have a maximum of five snowmobiles per group, including the non-commercial guide.

For both snowcoaches and snowmobiles, operators could meet voluntary E-BAT standards beginning in the 2014/2015 season, which would allow for up to two snowcoaches per transportation event, and an increased seasonal average group size of up to eight snowmobiles per transportation event (while keeping snowmobile groups at a maximum of ten snowmobiles).

– Phase III: The final phase of the transition to management by transportation events would start no later than 2017/2018 season. By that time, all snowmobiles would be required to meet New BAT standards and all snowcoaches would be required to meet BAT standards for snowcoaches (described in appendix B). In Phase III, all snowcoach standards that applied in Phase II would remain.

  Snowmobile operators would be able to use their allocated transportation events for snowmobiles, snowcoaches, or a mix of both, as long as no more than 50 total events come from snowmobiles on a given day. For example, if a commercial tour operator is allocated a total of three snowmobile transportation events, that operator could run three snowmobile events, two snowmobile events and one snowcoach event, one snowmobile event and two snowcoach events, or three snowcoach events. Daily allocations and entrance distributions for transportation events under alternative 4 are shown in table 1.

  At the highest potential level of use, with all 50 snowmobile events used in a single day and all snowmobiles meeting New BAT requirements, there could be a maximum of 480 snowmobiles in the park, as shown in table 1. Although this is the maximum number of snowmobiles that could be permitted into the park on a single day, this level of use would not occur every day because commercially guided transportation events would be required to average no more than 7 snowmobile per event averaged seasonally, and non-commercially guided transportation events could not exceed a maximum group size of 5.

  No later than December 2017, the maximum daily average number of snowmobiles would be 342 snowmobiles per day (322 commercially guided snowmobiles plus 20 non-commercially guided snowmobiles).

ENVIRONMENTAL CONSEQUENCES

Impacts of the alternatives were assessed in accordance with Director's Order 12 and Handbook: Conservation Planning, Environmental Impact Analysis and Decision-Making. This Handbook requires that impacts on park resources be analyzed in terms of their context, duration, and intensity. The analysis provides decision-makers and the public with an understanding of the implications of winter management actions in the short and long term, cumulatively, and within context, based on an understanding and interpretation by resource professionals and specialists.

For each impact topic, methods were identified for measuring potential changes to the park's resources in each proposed action alternative. Intensity definitions were established for each impact topic to help in understanding the severity and magnitude of changes in resource conditions, both adverse and beneficial.

A detailed description of how impacts were analyzed across proposed action alternatives can be found in chapter 4. Table ES-5 summarizes the results of the impact analysis for the impact topics that were assessed.

TABLE ES-2: SUMMARY OF ALTERNATIVE ELEMENTS

	Alternative 1: No Action - No Snowmobile / Snowcoach Use	Alternative 2: Continue Snowmobile/Snowcoach Use at 2012/2013 Winter Season Interim Regulation Limits	Alternative 3: Transition to Snowcoaches that Meet BAT Requirements Only	Alternative 4: Manage OSV Use by Transportation Events
General Description	Once the 2009 interim regulation expires (after the 2012/2013 season) there would be no regulation in its place and OSV use would be no longer permitted. Administrative OSV use would continue as needed. Visitors could ski or snowshoe into the park.	OSV use would continue at levels described under the 2009 to 2013 interim regulations – up to 318 snowmobiles and up to 78 snowcoaches per day.	OSV access into the park would transition to BAT compliant snowcoaches beginning in the 2017/2018 winter season when all snowcoaches must meet BAT requirements. Snowcoaches would replace snowmobiles within a 3-year period (by the 2020/2021 winter season).	OSV access to the park would be managed by transportation events. A total of 110 transportation events would be allowed each day. Operators would have the flexibility to allocate their transportation events between snowmobiles and snowcoaches, but no more than daily 50 snowmobile events would be permitted. If OSVs meet voluntary E-BAT standards, there is the potential for increasing the average group size. Non-commercial guiding would be included under this alternative.
Elements Related to Snowmobile Use				
Daily Snowmobile Limits (with Allocations by Entrance)	n/a	Up to 318 snowmobiles per day (Actual recent average is about 191 per day). Entrance allocations (by number of snowmobiles): • West – 160 • South – 114 • East – 20 • North – 12 • Old Faithful – 12	Up to 318 snowmobiles per day through 2017/2018 winter season. Entrance allocations (by number of snowmobiles): • West – 160 • South – 114 • East – 20 • North – 12 • Old Faithful – 12 No commercial snowmobiles would be permitted after the 2020/2021 winter season.	110 transportation events would be allowed each day, with no more than 50 transportation events from snowmobiles. A transportation event would allow one snowcoach or one group of snowmobiles, with a seasonal average group size of 7 snowmobiles. (Each group of snowmobiles may have up to 10 vehicles, but must average a group size of no more than 7 snowmobiles over the course of a winter season. All snowmobiles will need to meet the New BAT standards no later than December 2017. Until such time when all snowmobiles in a transportation event meet the New BAT standards, use would be averaged daily. However, if New BAT standards are met before December 2017, use would be averaged seasonally for transportation events where all snowmobiles in the event meet the New BAT standard. If all snowmobiles in a transportation event meet voluntary E-BAT standards, there is a potential for an increase in the number of vehicles per transportation event – from a seasonal average of 7 to an average of 8 snowmobiles per group. Snowmobile transportation event entrance allocations (by gate): • West – 23 • South – 16 • East – 3 • North – 2 • Old Faithful – 2 In addition, four non-commercially guided events, with up to 5 snowmobiles per group, would be permitted each day, one from each entrance.
Variable Snowmobile Numbers	n/a	Daily snowmobile levels would be fixed for the season. No variation would occur.		Snowmobile numbers could vary daily, depending on how operators use their transportation events. Up to 50 daily transportation events could be allocated to snowmobiles.
Variable Entrance Allocations	n/a	Entrance allocations would be fixed (may not be shared between entrances).		The total number of transportation events at each gate would be fixed, but transportation events could be traded between operators within each gate. This would not apply to non-commercially guided snowmobile groups.

	Alternative 1: No Action - No Snowmobile / Snowcoach Use	Alternative 2: Continue Snowmobile/Snowcoach Use at 2012/2013 Winter Season Interim Regulation Limits	Alternative 3: Transition to Snowcoaches that Meet BAT Requirements Only	Alternative 4: Manage OSV Use by Transportation Events
Snowmobile Guide Requirements, Including Maximum Group Size (If Applicable)	n/a	100% commercially guided. Group size (including guide's snowmobile):10		100% guided – commercial and non-commercial guiding allowed. Transportation event size for commercial operations (including guide):10 maximum, average of 7 averaged over a season once all snowmobiles in a transportation event meet New BAT. Before meeting New BAT, group size would average 7 daily. Four transportation events (one per gate) of up to 5 snowmobiles each would be reserved for non-commercially guided access. Each non-commercial guide would be allowed to lead up to 2 groups per season and permits for this opportunity would be allocated via an on-line lottery system (see appendix C).
BAT Requirements for Snowmobiles	n/a	BAT required for snowmobiles would be the same as the interim regulations.	No changes to BAT for noise standards because snowmobiles would be phased out.	BAT would be required for commercially and non-commercially guided snowmobiles. Initially (Phase I), the BAT noise standard for all snowmobiles would be 73 dBA (SAE J192) and the CO standard would be 120 g/kW-hr. The hydrocarbon standard would be 15 g/kW-hr. No later than the 2017/2018 season, the BAT noise standard would be reduced to 67 dBA (SAE J1161) and the CO standard would be reduced to 90 g/kW-hr. The hydrocarbon standard would remain 15 g/kW-hr. Starting in Phase II December 2014, snowmobiles would have the option to meet voluntary E-BAT standards of 65 dBA and 60 g/kW-hr for CO.
Cost of Snowmobile Use	n/a	Park entrance fee. Cost of snowmobile guide and rental.	Park entrance fee. Cost of snowmobile guide and rental.	Park entrance fee (for commercially and non-commercially guided groups). Cost of snowmobile guide and rental. BAT snowmobile rental fees. Lottery fees for non-commercially guided groups.
Elements Related to Snowcoach Use				
Daily Snowcoach Limits (with Allocations by Entrance)	n/a	Up to 78 snowcoaches per day. Entrance allocations (by number of snowcoaches): • West – 34 • South – 13 • East – 2 • North – 13 • Old Faithful – 16	Up to 78 snowcoaches per day initially, allocated by entrance the same as in alternative 2. Once all snowcoaches meet BAT, increase to up to 120 BAT snowcoaches per day (with a corresponding decrease in snowmobiles over a 3-year period as snowcoach numbers increase). Entrance allocations after transition (by number of snowcoaches): • West – 62 • South – 10 • East – 0 • North – 19 • Old Faithful – 29	A transportation event would initially equal one snowcoach or one group of snowmobiles (see above under "Daily Snowmobile Limits"). The number of snowcoaches per event could increase from 1 to 2 over time if each snowcoach meets voluntary E-BAT (each snowcoach emits less than 71 dBA of noise). Snowcoach entrance allocations (by transportation events) if all 50 snowmobile events are used: • West – 26 • South – 10 • East – 2 • North – 10 • Old Faithful – 12 Snowcoach entrance allocations (by transportation events) if none of the commercial snowmobile events are used (106 events, with 4 events reserved for non-commercially guided snowmobile use): • West – 47 • South – 17 • East – 2 • North – 17 • Old Faithful – 23

	Alternative 1: No Action - No Snowmobile / Snowcoach Use	Alternative 2: Continue Snowmobile/Snowcoach Use at 2012/2013 Winter Season Interim Regulation Limits	Alternative 3: Transition to Snowcoaches that Meet BAT Requirements Only	Alternative 4: Manage OSV Use by Transportation Events
Variable Snowcoach Numbers	n/a	Daily snowcoach levels would be fixed for the season. No variation would occur.		Snowcoach numbers could vary daily, depending on which vehicles the operators allocate their transportation events to. Up to 50 transportation events may be allocated to groups of snowmobiles daily. If all 50 snowmobile allocations are used, 60 allocations would be available for snowcoach use. If no snowmobile allocations are used, 106 snowcoach transportation events would be available to operators.
Variable Entrance Allocations	n/a	Entrance allocations would be fixed (may not be shared between entrances).		Entrance allocations would be flexible, based on the demand at the entry locations (i.e., sharing of transportation events among operators at a single entrance).
Snowcoach Guide Requirements	n/a	Common to all action alternatives: snowcoach entry by commercial guide only.		
BAT Requirements for Snowcoaches	n/a	BAT would be developed and implemented for snowcoaches by the 2017/2018 season. BAT for snowcoaches would require sound emissions to be less than 75 dBA.		No later than December 2017, BAT requirements for snowcoaches would take effect. At that time, existing snowcoaches would need to meet the BAT requirements, whereas new snowcoaches coming on line would need to meet the BAT standard by the 2014/2015 season. BAT for snowcoaches would require noise emissions to be less than 75 dBA (SAE J1161 at cruising speed) and engines meet EPA Tier 2 standards. With voluntary E-BAT, two snowcoaches would be allowed in a group if both snowcoaches have noise emission of 71 dBA or less.
Wheeled Vehicle Access – Common to all alternatives: Wheeled vehicle access would continue along the road between Mammoth Hot Springs and Cooke City. No other roads would be plowed for wheeled vehicle use.				
Other/General Elements				
Road Grooming	Allow for the minimal road grooming needed to maintain administrative access. Sylvan Pass would not be maintained.	Continued road grooming. Manage Sylvan Pass in accordance with the Sylvan Pass Working Group agreement.	Continued road grooming. Sylvan Pass would be closed to vehicle traffic and would not be maintained.	Continued road grooming. Manage Sylvan Pass in accordance with the Sylvan Pass Working Group agreement.
Zoning –Temporal and Spatial	n/a	Continue temporal and spatial zoning of some side roads (e.g., snowcoaches only in the morning, snowmobiles and snowcoaches in the afternoon).	The east side of the park would only be available for non-motorized use once transition to snowcoaches is complete. OSV use would not be permitted from the East Entrance to the Fishing Bridge Developed Area.	Continued temporal and spatial zoning of some side roads (e.g., snowcoaches only in the morning, snowmobiles and snowcoaches in the afternoons).
Opportunities for Non-motorized Recreation Use	Park would be open for skiing and snowshoe access. Most of the park would be considered “backcountry” for this type of use.	Continue to groom 35 miles of secondary park roads for cross-country skiers and snowshoers. Use will be permitted subject to Winter Severity Index.		
Dates/Length of Winter Season	The season would start when accumulation of snow allows for non-motorized use. It would continue into March, depending on snow levels and any closures for wildlife management and spring road plowing).	Common to all action alternatives: The winter season would take place from December 15 to March 15 each year.		
Estimated Number of Daily Vehicle Passengers (Excludes Mammoth to Cooke City) Maximum Numbers Assume 2 people per Snowmobile and 12.3 per Snowcoach. Average Numbers Assume 1.4 People per Snowmobile and 8 per Snowcoach.	Zero OSVs.	Maximum • Snowmobile = 636 • Snowcoach = 959 • Total = 1,595 Average • Snowmobile = 445 • Snowcoach = 624 • Total = 1,069	Maximum • Snowmobile passengers = 636 (0 after phaseout) • Snowcoach passengers = 959 (1,476 after phaseout) • Total = 1,519 (1,476 after phaseout) Average • Snowmobile passengers = 445 (0 after phaseout) • Snowcoach passengers = 624 (960 after phaseout) • Total = 1,069 (960 after phaseout)	See table 1.

	Alternative 1: No Action - No Snowmobile / Snowcoach Use	Alternative 2: Continue Snowmobile/Snowcoach Use at 2012/2013 Winter Season Interim Regulation Limits	Alternative 3: Transition to Snowcoaches that Meet BAT Requirements Only	Alternative 4: Manage OSV Use by Transportation Events
Transition Period (when Limits under a New Regulation, that are Different from Current Limits, Would Take Effect)	The 2009 to 2013 interim regulations will have expired. No transition period.	The 2009 to 2013 interim regulations would continue. No transition period.	The 2009 to 2013 interim regulations would continue until the 2017/2018 season, after which time a 3-year phaseout of snowmobiles would occur.	There would be a one-season transition period to prepare for implementation of the new winter use plan. Provisions of the 2009 to 2013 interim regulations would continue during this transition.
Adaptive Management Program	No adaptive management program would be implemented.	Adaptive management would be implemented as outlined in appendix D.		

TABLE ES-3: HOW ALTERNATIVES MEET OBJECTIVES

Objective	Alternative 1: No Action - No Snowmobile / Snowcoach Use	Alternative 2: Continue Snowmobile/Snowcoach Use at 2012/2013 Winter Season Regulation Limits	Alternative 3: Transition to Snowcoaches that Meet BAT Requirements Only	Alternative 4: Manage OSV Use by Transportation Events
Visitor Use, Experience, and Accessibility				
Provide the opportunity for visitors to experience and be inspired by Yellowstone's unique winter resources and values while ensuring resource protection.	Meets objective to some degree because the interior of the park would be closed to OSV use, greatly limiting the visitors that can experience this area. The park would continue to provide a virtual experience for all, including administration of the website to provide understanding and appreciation of the park's winter resources to those unable to visit the park. Visitors could continue to experience the park virtually through the park's website.	Meets objective to a large degree, because visitors would be able to experience the interior of the park with OSVs from all entrances. Daily use limits of 318 snowmobiles and 78 snowcoaches would allow for resource protection. Visitors could continue to experience the park virtually through the park's website and webcam at Old Faithful.	Meets objective to a moderate degree because visitors would be provided the opportunity to experience the interior of the park using OSV; however, after the transition period, visitors would only be able to enter the park via snowcoach. This alternative would reduce overall numbers of OSVs compared to the other action alternatives, and ensure resource protection. Visitors could continue to experience the park virtually through the park's website and webcam at Old Faithful.	Fully meets objective because visitors would be able to experience the interior of the park using OSVs from all entrances. In addition, provisions are made to allow for increases in use, while reducing or minimizing impacts to park. The addition of non-commercial guiding would provide an additional use opportunity. Visitors could continue to experience the park virtually through the park's website and webcam at Old Faithful.
Increase visitor understanding and appreciation of the park's winter resources.	Meets objective to some degree because the interior of the park would be closed to OSV use, greatly limiting the visitors that can experience this area, but the park would continue to provide a virtual experience for all, including administration of the website to provide understanding and appreciation of the park's winter resources to those unable to visit the park.	Fully meets objective because visitors have the opportunity to visit the interior of the park and view Yellowstone in the winter, wildlife, and the park's unique geothermal features. In addition, the park would continue to provide a virtual experience for all, including administration of the website and web cam at Old Faithful to provide understanding and appreciation of the park's winter resources to those unable to visit.	Fully meets objective because visitors have the opportunity to visit the interior of the park and view Yellowstone in the winter, wildlife, and the park's unique geothermal features. In addition, the park would continue to provide a virtual experience for all, including administration of the website and web cam at Old Faithful to provide understanding and appreciation of the park's winter resources to those unable to visit.	Fully meets objective because visitors have the opportunity to visit the interior of the park and view Yellowstone in the winter, wildlife, and the park's unique geothermal features. In addition, the park would continue to provide a virtual experience for all, including administration of the website and web cam at Old Faithful to provide understanding and appreciation of the park's winter resources to those unable to visit.
Provide access for winter opportunities in the park that are appropriate and universally accessible.	Meets objective to some degree because transportation to the interior of the park would no longer be available, but non-motorized uses and virtual visitation would continue.	Meets objective to a large degree because access to winter opportunities in the interior of the park would include both snowmobile and snowcoach use. Access would be provided for a wide range of visitors.	Meets objective to a moderate degree because access to winter opportunities in the interior of the park would include both snowmobile and snowcoach use, with the eventual phaseout of snowmobiles. The lack of snowmobile access would reduce the winter opportunities available. Access would be provided for a wide range of visitors.	Meets objective to a large degree because access to winter opportunities in the interior of the park would include both snowmobile and snowcoach use. Access would be provided for a wide range of visitors.
Resources				
Wildlife: Manage winter use so that it does not disrupt the winter wildlife ecology, including sensitive species.	Meets objective to a large degree because wildlife in the interior of the park, including sensitive species, would no longer have interactions with recreational OSVs. Interactions with non-motorized users would continue on a limited basis.	Meets objective to a moderate degree because wildlife, including sensitive species, in the interior of the park have the potential to be displaced by the use of OSVs. Winter use levels would be the same as recent maximum allowable use, which would minimally disrupt studied wildlife species at the population level.	Meets objective to a moderate degree because wildlife in the interior of the park, including sensitive species, may be displaced by the use of OSVs. This alternative would reduce overall numbers of OSVs compared to the other action alternatives once the transition to snowcoaches is complete, which would minimally disrupt studied wildlife species at the population level.	Meets objective to a moderate degree because wildlife in the interior of the park, including sensitive species, have the potential to be displaced by the use of OSVs. Managing by transportation events would provide for fewer intervals of use and fewer disturbance events for wildlife within the park compared to the other action alternatives. Because there would be approximately 10% fewer transportation events under alternative 4 than alternatives 2 and 3, this alternative meets this objective to a greater degree than the other action alternatives.
Sound: Manage winter use to protect naturally occurring background sound levels and to minimize loud noises.	Meets objective to a large degree because minimal OSV use (administrative use only) would occur in the interior of the park.	Meets objective to a moderate degree because OSV use would occur in the interior of the park, but at levels that still allow for times of natural quiet.	Meets objective to a moderate degree because OSV use would occur in the interior of the park, but at levels that still allow for times of natural quiet.	Meets objective to a moderate degree because OSV use would occur in the interior of the park, but at levels that still allow for times of natural quiet. Because there would be approximately 10% fewer transportation events under alternative 4 than alternatives 2 and 3, and because managing by transportation events would provide for more intervals of quiet within the park, this alternative meets this objective to a greater degree than the other two action alternatives.
Air Quality: Manage winter use to minimize impacts to resources that may be affected by air pollution including visibility and aquatic systems.	Meets objective to a large degree because minimal OSV use (administrative use only) would occur in the interior of the park and air emissions would be at very low levels.	Meets objective to a moderate degree because OSV use, and air emissions from that use, would continue in the interior of the park. Levels of use would be the same as recent maximum allowable use. Air emissions are expected to be below all regulatory standards.	Meets objective to a moderate degree because OSV use, and air emissions from that use, would continue in the interior of the park. Air emissions are expected to be below all regulatory standards.	Meets objective to a moderate degree because OSV use, and air emissions from that use, would continue in the interior of the park. Air emissions are expected to be below all regulatory standards.

Objective	Alternative 1: No Action - No Snowmobile / Snowcoach Use	Alternative 2: Continue Snowmobile/Snowcoach Use at 2012/2013 Winter Season Regulation Limits	Alternative 3: Transition to Snowcoaches that Meet BAT Requirements Only	Alternative 4: Manage OSV Use by Transportation Events
Wilderness: Manage winter use to protect wilderness character and values.	Meets objective to a large degree because minimal OSV use (administrative use only) would occur in the interior of the park.	Meets objective to a moderate degree because OSV use would occur in the interior of the park; however, modeling and observations in the park have shown that disturbances, specifically noise, would be limited in time and duration.	Meets objective to a moderate degree because OSV use would occur in the interior of the park; however, modeling and observations in the park have shown that disturbances, specifically noise, would be limited in time and duration.	Meets objective to a moderate degree because OSV use would occur in the interior of the park; however, modeling has shown that disturbances, specifically noise, would be limited in time and duration. Management by transportation events would further limit the duration of disturbances. Because there would be approximately 10% fewer transportation events under alternative 4 than alternatives 2 and 3 (which would average 123 and 120 transportation events, respectively), this alternative meets this objective to a greater degree than the other action alternatives.
Health and Safety				
Seek to manage access in the winter for the safety of all visitors and employees, including limiting impacts from emissions, noise, and known hazards.	Meets objective to a large degree because recreational OSV use would not occur in the interior of the park. Emissions, noise, and known hazards would be reduced because the interior of the park would be closed to the public, as would Sylvan Pass; however, non-motorized use (skiing and snowshoeing) would be permitted in the interior of the park, resulting in known hazards from harsh winter conditions.	Meets objective to some degree as OSV and non-motorized use would be permitted in the interior of the park, following guidelines and regulations to promote the health and safety of visitors such as hours of operation, BAT and guiding requirements. Visitors would have the potential to be exposed to emissions, noise, and known hazards. Additionally, Sylvan Pass would continue to operate and workers would continue to be exposed to hazardous conditions inherent in conducting operations in an avalanche prone area.	Meets objective to a large degree because OSV and non-motorized use would be permitted in the interior of the park, following guidelines and regulations to promote the health and safety of visitors such as hours of operation, BAT and guiding requirements. Visitors would have the potential to be exposed to emissions, noise, and known hazards. Sylvan Pass would not continue to operate, greatly reducing the risk to park staff that would no longer be exposed to the hazardous conditions inherent in conducting operations in an avalanche prone area.	Meets objective to some degree as OSV and non-motorized use would be permitted in the interior of the park, following guidelines and regulations to promote the over the health and safety of visitors such as hours of operation, BAT and guiding requirements. Visitors would have the potential to be exposed to emissions, noise, and known hazards. Additionally, Sylvan Pass would continue to operate and workers would continue to be exposed to hazardous conditions inherent in conducting operations in an avalanche prone area.
Coordination and Cooperation				
Improve coordination and communication regarding winter use management with park partners, gateway communities, and other stakeholders.	Fully meets objective because the park would continue to coordinate and communicate with park partners, cooperating agencies, gateway communities, and other stakeholders.			
Park Management/Operations				
Develop and implement an adaptive management program that includes monitoring the condition of resources.	Meets objective to a large degree because the adaptive management program under no action would differ from the action alternatives. It would focus on monitoring park resources in the near absence of OSVs and understanding if changes to limited administrative OSV use and non-motorized uses are needed.	Fully meets objective because adaptive management would occur under these alternatives.		
Promote advances of vehicle technology (OSVs) that will reduce impacts and facilitate continuous improvement of technology over time.	Does not meet objective because OSVs would not be allowed into the park, reducing the incentive for the development of new technology.	Meets objective to a moderate degree because BAT requirements would continue to be implemented for snowmobiles and would further be developed and implemented for snowcoaches. No additional steps would be taken to promote technology.	Meets objective to a moderate degree because BAT requirements would continue to be implemented for snowmobiles and would further be developed and implemented for snowcoaches.	Meets objective to a large degree because BAT requirements would continue to be implemented for snowmobiles and would further be developed and implemented for snowcoaches. In addition, incentives to improve environmental performance of OSVs thorough E-BAT would reward innovation and commitment to lower impact OSVs and allow for increased use, without impacting park resources, should these reductions occur.
Provide for winter use that is consistent with the park priority to provide critical visitor services at core locations.	Meets objective to some degree because services in the northern area of the park (Mammoth) would continue to be provided. Due to lack of OSV access, services in the interior of the park would not continue.	Meets objective to a large degree because services in the northern area of the park (Mammoth) would continue to be provided and OSV use would allow for the continuation of services in the interior of the park in the winter.		

TABLE ES-4: ESTIMATED VISITATION UNDER EACH ALTERNATIVE

Alternative	Event Types	Max.[a] number of events	Min. number of events	Max. number of BAT OSVs (daily)	Average[b] number of BAT OSVs (daily)	Max. number of E-BAT OSVs (daily)	Average number of E-BAT OSVs (daily)	Max. number of people daily[c] (peak day)	Max. average daily number of people (avg day)	Max. number of people per Season
Alternative 2: Continue Snowmobile / Snowcoach Use at 2012/2013 Winter Season Interim Regulation Limits	Commercial Snowcoaches	78	78	78	78	N/A	N/A	1,069	1,069	96,174
	Commercial Snowmobiles	159	31.8	318	318	N/A	N/A	636	636	57,240
	Non-commercial Snowmobiles			0	0	N/A	N/A	0	0	0
	SUM	237	110	396	396			1,705	1,705	153,414
Alternative 3: Transition to BAT Snowcoaches (after phase-out, before phase-out visitation is the same as alternative 2)	Commercial Snowcoaches	120	120	120	120	N/A	N/A	1,644	1,644	147,960
	Commercial Snowmobiles			0	0	N/A	N/A	0	0	0
	Non-commercial Snowmobiles			0	0	N/A	N/A	0	0	0
	SUM	120	120	120	120			1,644	1,644	147,960
Alternative 4: Manage OSV Use by Transportation Events (pre E-BAT, maximum number of snowmobiles)	Commercial Snowcoaches	60		60	60	N/A	N/A	822	822	73,980
	Commercial Snowmobiles	46		460	322	N/A	N/A	920	644	57,960
	Non-commercial Snowmobiles	4		20	20	N/A	N/A	40	40	3,600
	SUM	110		540	402			1,782	1,506	135,540
Alternative 4: Manage OSV Use by Transportation Events (pre E-BAT, maximum number of snowcoaches)	Commercial Snowcoaches	106		106	106	N/A	N/A	1,452	1,452	130,698
	Commercial Snowmobiles	0		0	0	N/A	N/A	0	0	0
	Non-commercial Snowmobiles	4		20	20	N/A	N/A	40	40	3,600
	SUM	110		126	126			1,492	1,492	134,298
Alternative 4: Manage OSV Use by Transportation Events (with E-BAT, maximum number of snowmobiles)	Commercial Snowcoaches	60				120	120	1,644	1,644	147,960
	Commercial Snowmobiles	46				460	368	920	736	66,240
	Non-commercial Snowmobiles	4				20	20	40	40	3,600
	SUM	110				600	508	2,604	2,420	217,800
Alternative 4: Manage OSV Use by Transportation Events (with E-BAT, maximum number of snowcoaches)	Commercial Snowcoaches	106				212	212	2,904	2,904	261,396
	Commercial Snowmobiles	0				0	0	0	0	0
	Non-commercial Snowmobiles	4				20	20	40	40	3600
	SUM	110				232	232	2,944	2,944	264,996

[a] Where there is no variation in the number of OSV allowed, maximum and minimum event numbers are the same.

[b] Average refers to the number of OSV allowed seasonally. The possible daily maximum and average differ for alternative 4 but are the same for all other alternatives.

[c] The maximum number of people per snowmobile was assumed to be 2.0; the maximum number of people per snowcoach was assumed to be 13.7

N/A = not applicable.

TABLE ES-5: IMPACT SUMMARY

	Alternative 1: No Action - No Snowmobile / Snowcoach Use	Alternative 2: Continue Snowmobile/Snowcoach Use at 2012/2013 Winter Season Interim Regulation Limits	Alternative 3: Transition to Snowcoaches that Meet BAT Requirements Only	Alternative 4: Manage OSV Use by Transportation Events
Wildlife and Wildlife Habitat, including Rare, Unique, Threatened, or Endangered Species, and Species of Concern				
Bison/Elk	Based on an analysis of the available data and literature regarding bison and elk in the greater Yellowstone area, the no-action alternative would result in short- and long-term negligible adverse impacts on bison and elk in the park, because OSV use would be limited to minimal administrative use and non-motorized use would be more limited, resulting in no observable impacts. Human activity during the winter months would be reduced. Cumulative impacts under alternative 1 would be long-term minor to major adverse. Alternative 1 would contribute minimally to cumulative impacts because there would be no visitor OSVs in the park.	Alternative 2 would allow for use levels similar to the 2009 to 2013 interim regulations, with BAT requirements, guiding regulations, speed limits, and restrictions on OSV access to park roads only. Continued monitoring and assessment would allow for additional restrictions to be established if impacts greater than those predicted in this plan/SEIS be observed. Thus, overall impacts on bison and elk under alternative 2 would be short- and long-term minor to moderate adverse. Cumulative impacts would be long-term minor to major adverse, to which alternative 2 would contribute minimally.	The existing data suggest that while the intensity and amount of impact on elk and bison from snowmobiles and snowcoaches differ, overall the impact of these OSVs on elk and bison is comparable. Thus, restricting OSVs to just snowcoaches would not eliminate adverse effects on wildlife. However, the available literature on bison and elk indicate that lower OSV events reduce wildlife displacement, behavior or physiology-related energy costs, and the potential for adverse demographic impacts, resulting in short- and long-term minor to moderate adverse impacts, and impacts under alternative 3 would be expected to be less than those under alternative 2. Cumulative impacts on bison and elk under alternative 3 would be long-term minor to major adverse, to which alternative 3 would contribute only a small amount.	Alternative 4 would allow for use levels similar to those permitted under the 2009 to 2013 interim rules, with an approximately 10 percent reduction in the number of transportation events. Should all OSVs meet voluntary E-BAT standards, group sizes would increase, but the number of transportation events would stay the same. The allowance for up to four non-commercially guided snowmobile groups per day is not expected to increase behavioral, physiological, or displacement responses by bison and elk. Continued monitoring and assessment would allow for additional restrictions to be established should impacts greater than those predicted in this plan/SEIS be observed. Thus, overall impacts under alternative 4 would be short- and long-term minor to moderate adverse. These impacts are expected to be less than those under alternatives 2 and 3 because the transportation events would be packaged and would result in fewer events than other action alternatives. Cumulative impacts would be long-term minor to major adverse, to which alternative 4 would contribute minimally.
Lynx/Wolverine	Alternative 1 would result in short- and long-term negligible adverse impacts on lynx and wolverines in the park because OSV use would be limited to minimal administrative use and there would be no observable impacts, with long-term beneficial impacts from the removal of human presence. Cumulative impacts of alternative 1 would be long-term minor to major adverse, to which alternative 1 would contribute minimally, if at all.	This alternative would maintain and allow OSV use at Sylvan Pass, the area of the park where human/wolverine interactions would be most likely to occur. However, daily entrance limits would restrict the East Entrance to just 20 snowmobiles and two snowcoaches per day, (approximately five transportation events), resulting in little use in this area, and minimal disturbance to wolverines. Restrictions on movements of lynx or wolverines during the winter months due to the presence and use of OSV routes in other areas of the park may limit reproductive success, dispersal, and overall genetic sustainability of the species, but such impacts are difficult to predict. Therefore, impacts predicted under this alternative would be short- and long-term minor adverse, with the potential for moderate adverse impacts if lynx and wolverines travel to other areas of the park or are in areas of active avalanche control activities. Cumulative impacts on lynx and wolverines under alternative 2 would be short-and long-term moderate adverse, to which alternative 2 would contribute a minimal amount.	Under this alternative Sylvan Pass would be closed to OSV use and maintenance activities would cease in the area of the park where human/wolverine and lynx interactions are most likely to occur. With a similar number of transportation events to alternative 2 (120 daily transportation events under alternative 3 versus 123 average events under alternative 2), restrictions on movements of lynx or wolverines during the winter months due to the presence and use of OSV routes in other areas of the park may limit reproductive success, dispersal, and overall genetic sustainability of the species, but such impacts are difficult to predict. Therefore, impacts predicted under this alternative would be short- and long-term minor adverse, and long-term beneficial from the removal of human presence at Sylvan Pass. Cumulative impacts on lynx and wolverines under alternative 3 would be long-term moderate adverse, to which alternative 3 would contribute minimally.	This alternative would allow OSV use at Sylvan Pass, the area of the park where human-wolverine interactions would be most likely. Furthermore, restrictions on movements of lynx or wolverines during the winter months due to the presence and use of OSV routes in other areas of the park may limit reproductive success, dispersal, and overall genetic sustainability of the species, but such impacts are difficult to predict. Therefore, impacts predicted under this alternative would be long-term minor adverse, with the potential for moderate adverse impacts if lynx and wolverines travel outside the eastern sector of the park or in the short term during avalanche control operations. Overall, impacts would be reduced from use levels permitted under the 2009 to 2013 interim regulations, because the number of daily transportation events would be reduced. Should all OSVs meet voluntary E-BAT standards, the overall number of transportation events would not increase and impacts would not be expected to increase. Cumulative impacts on lynx and wolverines under alternative 4 would be moderate adverse, of which alternative 4 would contribute a minimal amount.
Trumpeter Swans/Eagles	Alternative 1 would result in short- and long-term negligible adverse impacts on swans and eagles in the park because OSV use would be limited to minimal administrative use and there would be no observable impacts. Cumulative impacts would be long-term moderate adverse, and alternative 1 would contribute minimally to the overall cumulative impacts on eagles and swans.	Alternative 2 would limit impacts on swans and eagles through use-limits, guiding requirements, and little overlap of OSV use with the active swan nesting season. Given these conditions and the mitigation measures discussed above, impacts on eagles and swans under alternative 2 would be localized short- to long-term negligible to minor adverse. Cumulative impacts would be long-term moderate adverse, and alternative 2 would contribute a small amount to the overall adverse cumulative impacts.	Alternative 3 would limit the impacts on swans and eagles through use limits, guiding requirements, and little overlap between OSV use and the active swan nesting season. Alternative 3 would result in localized short- and long-term, negligible to minor, adverse impacts, with impacts slightly less than alternative 2. Cumulative impacts would be long-term moderate adverse, and alternative 3 would contribute a small amount to the overall adverse cumulative impacts.	Alternative 4 would limit impacts on swans and eagles through use-limits, providing training for and limiting non-commercially guided snowmobile groups, and little overlap of OSV use with the active swan nesting season. Given these conditions and the mitigation measures that would be implemented, impacts on eagles and swans under alternative 4 would be localized short- to long-term negligible to minor adverse, and would be less than under alternative 2 or 3 due to the reduced number of transportation events. Cumulative impacts would be long-term moderate adverse, and alternative 4 would contribute a small amount to the overall adverse cumulative impacts.

	Alternative 1: No Action - No Snowmobile / Snowcoach Use	Alternative 2: Continue Snowmobile/Snowcoach Use at 2012/2013 Winter Season Interim Regulation Limits	Alternative 3: Transition to Snowcoaches that Meet BAT Requirements Only	Alternative 4: Manage OSV Use by Transportation Events
Gray Wolves	Alternative 1 would result in short- and long-term negligible adverse impacts on wolves in the park because OSV use would be limited to minimal administrative use and there would be no observable impacts. The limited human presence would have long-term beneficial impacts. Cumulative impacts would be long-term, minor, adverse, and alternative 1 would contribute a small amount to the overall cumulative impacts.	Alternative 2 would result in short- and long-term negligible to minor adverse impacts on wolves in the park because OSV use levels and guiding requirements use would limit the duration of interaction and the approach distance of OSV users. Cumulative impacts would be long-term minor adverse, and alternative 2 would contribute a small amount to the overall adverse cumulative impacts.	Alternative 3 would result in short- and long-term negligible to minor adverse impacts on wolves in the park because OSV use, or total number of transportation events, would be slightly reduced from the levels permitted under the 2009 to 2013 interim regulations (alternative 2) and the duration of encounters and approach distance of OSV users when encountering wolves would be limited due to guiding requirements. Cumulative impacts would be long-term minor adverse, and alternative 3 would contribute a small amount to the overall adverse cumulative impacts.	Alternative 4 would result in short- and long-term negligible to minor adverse impacts on wolves in the park, less than those expected under alternatives 2 and 4. OSV use, specifically the number of transportation events, would be reduced from the levels permitted under the 2009 to 2013 interim regulations, which would reduce the frequency of OSV encounters with wolves. Should all OSVs meet voluntary E-BAT standards, it would not increase the overall number of transportation events and would not be expected to increase impact levels beyond a minimal level. Cumulative impacts would be long-term minor adverse, and alternative 4 would contribute a small amount to the overall adverse cumulative impacts.
Air Quality	The effects of alternative 1 on air quality and visibility would be long-term minor adverse. Cumulative impacts would result in long-term minor adverse impacts on air quality.	Alternative 2 would have long-term minor adverse impacts on air quality before and after the transition to BAT snowcoaches. Alternative 2 would have long-term negligible adverse effects on visibility, before, during, and after the transition to BAT snowcoaches. There would be long-term minor adverse cumulative impacts on air quality and visibility.	The effects of alternative 3 on air quality would be long-term minor adverse. The effect of alternative 3 on visibility would be long-term negligible adverse. Cumulative impacts on air quality and visibility would be long-term minor adverse.	The effects of alternative 4 on air quality would be long-term minor except for predicted maximum 1-hour NO_2 concentrations under conditions 4a and 4c (the analysis scenarios where transportation event allocations would be used to maximize the number of snowmobile entries) at one site that would result in long-term moderate adverse impacts. All other sites would have minor long-term adverse impacts. The effect of alternative 4 on visibility would be long-term negligible adverse. Cumulative impacts on air quality and visibility would be long-term minor to moderate adverse.
Soundscapes and the Acoustic Environment	The effects of alternative 1 on soundscapes would be long-term, negligible to minor, and adverse due to administrative OSV use. Minor impacts would be limited to travel corridors. There would be long-term minor adverse cumulative impacts on soundscapes.	Alternative 2 would have long-term negligible to moderate adverse impacts on soundscapes due to the level of OSV use permitted. Moderate impacts would be limited to travel corridors. There would be long-term moderate adverse cumulative impacts on soundscapes.	The effects of alternative 3 on soundscapes would be long-term, negligible to moderate and adverse, both before and after the phaseout to BAT snowcoaches only. Moderate impacts would be limited to travel corridors. There would be long-term, moderate adverse cumulative impacts on soundscapes.	The effects of alternative 4 on soundscapes would be long-term, negligible to moderate and adverse. Moderate impacts would be limited to travel corridors. There would be long-term moderate adverse cumulative impacts on soundscapes.
Visitor Use, Experience, and Accessibility	Restricting winter access to the interior of the park by non-motorized means would result in long-term major adverse impacts on visitor use and experience for all visitors, including those with mobility impairments. Winter visitors desiring either or both non-motorized and motorized experiences would be affected by loss of access. Overall cumulative effects would be long-term major adverse.	Under alternative 2, continuing OSV use and access at the same levels as the 2009 to 2013 interim regulation limits would meet recent demand for winter visitation, including visitors with mobility impairments. Both motorized and non-motorized winter users would experience the benefits of continued access to the park's interior Therefore, alternative 2 would result in long-term benefits for visitor use and experience. Cumulative impacts on visitor use and experience under alternative 2 would be long-term and beneficial.	Under alternative 3, changes in visitor experience created by the transition to snowcoach access only would result in parkwide, long-term benefits compared to the no-action alternative. Both motorized and non-motorized winter users would experience the benefits of continued access to the park's interior. However, the opportunity to experience the park by snowmobile would be lost for all park users, including those with mobility impairments. This would result in some visitors' expectations not being met and result in long-term minor to moderate adverse impacts. Overall, alternative 3 would result in long-term beneficial impacts on visitor experience and access, with long-term moderate adverse impacts from the phaseout of the snowmobile experience but the maintenance of other winter experiences in the park. Cumulative impacts on visitor use and experience would be long-term beneficial and long-term moderate adverse.	Under alternative 4, management by transportation events and the inclusion of non-commercially guided snowmobile tours would increase visitor opportunities, resulting in parkwide, long-term beneficial impacts compared to the no-action alternative for visitor use and experience and visitor accessibility. If visitors are able to experience winter use, but not in the mode they desire due to how operators use their allocations, there would be a potential for long-term moderate adverse impacts. The number of visitors who have access to the park would increase compared to the other alternatives. Impacts on all resources, including visitor use, experience, and accessibility, would remain the same or decrease compared to recent maximum allowable use due to a decrease in the number of transportation events compared to the conditions allowed under the 2009 to 2013 interim regulations. Both motorized and non-motorized winter users would experience the benefits of continued access to the park's interior, and operators would have the ability to choose the type of service they provide. Overall, alternative 4 would result in long-term benefits for visitor experience and access. Cumulative impacts would be beneficial.
Health and Safety	Overall, air pollution and noise levels would be limited to administrative OSV use and would be minimal, and the closure of Sylvan Pass would reduce the avalanche risk to staff. Therefore, impacts on health and safety would be long-term negligible adverse and long-term beneficial, with the potential for long-term minor adverse impacts from the possibility of non-motorized users being out in harsh winter conditions with minimal support facilities. Cumulative impacts would be long-term, negligible adverse.	Under alternative 2, impacts on human health and safety would be long-term negligible adverse from air and noise emissions, long-term moderate adverse from the operation of Sylvan Pass, and long-term minor adverse from user conflicts and exposure to the elements. Cumulative impacts under alternative 2 would be long-term minor adverse.	Under alternative 3, impacts on human health and safety would be long-term negligible adverse from air and noise emissions, long-term beneficial from the closure of Sylvan Pass, and long-term minor adverse from user conflicts and exposure to the elements, both before and after the transition to snowcoach only. Cumulative impacts would be long-term negligible adverse.	Under alternative 4, impacts on human health and safety would be long-term negligible adverse from air and noise emissions, long-term moderate adverse from the operation of Sylvan Pass, and long-term minor adverse from user conflicts and exposure to the elements. Cumulative impacts would be long-term minor adverse.

	Alternative 1: No Action - No Snowmobile / Snowcoach Use	Alternative 2: Continue Snowmobile/Snowcoach Use at 2012/2013 Winter Season Interim Regulation Limits	Alternative 3: Transition to Snowcoaches that Meet BAT Requirements Only	Alternative 4: Manage OSV Use by Transportation Events
Socioeconomic Values	The impacts are estimated to be negligible, adverse, and long term for the three-state area, the five-county area and Cody and Jackson, Wyoming. West Yellowstone is projected to experience minor, adverse, long-term impacts. As described earlier, the adverse direct impacts would be most directly felt by communities and businesses near the park, especially in areas that have a higher proportion of business tied directly to park visitation. At the North Entrance, Gardiner, Montana, might experience beneficial impacts if visitors who would have visited the other entrances switch to the North Entrance. The IMPLAN modeling captures the indirect and induced effects as well. As individual businesses are adversely affected, they would reduce purchases of other goods and services from suppliers. Conversely if individual businesses are beneficially affected they would increase the purchase of goods and services from suppliers. These feedback effects impact sectors of the economy beyond those that are influenced directly by visitors. Cumulative impacts would be long-term negligible adverse or beneficial cumulative impacts on the socioeconomic environment. In West Yellowstone cumulative negligible to minor adverse impacts could result.	Compared to alternative 1, alternative 2 would result in beneficial, long-term impacts for the three-state area, the five county area, and the communities of Cody and Jackson. In West Yellowstone, the beneficial, long-term impacts would be larger on average. Alternative 2 would continue recent management, under which there has been some increase in visitation, especially for snowcoach use. Cumulative impacts would be long-term beneficial.	Compared to alternative 1, alternative 3 is expected to have on average beneficial, long-term impacts for all the communities except Cody, as seen in tables 68, 69, and 70. In order to generate larger beneficial impacts under this alternative, demand for snowcoach tours must increase to more than make up for the eventual phaseout of snowmobiles. Cumulative impacts would be long-term beneficial.	Compared to alternative 1, alternative 4 is expected to have on average beneficial, long-term impacts for all the communities, as seen in tables 68, 69, and 70. Cumulative impacts would be long-term beneficial.
Park Operations and Management	Alternative 1 would have long-term negligible adverse impacts on park operations because staffing and resource requirements would be covered by existing funding, as well as long-term benefits from the potential reallocation of staff to other areas of the park during the winter season. In addition, fuel requirements and GHG emissions would be reduced from recent levels because the number of staff members needed in the interior of the park, and therefore OSV use, would be reduced. Cumulative impacts under alternative 1 would be long-term, negligible adverse, of which alternative 1 would contribute a large part.	Alternative 2 would result in long-term negligible to minor adverse impacts because the staffing and resource requirements for the implementation of the alternative would likely be met with existing funding sources. Any additional resources required may impact park operations, but through other funding sources or reallocation of resources, would not have a noticeable impact on park operations. Cumulative impacts under alternative 2 would be long-term negligible to minor adverse, to which alternative 2 would contribute a large part.	Alternative 3 would result in long-term negligible to minor adverse impacts on park operations and management because the staffing and resource requirements for the implementation of the alternative would likely be met with existing funding sources. Cumulative impacts under alternative 3 would be long-term negligible to minor adverse, to which alternative 3 would contribute a large part.	Alternative 4 would result in long-term negligible to minor adverse impacts on park operations and management because the staffing and resource requirements for the implementation of the alternative would likely be met with existing funding sources. Additional management required under this alternative would be accommodated through existing staff or from lottery fees associated with the non-commercially guided program. Cumulative impacts under alternative 4 would be long-term negligible to minor adverse, of which alternative 4 impacts would contribute a large part.

Contents

APPENDICES

FIGURES

TABLES

ACRONYMS AND ABBREVIATIONS

ACGIH	American Conference of Industrial Hygienists
ADA	American with Disabilities Act
ANSI	American National Standards Institute
ARD	Air Resources Division
AQI	air quality index
AQRV	air quality related value
BAT	best available technology
CAA	Clean Air Act
CEQ	Council on Environmental Quality
CO	carbon monoxide
dB	decibel
dBA	decibel (A-weighted)
E-BAT	enhanced environmental performance standards
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FLAG	Federal Land Managers' Air Quality Related Values Work Group
FONSI	Finding of No Significant Impact
GC	glucocorticoids
GHG	greenhouse gas
GIS	Geographical Information System
GPS	Global Positioning System
HAP	hazardous air pollutant
IBMP	Interagency Bison Management Plan
MBTA	Migratory Bird Treaty Act
MCF	1,000 cubic feet
mph	miles per hour
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NIOSH	National Institute for Occupational Safety and Health
NPS	National Park Service
ORMA	Operational Risk Management Assessment
OSHA	Occupational Safety and Health Administration
OSV	oversnow vehicle
PM	particulate matter
PEL	permissible exposure limit

PEPC	Planning, Environment, and Public Comment
plan/SEIS	Winter Use Plan / Supplemental Environmental Impact Statement
PRB	policy relevant background
PSD	prevention of significant deterioration
REL	recommended exposure limits
ROD	Record of Decision
ROS	Recreation Opportunity Spectrum
SAE	Society of Automotive Engineers
SAT	Science Advisory Team
TLV	threshold limit value
TWA	time-weighted average
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
VOC	volatile organic compound
VSO	Visitor Services Office

CHAPTER 1

Purpose of and Need for Action

CHAPTER 1: PURPOSE OF AND NEED FOR ACTION

This "Purpose of and Need for Action" chapter describes why the National Park Service (NPS) is taking action at this time with respect to winter use in the interior of Yellowstone National Park (Yellowstone, or the park). This Winter Use Plan / Supplemental Environmental Impact Statement (plan/SEIS) presents three action alternatives for managing winter use, including oversnow vehicle (OSV) use, and assesses the impacts that could result if the park were to take no action (no-action alternative) or implement any of the three action alternatives. Upon conclusion of the plan/SEIS and decision-making process, the alternative selected for implementation will become the long-term winter use plan, which will specifically address the issue of OSV use in the interior of the park. It will also form the basis for a special regulation to manage OSV use in the park should an alternative be selected that would allow OSV use to continue. For a definition of OSV and other detailed definitions used throughout the document, please see the "Definitions" section in the "Alternatives" chapter.

Specifically, this chapter includes the following:

- Statements of the purpose of and need for taking action, as well as objectives in taking action developed during internal and public scoping;
- A description of the project study area;
- A description of the purpose and significance of the park;
- A description of the history and management of winter use in the park, with a focus on OSV management;
- Related laws, policies, plans, and other constraints; and
- A discussion of issues and impact topics identified during the scoping process and considered in preparation of this plan/SEIS, as well as issues and impact topics dismissed from further analysis.

PURPOSE OF THE PLAN

The purpose of this plan/SEIS is to establish a management framework that allows the public to experience the unique winter resources and values at Yellowstone National Park. This plan/SEIS will be used to determine whether motorized winter use in the interior of the park is appropriate, and if so, the type, extent, and location of this use.

*"**Purpose** is a statement of goals and objectives that NPS intends to fulfill by taking action."*

NEED FOR ACTION

The NPS provides opportunities for people to experience the park in the winter, but access to most of the park in the winter is limited by distance and the harsh winter environment, which presents challenges to safety and park operations. The park offers unique winter experiences that are distinct from other times of the year. In the past, the park has provided access to OSV users; however, the legal authority for OSV use (snowmobiles and snowcoaches) at Yellowstone expires on March 15, 2013. Therefore the park is developing this plan because a decision is needed about

*"**Need** is a discussion of existing conditions that need to be changed, problems that need to be remedied, decisions that need to be made, and policies or mandates that need to be implemented. In other words, it explains why [the] park is proposing this action at this time."*

whether OSV use should continue, and if so, how to direct use to protect resources and values and provide for visitor use and enjoyment.

OBJECTIVES IN TAKING ACTION

Objectives *are "…goals the park must accomplish by taking action for the action to be considered a success."*

Pursuant to the NPS Director's Order 12 Handbook, objectives are what must be achieved to a large degree for the action to be considered a success (NPS 2001). All alternatives carried forward for detailed analysis in this plan/SEIS meet the park's objectives to a large degree and resolve the purpose of and need for action. Objectives for managing winter use at Yellowstone are grounded in the park's enabling legislation, purpose, and significance and the goals of the park as stated in planning documents. Objectives are also compatible with direction and guidance provided by the park's strategic plan, 1995 Natural Resources Management Plan, 1974 Master Plan, and other management guidance. The objectives for managing winter use at Yellowstone are stated below.

VISITOR USE, EXPERIENCE, AND ACCESSIBILITY

- Provide the opportunity for visitors to experience and be inspired by Yellowstone's unique winter resources and values while ensuring resource protection.
- Increase visitor understanding and appreciation of the park's winter resources.
- Provide access for winter opportunities in the park that are appropriate and universally accessible.

RESOURCES

- Wildlife: Manage winter use so that it does not disrupt the winter wildlife ecology, including sensitive species.
- Sound: Manage winter use to protect naturally occurring sounds and to minimize human-caused sounds.
- Air Quality: Manage winter use to minimize impacts on resources that may be affected by air pollution, including visibility and aquatic systems.
- Wilderness: Manage winter use to protect wilderness character and values.
- Develop and implement an adaptive management program that includes monitoring the condition of resources.

HEALTH AND SAFETY

- Manage access in the winter for the safety of all visitors and employees, including limiting impacts from emissions, noise, and known hazards.

COORDINATION AND COOPERATION

- Improve coordination and communication regarding winter use management with park partners, gateway communities, and other stakeholders.

PARK OPERATIONS AND MANAGEMENT

- Promote advances in OSV technology that will reduce impacts and facilitate continuous improvement of technology over time.
- Provide for winter use that is consistent with the park priority to provide critical visitor services at core locations.

PROJECT STUDY AREA

The geographic study area for this plan/SEIS is Yellowstone National Park in the states of Wyoming, Montana, and Idaho, (figure 1) unless otherwise noted under each resource topic.

PURPOSE AND SIGNIFICANCE OF YELLOWSTONE NATIONAL PARK

National park system units are established by Congress to fulfill specified purposes. A park's purpose provides the foundation for decision-making as it relates to the conservation of park resources and providing for the "enjoyment of future generations."

Congress established Yellowstone National Park to "dedicate and set apart as a public park or pleasuring-ground for the benefit and enjoyment of the people; … for the preservation, from injury or spoliation, of all timber, mineral deposits, natural curiosities, or wonders within said park, and their retention in their natural condition" (U.S. Congress 1872). Yellowstone National Park's purpose and significance are rooted in its enabling legislation (as described further under "Related Laws, Policies, Plans, and Constraints"), subsequent legislation, and current knowledge of its natural, cultural, and visual resources. Statements of a park's significance describe why the park is important within a global, national, regional, and ecosystem wide context and are directly linked to the purpose of the park. Yellowstone National Park is significant for the following reasons:

- It is the world's first national park.
- It preserves geologic wonders, including the world's most extraordinary collection of geysers and hot springs and the underlying volcanic activity that sustains them. Yellowstone National Park is positioned on a "hot spot," where the earth's crust is unusually thin and molten magma rises relatively close to the surface.
- It preserves abundant and diverse wildlife in one of the largest remaining intact and wild ecosystems on earth, supporting surrounding ecosystems and serving as a benchmark for understanding nature.

Hot Spring in Winter

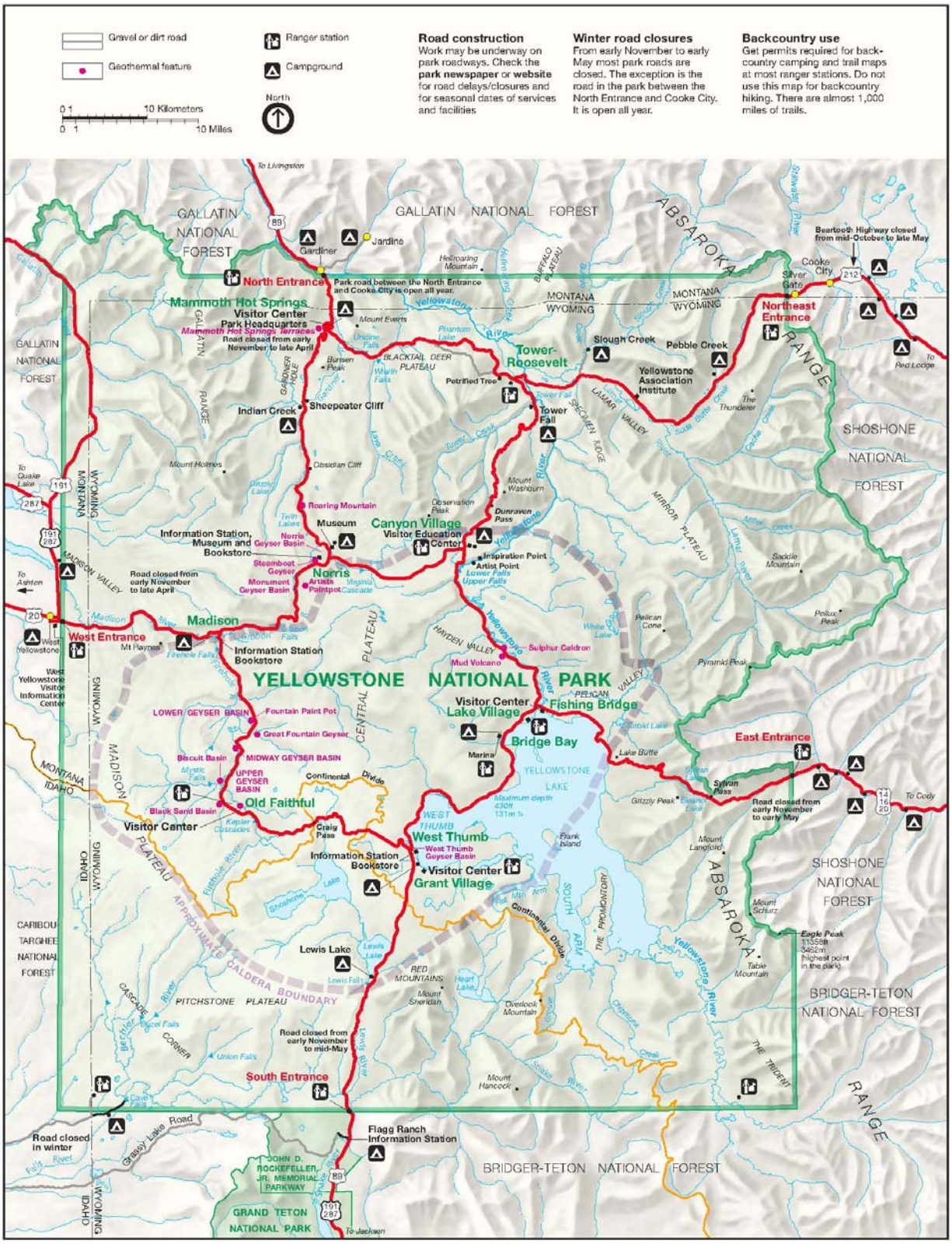


FIGURE 1: YELLOWSTONE NATIONAL PARK MAP

- It preserves an 11,000-year continuum of human history, including sites, structures, and events that reflect our shared heritage. This history includes the birthplace of the national park idea—a milestone in conservation history.
- It provides for the benefit, enjoyment, education, and inspiration of this and future generations. Visitors have a range of opportunities to experience the essence of Yellowstone's wonders and wildness in a way that honors the park's value to the human spirit and deepens the public's understanding and connection to it.

SUMMARY OF OVERSNOW VEHICLE MANAGEMENT AT YELLOWSTONE NATIONAL PARK

Winter use in Yellowstone, specifically issues related to OSVs, has been the subject of debate for more than 75 years. At least 12 times since 1930, the NPS and park stakeholders have discussed winter use in Yellowstone. Interest in accessing the park in the winter began in the early 1930s and grew throughout the years. In the 1970s, 1980s, and early 1990s, snowmobile use in the park grew consistently, with the use of snowcoaches following in popularity. Historically, the increase in the use of these vehicles (collectively known as OSVs) to access the park, brought unanticipated problems including air and noise pollution, wildlife harassment, and conflicts with other users, as documented in past planning efforts. To address these problems, planning for the management of OSV use began with the Master Plan in 1974 (NPS 1974). Since then, a series of planning processes have examined winter use in Yellowstone. A detailed description of these processes can be found on the park's winter use website at http://www.nps.gov/yell/planyourvisit/winteruse.htm.

In 2009, following litigation over a 2007 plan and rule, the NPS completed a new Interim Winter Use Plan Finding of No Significant Impact (FONSI) and promulgated an interim rule. The interim plan and rule allowed access for up to 318 snowmobiles and 78 snowcoaches into Yellowstone per day during the 2009/2010 and 2010/2011 winter seasons. It continued to require all snowmobiles and snowcoaches to be 100 percent guided, and required snowmobiles to meet best available technology (BAT) requirements.

In addition, the rule provided for motorized OSV travel over Sylvan Pass and Yellowstone's East Entrance Road as agreed to by the Sylvan Pass Working Group (the NPS, State of Wyoming, Park County, Wyoming, and the City of Cody). The interim plan and rule did not allow snowmobile and snowcoach use after March 2011.

The 2009 interim plan and rule were challenged by the State of Wyoming and Park County, Wyoming. On September 17, 2010, the Wyoming court issued a ruling in favor of the NPS on the interim plan and rule, which expired on March 15, 2011, following the close of the 2010/2011 winter season. This ruling was affirmed by the 10th Circuit Court of Appeals in February 2012.

In May 2011, the NPS released the 2011 Draft Winter Use Plan/Environmental Impact Statement (EIS). Following the public comment period on the draft, the NPS determined that additional study was needed prior to putting a long-term plan in place. As a result, in November 2011 the NPS released the final 2011 Winter Use Plan/EIS with a preferred alternative applicable only for the 2011/2012 winter season, for which the park would operate under the same rules and restrictions in place during the previous two seasons. In December 2011, a record of decision (ROD) and final regulation implementing the preferred alternative were issued.

On June 29, 2012, the NPS released the draft plan/SEIS and published a Notice of Availability in the *Federal Register* (77 FR 38824). Public comment on the draft plan/SEIS closed on August 20, 2012. Numerous commenters requested additional time to consider the new management concept presented in

the draft plan/SEIS and respond substantively to it. Accordingly, the NPS decided to reopen public comment on the draft plan/SEIS for an additional 30 days. Mindful of the short amount of time left before the December 15, 2012, opening of the 2012/2013 winter season and desiring to take the time necessary to make a reasoned, sustainable long-term decision on winter use, the NPS amended the December 2011 ROD. Using the analyses contained in alternative 2 in the final 2011 Winter Use Plan/EIS and updated information gathered during the 2011/2012 winter season, the NPS promulgated a new rule to extend for one additional winter season the 2011/2012 daily entry limits and operating requirements. As of March 15, 2013, no motorized OSVs use can be allowed in the park unless a new ROD is signed and a new regulation is issued.

The Notice of Intent for this long-term plan/SEIS for winter use was published on February 8, 2012. The NPS intends to make a decision regarding future winter use prior to the 2013/2014 winter season.

SUMMARY OF SCIENTIFIC LITERATURE ON OVERSNOW VEHICLE USE

The information presented in this plan/SEIS, including information in the "Affected Environment" and "Environmental Consequences" chapters, was developed based on best available information regarding the resources at Yellowstone. To support the wealth of existing information, a science advisory team (SAT) was convened, resulting in a report titled Scientific Assessment of Yellowstone National Park Winter Use (NPS 2011f). In addition, an Operational Risk Management Assessment (ORMA) process was conducted to further look at Sylvan Pass operations. These processes and documents are discussed further below.

SCIENCE ADVISORY TEAM

The Superintendent of Yellowstone established a SAT to support the development of the winter use planning process. Many of the SAT activities were conducted in support of the draft and final 2011 Winter Use Plan/EISs and are still applicable to this plan/SEIS. The SAT was chartered to operate for five years, with some of the activities occurring during the EIS/SEIS processes, and some activities occurring during plan implementation. The SAT charter specified the following primary goals:

1. Enhance the accountability and integrity of Yellowstone's scientific assessments of impacts from winter use activities on park natural resources.
2. Provide additional scientific interpretation of existing research to support analysis in new National Environmental Policy Act (NEPA) documents and long-term winter use management plans.
3. Provide scientific recommendations for the experimental designs and adaptive management methodologies for monitoring changes in impacts on park resources, values, and visitor experience resulting from managed winter use, to occur after the SEIS process during the adaptive management process.
4. Integrate and interpret scientific results to provide regular updates on the best available assessment of the consequences of winter use for park resources, values, and visitor experience.
5. Ensure that science is accurately represented and integrated into decision-making. The SAT will provide independent peer review of scientific information to meet Department of the Interior and NPS mandates under the Information Quality Act.

The Scientific Assessment of Yellowstone National Park Winter Use was informed by facilitated workshops with natural resource and social science experts in February 2010, air quality experts in May 2010, and acoustics and soundscape experts in July 2010. SAT members were invited to participate in these workshops along with the other resource experts. Additionally, the SAT identified important issues based on their best professional judgment in a series of facilitated conference calls throughout the winter and summer of 2010. The U.S. Geological Survey Northern Rockies Science Center completed a peer review of this report according to established U.S. Geological Survey Fundamental Science Practices. Following this peer review, the report was revised with additional data incorporated and underwent additional internal NPS reviews prior to being finalized.

SCIENTIFIC ASSESSMENT OF YELLOWSTONE NATIONAL PARK WINTER USE

The Scientific Assessment of Yellowstone National Park Winter Use, which was prepared in support of the 2011 Winter Use Plan/EISs, is available at the Yellowstone Winter Use website at http://www.nps.gov/yell/planyourvisit/winteruse.htm and the Planning, Environment, and Public Comment (PEPC) website at http://parkplanning.nps.gov/yell. The scientific assessment refers to available scientific information related to the potential effects of OSV use on a variety of impact topics, including natural resources and visitor experience. The scientific assessment was reviewed for this plan/SEIS process and it was determined to be up to date and valid for use in this plan/SEIS. In addition, a literature search was conducted and it was determined that since the Scientific Assessment of Yellowstone National Park Winter Use was published, no additional studies that provide new information with a direct correlation to winter use at Yellowstone have been published. Additional information on the SAT, as well as the Scientific Assessment of Yellowstone National Park Winter Use, can be found online at http://www.nps.gov/yell/parkmgmt/winterusetechnicaldocuments.htm.

OPERATIONAL RISK MANAGEMENT ASSESSMENT

Additional supporting information for this winter use planning process was provided from the ORMA process that occurred for the operation of Sylvan Pass in August 2010. This review was a follow up to the initial ORMA conducted in 2007. A panel of experts evaluated the risks to employee and visitor safety as reflected by the existing operations that were initiated in 2007, as well as the potential areas of improvement (for visitor access, agency cost, resource protection, and effectiveness of avalanche control) of several new potential avalanche control options, with an operational mission to avoid negative avalanche-human contact. This information was considered and incorporated in the "Health and Safety" section in this plan/SEIS. Additional details on this process, including the document and list of participants, can be found at the Yellowstone Winter Use website at http://www.nps.gov/yell/parkmgmt/winterusetechnicaldocuments.htm.

ISSUES AND IMPACT TOPICS

NEPA regulations require an "early and open process for determining the scope of issues to be addressed and for identifying the significant issues related to a proposed action" (40 CFR 1501.7). Issues are problems, opportunities, and concerns regarding the current and potential future management elements for managing winter use, impacts of winter use, and winter use opportunities in Yellowstone that are included in this plan/SEIS. The issues were identified by the NPS, cooperating agencies, other agencies, and the public throughout the scoping process. Information obtained from the public scoping period and the public comment period on the 2011 Winter Use Plan/EIS was included in this document. A detailed summary of the

***Issues**—The issues were identified by the NPS, cooperating agencies, other agencies, and the public throughout the scoping process.*

public outreach for the 2011 planning process, which was incorporated into this plan/SEIS, is provided in the "Consultation and Coordination" chapter. The impact topics discussed below were derived from issues.

Impact topics are a more refined set of concerns analyzed for each of the winter use alternatives. The impact topic represents a resource, such as wildlife and wildlife habitat, including rare, unique, threatened, or endangered species, and species of concern, that may be impacted by winter use. In the case of wildlife and wildlife habitat, including rare, unique, threatened, or endangered species, and species of concern, for example, such impacts would include potential disturbance from OSV use, as further discussed below. Each impact topic is explained in the "Affected Environment" chapter. In the "Environmental Consequences" chapter, the impact topics are used to explain the extent to which an issue would be made better or worse by the actions under a particular alternative.

Public Scoping Meeting Held in West Yellowstone, Montana

Public scoping for this plan/SEIS began on February 8, 2012, with the publication of a Notice of Intent to Prepare an EIS in the *Federal Register*. During the scoping period, a total of four public scoping open houses were held: two in Montana and two in Wyoming. The public scoping period closed on March 9, 2012; the NPS received more than 73,000 separate letters on the scope of this plan/SEIS. Comments received included suggestions for and opposition to alternative elements, such as opposition to requiring operators to provide both snowcoaches and snowmobiles, opposition to restricting use during the first two and last two weeks of the season, questioning what defines a transportation event (called sound events during public scoping), and questioning how many non-commercially guided vehicles should be allowed. Additional comments included general support for sound event management, general opposition to sound event management, questions about the development of BAT snowcoaches and the operation of Sylvan Pass (whether it should remain open, and the impacts of that decision), and support for a transition period for phasing in any new use level requirements.

These issues and impact topics also take into account comments received on the draft plan/SEIS. The comment period for the draft plan/SEIS was open from June 29, 2012, to August 20, 2012, and re-opened in September 2012 for an additional 30 days. In July 2012 four public meetings were held in Wyoming and Montana. During the public comment period, more than 11,900 pieces of correspondence were received. Comments received were similar to those for public scoping and included questions on NPS air and sound modeling inputs, as well as questions on the comparability of snowmobiles and snowcoaches described under alternative 4.

WILDLIFE AND WILDLIFE HABITAT, INCLUDING RARE, UNIQUE, THREATENED, OR ENDANGERED SPECIES, AND SPECIES OF CONCERN

Various elements of the alternatives evaluated have the potential to impact wildlife in the interior of the park. The species below were specifically selected for detailed analysis in this plan/SEIS due to the potential impacts of winter use in the park.

Bison Foraging in Winter

Winter use of the park by ungulates (hoofed mammals) such as elk (*Cervus elaphus*) and bison (*Bison bison*) is widespread, and herds of these large ungulates are focal points for visitors. Elk and bison in the park are the subject of numerous studies relating to OSV use. They are potentially subject to encounters and conflicts with OSV users and other winter visitors. Bison and elk were brought up as species of concern by the public during scoping. These two ungulates are therefore retained for analysis in this plan/SEIS. Three species, Canada lynx (*Lynx canadensis*), grizzly bear (*Ursus arctos horribilis*), and gray wolf (*Canis lupus*) are listed or treated as threatened (they are species of special concern in the park) under the Endangered Species Act (ESA). Grizzly bears are unlikely to experience adverse effects from OSV use, and were therefore not further evaluated in this plan/SEIS (see "Issues and Impact Topics Considered but Dismissed from Further Analysis"). Impacts on Canada lynx and gray wolf, however, have been carried forward for analysis because these species could be impacted by OSV use and associated actions. Additional species of concern that are relatively rare in the park or in need of special protection and could be adversely affected by OSV use and its associated actions include the wolverine (*Gulo gulo*), bald eagle (*Haliaeetus leucocephalus*), and trumpeter swan (*Cygnus buccinator*). Other species or categories of species that were mentioned in scoping or previous NEPA analyses but that would not experience adverse impacts greater than minor and/or are not rare or in need of special protection are discussed in "Issues and Impact Topics Considered but Dismissed from Further Analysis," below.

AIR QUALITY

Section 4.7.1 of NPS *Management Policies 2006* (NPS 2006a) states that the NPS has a responsibility to protect air quality under the NPS Organic Act of 1916 and the Clean Air Act (CAA). The NPS *Management Policies 2006* note that the CAA recognizes the importance of integral vistas, which are those views perceived from within Class I areas of a specific landmark or panorama located outside the boundary of the Class I area. Integral vistas have been identified by the NPS and are listed in Natural Resources Reference Manual 77 (NPS 2011c). There are no regulations requiring special protection of these integral vistas, but the "NPS will strive to protect these park-related resources through cooperative means" (NPS 2006a).

Air quality is a key resource in itself as well as a highly prized (and expected) element of the park visitor experience. Potential impacts on air quality from winter use in Yellowstone include air-quality related issues from exhaust as well as visibility (particularly from OSV emissions). During public scoping for this planning effort and during past planning efforts, public and cooperating agency commenters raised concern about air emissions from the various forms of OSV travel, as well as making suggestions for how air quality should be analyzed in the plan/SEIS. These include consideration of new technologies, development of an air monitoring protocol, and the emission factors used to model the various forms of OSV travel, among others.

Because of the potential impacts on air quality from the alternatives under consideration in this plan/SEIS, including emissions, visibility, and air-quality related values, this topic is addressed in detail.

SOUNDSCAPES AND THE ACOUSTIC ENVIRONMENT

Section 4.9 of the NPS *Management Policies 2006* (NPS 2006a) states that the NPS will preserve, to the greatest extent possible, the natural soundscapes of the park, including both biological and physical sounds. Natural sounds are intrinsic elements of the environment that are vital to the functioning of ecosystems and can be used to determine the diversity and interactions of species within communities. Soundscapes are often associated with parks and are considered important components of natural wildlife interactions, as well as visitor experience.

Winter soundscapes in Yellowstone include both natural and non-natural sounds. During public scoping for this planning effort and during past planning efforts, public and cooperating agency commenters raised concern about the noise levels of various forms of OSV travel.

Because of the potential impacts on the park's natural soundscape from the alternatives under consideration in this plan/SEIS, this topic is analyzed in detail.

VISITOR USE, EXPERIENCE, AND ACCESSIBILITY

The NPS *Management Policies 2006* states that "[t]he fundamental purpose of all parks also includes providing for the enjoyment of park resources and values by the people of the United States" (NPS 2006a). Part of visitor use and experience is visitor access to enjoying park resources and values. NPS *Management Policies 2006* states that "All reasonable efforts will be undertaken to make NPS facilities, programs, and services accessible to and usable by all people…" (NPS 2006a). During public scoping for this planning effort and during past planning efforts, public and cooperating agency commenters noted the role that various forms of access (snowcoaches and snowmobiles) play in providing visitors access to the winter experience in the interior of the park.

Example of the Sights Seen as Part of the Visitor Experience in Yellowstone in the Winter

The vast majority of winter visitors use OSVs to access the interior of the park. For some, these vehicles are an integral component of their experience. Others perceive negative impacts from OSV use, even if they use OSVs to access the park. Public input from this and past planning efforts has shown that expectations for a winter visitor experience in the interior of Yellowstone vary among visitors. At issue is the nature of visitor enjoyment and its relationship to the management and conservation of park resources and values.

Because of the potential for impacts on park visitor use and experience as well as visitor accessibility from the alternatives under consideration in this plan/SEIS, this topic is analyzed in detail. This plan/SEIS considers and analyzes the potential impacts resulting from changes in accessibility to the interior of the park for the very young, the elderly, and those who are mobility challenged. For these individuals, issues considered include opportunities to access and experience the park, the ability to view wildlife and scenery, and their exposure to and protection from winter weather including cold temperatures and high winds.

HEALTH AND SAFETY

Section 8.2.5.1 of the NPS *Management Policies 2006* (NPS 2006a) states that the saving of human life will take precedence over all other management actions, because the NPS strives to protect human life and provide for injury-free visits. During public scoping for this planning effort and during past planning efforts, public and cooperating agency commenters indicated concerns for safety regarding the operation of Sylvan Pass, as well as noted potential safety benefits from road plowing in the interior of the park.

Health and safety issues associated with some of the actions under consideration in this plan/SEIS include the effect of motorized vehicle emissions and noise on employees and visitors, avalanche hazards, and safety problems where different modes of winter transport are used in close proximity. Because of these potential impacts on health and safety from the alternatives under consideration in this plan/SEIS, this topic is analyzed in detail.

SOCIOECONOMIC VALUES

Under Section 8.11 of the NPS *Management Policies 2006* (NPS 2006a), the NPS is required to facilitate social science studies that support the NPS mission by providing an understanding of park visitors, the non-visiting public, gateway communities and regions, and human interactions with park resources. This approach provides a scientific basis for park planning, development, operations, management, education, and interpretive activities.

During this and past planning efforts, public and cooperating agency commenters indicated concern about the potential economic impacts of changing the management of winter use in the park on local businesses. The gateway communities of the park are dependent, in part, on winter use of the park, and any change in management during the winter use period could impact local business revenue. Concerns have also been voiced over affordable access, diversification of gateway community economies, protection of local business opportunities, and a need for additional socioeconomic surveys. Because of the potential impacts on socioeconomics from the alternatives under consideration in this plan/SEIS, this topic is analyzed in detail.

PARK OPERATIONS AND MANAGEMENT

Due to the harsh environmental conditions, management of winter use in the interior of Yellowstone requires a sufficient number of personnel and an adequate level of funding. Experience has shown that managing winter use in the park presents logistical and financial challenges. Any significant change to winter use in the park could influence the level of park staff and time and other resources required, and could increase the commitment of limited NPS resources (staff, money, time, and equipment). During public scoping for this planning effort and during past planning efforts, public and cooperating agency commenters raised concerns about the amount of staff and resources needed to carry out each alternative. Because of the potential impacts on park operations from the alternatives under consideration in this plan/SEIS, this topic is analyzed in detail.

ISSUES AND IMPACT TOPICS CONSIDERED BUT DISMISSED FROM FURTHER ANALYSIS

As described in the “Environmental Consequences” chapter in this plan/SEIS, the NPS takes a “hard look” at all potential impacts by considering the direct, indirect, and cumulative effects of the proposed action on the environment, along with connected and cumulative actions. In those cases where impacts are either not anticipated or are expected to be minor or less, the issues and impact topics are dismissed

from detailed analysis. As described in NEPA regulations, NEPA analysis should focus on issues that are truly significant to the action in question, rather than amassing needless detail (Council on Environmental Quality (CEQ) NEPA regulations, 40 CFR 1500.1 (b)). This section identifies the issues and impact topics dismissed from detailed analysis in this plan/SEIS and provides the rationale for the dismissal. Generally, issues and impact topics are dismissed from detailed analysis for one or more of the following reasons:

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

For each issue or topic presented below, if the resource is found in the analysis area or the issue is applicable to the proposal, then a limited analysis of direct, indirect, and cumulative effects is presented.

GEOLOGIC RESOURCES (SOILS, BEDROCK, STREAMBEDS, ETC.) INCLUDING GEOTHERMAL RESOURCES

Section 4.8 of the NPS *Management Policies 2006* (NPS 2006a) addresses geologic resource management, including geologic features and process. This policy states that the NPS will (1) assess the impacts of natural processes and human activities on geologic resources; (2) maintain and restore the integrity of existing geologic resources; (3) integrate geologic resource management into NPS operations and planning; and (4) interpret geologic resources for park visitors. Visitor access to the park's geologic and geothermal features in the winter months occurs via OSV on existing paved roads covered by snow. OSVs are the primary means of transportation to these sites in the interior of the park. Because any OSV use under consideration in this plan/SEIS would occur only on existing snow covered paved roads (the same roads open to wheeled-vehicle traffic in the summer), with access to foot traffic along established boardwalks, geologic or geothermal resources would not be affected or disturbed. Therefore the potential impacts on geologic and geothermal resources from the range of alternatives evaluated have been dismissed from further analysis in this plan/SEIS.

Topography and soils are considered geologic resources. Geology is a major determinant of water and soil chemistry, the types of plants that will grow and thrive, and the stability of hillsides. The topography and soils of the park would not be impacted by the alternatives being considered in this plan/SEIS; OSV use as proposed under the action alternatives would not impact topography or soils. Any proposed OSV use in the park under consideration in this plan/SEIS would occur on existing paved roads, which are the same roads open to wheeled vehicle traffic in the summer. Therefore, the implementation of a winter use plan would not disturb topography or soils because OSV traffic would not directly access soils or topographic features. Because no impacts would occur on soils or topography, the potential impacts on these resources have been dismissed from further analysis in this plan/SEIS.

GEOHAZARDS

A geohazard is an event related to geological features and processes, like an earthquake or rock slide, that causes loss of life and severe damage to property and the natural and built environment. Although geohazards, such as earthquakes, do occur in the park, they would not impact or be impacted by the

implementation of any of the alternatives under consideration in this plan. Therefore, this topic is dismissed from further consideration in this plan/SEIS.

OTHER WILDLIFE AND WILDLIFE HABITAT

Issues and concerns about impacts on wildlife were raised during scoping and during the preparation of this and previous NEPA documents relating to OSV use in the park. These concerns centered on certain species that could be adversely affected by OSV use and/or that have been studied in relation to OSV use. As discussed earlier in this chapter, those species are included in the plan for detailed analysis. This section refers to other species that would be expected to be minimally affected by the alternatives considered in this plan. These species or categories of wildlife, and the reason for their dismissal from detailed analysis, are discussed below.

Grizzly Bear (*Ursus arctos horribilis*)

The greater Yellowstone area grizzly population is considered a distinct population segment and has increased from a low of 136 animals in 1975 to more than 500 bears in 2010 (USFWS 2010a). This increase occurred during periods of heavy OSV use, when visitor numbers in the park varied from 70,000 to 100,000 each winter. Yellowstone's grizzly bear population, estimated to be between 431 and 588 in the Yellowstone ecosystem (NPS 2010a), is currently listed as threatened (USFWS 2010a).

Grizzly bears are not active during the winter, but OSV-related activities could disturb them during hibernation or after emergence in the spring, which could occur as early as mid-February. In fall, grizzlies are in hyperphagia, an annual phase in which they gorge themselves on available foods in preparation for hibernation. Females are the first to den, starting in the first week of September, with 90 percent of female grizzlies denned by the end of November. The earliest den entry recorded for male grizzlies was the second week of October, with 90 percent denned by the fourth week of November. Dens are often found in north slopes, usually at altitudes from 6,500 to 10,000 feet (averaging 8,100 feet) close to whitebark pine and/or subalpine fir forests (McNamee 1984; Judd, Knight, and Blanchard 1986). In spring, males are first to emerge from winter hibernation, starting as early as mid-February; females with cubs usually emerge by mid-April (Haroldson et al. 2002). Spring-emerging bears consume ungulate carcasses, when available, and rely on these carcasses as a primary food source while also consuming whitebark pine nuts, spring vegetation, and over-wintered whitebark pine nuts, if available (Mattson, Blanchard, and Knight 1991, 1992).

Grizzly bears are sensitive to human disturbance at den sites and Mace and Waller (1997) speculated that female grizzly bears with cubs that are still confined to the den site in the spring have the greatest potential to be disturbed by OSV use. OSV use in Yellowstone is restricted to groomed road corridors and occurs from late December to early March, when most female grizzlies are still denned. Male grizzly bears are the earliest to emerge in the spring, and may overlap with OSV use in the park.

Impacts on bears from human recreation year-round are mitigated by park-established bear management areas, where human disturbance is limited by the total closure of an area, trail closure, a minimum party size of four or more people, and human travel restrictions to daylight hours only. Bear management areas are designed to reduce the impacts of human disturbance in high-density bear habitat. Areas with denning females are closed from the start of spring emergence, generally March 1 (NPS 2010a). These closures would serve to further protect den sites from winter use extending until March 15.

Grizzly bears in Yellowstone generally den far from groomed park roads and areas used by recreationists, and are in hibernation for most of the winter months. Therefore, OSV use in the park as proposed in this plan/SEIS has little potential to disturb them. Although there is overlap with the proposed winter use

season (which extends through March 15) and spring emergence (which can occur as early as mid-February), female grizzlies with cubs, which may be the most sensitive to disturbance, generally do not emerge until after the winter use season has ended. In addition, areas with denning females are closed, generally starting March 1 (NPS 2010a). Additionally, grizzly populations were increasing in the park during winter use periods, including periods of heavy OSV use prior to 2004 and the continued, but reduced, OSV use during the following winters. The whitebark pine declines in the area may result in changes in bear ecology; however, specifics of how this may affect denning chronology are unknown. All of the action alternatives for winter use management (alternatives 2, 3, and 4) would have, at most, short-term and negligible impacts on grizzly bears, because encounters between OSVs and grizzly bears are limited both by seasonal timing and by the restriction of OSV users in the park to groomed roads. Under the no-action alternative (alternative 1), no effects would be assumed from the limited administrative use that would occur. Therefore, potential impacts on grizzly bears from the alternatives under consideration in this plan are not analyzed in further detail.

Black Bear (*Ursus americanus*)

Similar to grizzly bears, black bears begin to den in late October to mid-November and re-emerge any time from March through early May, with a general denning period of about five months. Therefore, during winter use, black bears are typically hibernating. In addition, previous analysis has demonstrated that existing winter recreation activities in the park do not affect black bears. Destruction of den sites or den habitat does not appear to be an issue in the park. 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 park does not overlap with most bear activity and therefore precludes most risks of bear/human conflicts. For these reasons, impacts on black bears would be no more than short term and negligible under all alternatives considered in this plan/SEIS. Therefore, potential impacts on black bears from the alternatives under consideration in this plan are not analyzed in further detail.

Cougar (*Puma concolor*)

Cougars are secretive predators. They weigh between 75 and 165 pounds as adults and primarily prey on elk calves and mule deer (*Odocoileus hemionus*) in northern Yellowstone. Cougars actively avoid encounters with humans and are rarely seen by park visitors. In 1987, the park began a two-phase study investigating the ecology, population, and movements of cougars in northern Yellowstone. Phase I took place from 1987 to 1996 and during this time researchers captured 88 cougars, 80 of which were radio collared and tracked. Phase II of the study began in 1998 and investigated the ecological role of cougars in the greater Yellowstone area ecosystem. The results of this research provide a good estimate of the cougar population, and the role of cougars in the Yellowstone ecology. Yellowstone's northern range currently supports an estimated population of 14 to 23 adult cougars and numerous cubs. Hunting by humans, habitat fragmentation, and habitat loss are the primary threats to cougar populations in the greater Yellowstone area (Greater Yellowstone Science Learning Center 2010). Cougars are primarily found in the northern section of the park, where proposed OSV road corridors would be limited. Therefore, exposure to OSVs under the alternatives in this plan/SEIS would be rare and impacts on cougars from OSV use in the park would be short term and at most negligible to minor under the action alternatives (alternatives 2, 3, and 4). Under the no-action alternative (alternative 1), no effects would be caused by the limited administrative use that would occur. Therefore, potential impacts on cougars from the alternatives under consideration in this plan are not analyzed in further detail.

Coyote (*Canis latrans*)

Coyotes are abundant, successful, and highly adaptable predators and scavengers found in most habitats below 8,000 feet throughout the greater Yellowstone area. Coyotes are adaptable to human use and appear to thrive in disturbed areas. During winter behavioral observations in 2009, coyotes generally displayed a look-resume response to OSV traffic (35.9 percent), with 41 percent showing no visible response, 20.5 percent travel, and 2.6 percent flight (McClure et al. 2009). OSV use has not been linked to declines in population or to changes in habitat use. Rather than demonstrating increased sensitivity, the coyote appears generally prone to losing its fear of humans and frequenting areas of human use, searching for food or begging (Taber 2006; Van Etten, Wilson, and Crabtree 2007).

The guiding requirements currently in place at Yellowstone appear to have eliminated most begging behavior. Visitors are instructed to store their food in closed compartments and to refrain from feeding begging coyotes. Additional measures include securing trashcans and areas of human food waste at developed sites. The primary issue regarding the impacts of OSV use on coyotes is the effect of unguided users feeding or not securing food from scavenging coyotes (Taber 2006).

Because there would be no recreational OSV use under the no-action alternative, alternative 1 would have no effects on coyotes. Alternatives 2, 3, and 4 include guiding requirements, with trained drivers operating snowcoaches, and guides leading groups of up to 10 snowmobiles (ranging from 7 to 10 under alternative 4). As shown in past studies that looked at guided OSV use (Taber 2006; NPS 2008a), the requirement for guided use would reduce the possibility of problem behaviors in coyotes because trained guides would continue to instruct their clients regarding food storage and feeding. Under alternative 4, non-commercial guides would receive similar training and would ensure that their groups comply with these guidelines. Also, under these alternatives, daily entry requirements limit OSV visitation to a level below historical limits with the number of transportation events at or below these levels. As stated above, at these use levels monitoring has shown that coyotes generally displayed a look-resume response (McClure et al. 2009). Also, monitoring of human/wildlife encounters would continue under these alternatives. If this monitoring indicates that the presence and activities of winter visitors are having impacts on coyotes that cannot be mitigated, selected areas of the park may be closed to visitor use. Therefore, these alternatives would result in at most short-term negligible effects on coyotes.

There would be negligible impacts on coyotes under all alternatives. Therefore, potential impacts on coyotes from the alternatives under consideration in this plan/SEIS are not analyzed in further detail.

Other Mid-sized Carnivores

Other mid-sized carnivores not addressed further in this analysis include the bobcat, fisher, marten, long-tailed weasel, river otter, and red fox. The reasons for dismissal of these species are discussed below. The wolverine and Canada lynx are included in the detailed analysis in this plan/SEIS.

The bobcat and red fox are managed as furbearers in the greater Yellowstone area, and thus may be hunted and trapped outside the park. Populations are considered stable (Olliff, Legg, and Kaeding 1999). OSV use as proposed under the alternatives considered in detail in this plan/SEIS would occasionally interact with these species, but such interactions would be rare and would occur in limited portions of available habitat. Interactions with OSVs would have short-term impacts, no more than negligible to minor, on the populations of red foxes and bobcats in the park under the action alternatives (alternatives 2, 3, and 4). Under the no-action alternative (alternative 1), only minimal effects are expected to arise from the limited administrative use that would occur. Therefore, potential impacts on bobcats and red foxes from the alternatives under consideration in this plan are not analyzed in further detail.

Fishers live in coniferous and mixed conifer and hardwood forests and prefer mature or old-growth forest cover. During winter in the greater Yellowstone area, fishers avoid areas of deep, fluffy snow and select riparian areas with relatively gentle slopes and dense canopy cover that may provide protection from snow (USFWS 2010b; Clark et al. 1989). Fishers are active throughout the winter and are opportunistic predators primarily of snowshoe hares, porcupines, squirrels, mice, and birds. Fishers also consume carrion and plant material (e.g., berries). The breeding season is from March to April (Heinemeyer and Jones 1994). Due to concern about the status of fishers, and lack of available information on their population, on April 15, 2010, the U.S. Fish and Wildlife Service (USFWS) determined that the Northern Rocky Mountain distinct population of the fisher may warrant federal protection as a threatened or endangered species. The Northern Rocky Mountain population area includes portions of northern Idaho, western Montana, and northwestern Wyoming. Snowtrack surveys have documented fishers in the greater Yellowstone area during the late 1990s but a track and hair survey in Yellowstone from 2001 to 2004 did not detect fishers (Murphy et al. 2006; USFWS 2010b). Although there have been no recent verified sightings, fishers likely exist at very low numbers in the greater Yellowstone area (USFWS 2010b). In Yellowstone, fishers may be found primarily in the heavily forested eastern sector of the park, also preferred by lynx. OSV traffic is limited in this section of the park, resulting in minimal habitat disruption from OSV use. Fishers appear to tolerate fairly high levels of human activity, and are thriving in suburban New England. Habitat availability is considered the most important factor to their survival (Bull, Aubry, and Wales 2001). Impacts on fishers from OSV use under the alternatives evaluated in detail in this plan/SEIS would be short term and negligible. Therefore, potential impacts on fishers from the alternatives under consideration in this plan are not analyzed in further detail.

Martens are smaller and more common than fishers in the greater Yellowstone area. Like fishers, martens remain active throughout the year and are most commonly found in older stands of spruce-fir. They prey on mice and voles, switching to red squirrels and hares as the snow deepens. Martens use meadows, forest edges, and rock alpine areas, with young born in mid-March to April. Mother martens raise the young in dens, and move dens frequently. The availability of dens is important for survival of the young (Clark et al. 1989; Ruggiero et al. 1994). Forest fragmentation as a result of logging is a threat to the greater Yellowstone area population of martens, and disturbance of natal dens could limit the survival of young. Because OSV use in Yellowstone would be restricted to roads under the alternatives and would not be in marten habitat, and OSVs would not be present in the park during the sensitive marten denning season, impacts from OSVs on martens under the alternatives evaluated would be short term and negligible. Therefore, potential impacts on martens from the alternatives under consideration in this plan are not analyzed in further detail.

Long-tailed weasels are solitary and voracious hunters. Weasels often tunnel under the snow to hunt prey. Long-tailed weasels are an unprotected species and little is known about their status in the park. Neither the subnivean (inhabiting the area in or under the snow layer) fauna hunted by weasels nor weasel habitat would be affected by OSV use under any of the alternatives in this plan/SEIS. OSV use would be limited to road corridors, which would limit the exposure of weasels to OSVs because disturbance to their habitat would be limited. Impacts on this species from OSV use would be short term and at most negligible. Therefore, potential impacts on weasels from the alternatives under consideration in this plan are not analyzed in further detail.

River otters are semi-aquatic, densely coated animals that weigh 11–30 pounds as adults. With their long, sleek bodies, otters are efficient aquatic predators that primarily hunt and eat fish. In the Yellowstone area, the river otter's diet is composed of a high percentage of the native species of cutthroat trout. Otters also consume long-nose suckers and a small percentage of introduced trout species. Because they rely on native cutthroat trout for a large percentage of their diet, continued declines in the population of native cutthroat trout species could negatively impact otters around Yellowstone Lake and throughout the park

(Crait and Ben-David 2006). Otters are also sensitive to the degradation of habitat, including clearing of riparian vegetation and aquatic pollution (Boyle 2006).

Otters in the Yellowstone area breed in late April, and give birth to young in March of the following year. Pups stay with the mother for approximately 1 year. River otters live in groups with strong social bonds. These groups consist of mother and pups, juveniles, or may be male-only (Boyle 2006). These life stages occur outside the OSV use season.

Historically, the river otter occupied most major drainages in the continental United States and Mexico. During the first half of the 1900s, river otters were heavily trapped throughout North America and were extirpated in many of the American states. In Wyoming, otter trapping was closed in 1953 and the species has been protected from take since 1973. There is an open trapping season for river otters in Idaho. Current river otter abundance estimates throughout the Rocky Mountain region are uncertain because no field techniques exist to reliably determine otter populations. There is additional uncertainty about the age at first breeding and how often otters breed. No direct measurement data exist on the effects of human-caused habitat alteration on river otters, including disturbance activities related to recreation (Boyle 2006).

Otters in Yellowstone may be found along Yellowstone Lake and the Lamar River drainage and may be found along river corridors throughout the park. Otters are active during winter months and are observed playing and sliding on snow-covered banks. Park roads and OSV routes often follow river drainages, but OSVs are restricted to designated routes that are mostly setback from riverbanks anywhere from 10 to 300 yards, with the setback typically being 50 yards. These setback areas limit the amount of habitat that would be disturbed. The amount of disturbance in river otter habitat would be minor, characterized primarily by noise disturbance likely resulting in a response by individuals. Due to the minimal amount of habitat that would be disturbed, impacts on otter would be minor or less. Therefore, this species is dismissed from further analysis in this plan/SEIS.

Moose (*Alces alces*)

Moose depend on mature lodgepole pine forests for their winter range and were historically rare in Yellowstone during the early 1900s. A 1980 survey estimated park populations at less than 1,000. Moose numbers appear to be dropping and future population trends likely depend on habitat availability and conditions, predation levels, and human activities (Tyers 1999).

Moose have massive bodies, low surface area, and long legs that are well adapted to cope with extreme cold and deep snow, and moose are able to winter in areas with deeper snow than elk. Moose move from low-elevation willow stands to up to 8,500-foot stands of subalpine fir and Douglas fir in November, where they overwinter (Tyers 2003) and browse on fir, willows, and lodgepole pine. Moose overwintering locations in the greater Yellowstone area include the Hermitage Point area, Buffalo Valley, Willow Flat, and the Snake and Gros Ventre River corridors. In Yellowstone, they are commonly seen in the park's southwestern corner along the Bechler and Falls rivers; around Yellowstone Lake; in the Soda Butte Creek, Pelican Creek, Lewis River, and Gallatin River drainages; and in Willow Park between Norris and Mammoth. Winter use occurs along the northwest side of Yellowstone Lake and on a 1-mile segment along Falls River to Cave Falls. OSV routes under the alternatives being considered in this plan/SEIS run adjacent to the Lewis River from Lewis River Falls to the confluence with the Snake River, and in the Willow Park area from Mammoth to Norris. An OSV route under the alternatives being considered in this plan/SEIS also crosses the lower reach of Pelican Creek. OSV encounters with moose would be expected to be quite rare: annual wildlife behavioral monitoring of current OSV use in the park has no recorded sightings of moose encounters with OSVs. However, sound from OSVs may cause disturbance to moose in the area and is addressed in the "Soundscapes and the Acoustic Environment"

section of the "Affected Environment" and "Environmental Consequences" chapters. Due to the lack of documented encounters and the limited areas of potential interaction, all alternatives being considered in this plan/SEIS would have, at most, short-term negligible impacts on moose. Therefore, potential impacts on moose from the alternatives under consideration in this plan/SEIS are not analyzed in further detail.

Bighorn Sheep (*Ovis canadensis*)

Populations of bighorn sheep in Yellowstone were nearly eradicated by 1900. Since then, population estimates of bighorn sheep have varied from a low of 134 in 1998 to a high of 487 in 1981. Current threats to the population include disease, drought, and competition with other ungulates (elk, mule deer, and bison) especially during severe winters. The isolation and low population numbers of the Yellowstone bighorn sheep herds also limit population growth and range expansion. The population high of 1981 was reduced by 60 percent following an outbreak of pinkeye (Meagher, Quinn, and Stackhouse 1992). Yellowstone's bighorn herds were slow to recover and, as of January 2010, aerial surveys indicated a population of 250 to 275 animals (NPS 2010c; Greater Yellowstone Science Learning Center 2010). Bighorn sheep in Yellowstone winter exclusively in the steep, rocky areas found in the northern section of the park, with the core of the herd centered in the vicinity of Mount Everts. Sheep avoid areas of human activity or development, but a 150-meter buffer from a disturbance may be sufficient in areas of low to moderate human use (Schoenecker et al. 2004). Any road use or human development that affects the migration of sheep from their lower elevation winter range to their higher-elevation summer range may negatively impact bighorn sheep herd populations (Legg 1998). Several areas of bighorn sheep winter range are closed to the public to minimize any adverse effects public use may have on these populations. Groomed winter OSV routes under the alternatives being considered in this plan/SEIS do not currently cross the bighorn sheep winter range, with the closest motorized route to the Mount Everts vicinity being the plowed road from Mammoth Hot Springs to Tower. Therefore, disturbance is currently limited to any sounds that may travel into the winter range from OSVs, motorized vehicles, or non-motorized winter travelers. Impacts on bighorn sheep under all alternatives considered in this plan/SEIS would be short term and negligible. Therefore, potential impacts on bighorn sheep from the alternatives under consideration in this plan/SEIS are not analyzed in further detail.

Pronghorn (*Antilocapra americana*), Mule Deer (*Odocoileus hemionus*), and White-tailed Deer (*O. virginianus*)

Pronghorns in Yellowstone spend the winter in the area between the North Entrance and Reese Creek, in a 30-kilometer area just northwest of Gardiner, Montana (Blank and Stevens 2006). Both mule deer and white-tailed deer are found in the park during the summer but mule deer primarily winter outside the park to the north of park boundaries. White-tailed deer are uncommon in the park and winter in Yellowstone's northern range, which is intersected by a wheeled-vehicle motorized route and where OSVs are rare (Barmore 2003). Annual winter wildlife monitoring surveys have no recorded interactions between OSV users and ungulate species other than bison and elk. Because pronghorns, mule deer and white-tailed deer winter outside the park or in areas that are not exposed to the winter OSV use proposed under the alternatives considered in this plan/SEIS, impacts on these species under all of the alternatives considered would be negligible. Therefore, potential impacts on pronghorn, mule deer, and white-tailed deer from the alternatives under consideration in this plan/SEIS are not analyzed in further detail.

Birds

Most bird species are not addressed further in this analysis because they are only in the park during the summer and/or their habitats are not likely to be impacted by winter recreation; therefore impacts from OSV use would be short term and would range from no impact to negligible adverse impacts for most species. 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. Most avian predators except for bald eagles, golden eagles, and owls are not present in the park in the winter and would therefore not be impacted by OSV use. Annual winter wildlife monitoring reports observed very few golden eagle and OSV interactions. Out of about five to eight observations from winter 2007 to 2009, the majority of observed golden eagle behavioral responses consisted of look-resume or no visible response, indicating few active movement responses by golden eagles (McClure et al. 2009, 2008; Davis et al. 2007). For the golden eagle and other avian predator species, due to the limited number of interactions and the limited amount of habitat that would be disturbed, impacts would not be greater than minor. Potential impacts on bald eagles are further addressed and carried forward for analysis in the "Environmental Consequences" chapter of this plan/SEIS.

For other species, such as non-migratory songbirds, there is the potential for impacts on individual birds or aggregations of birds if food sources are adjacent to roads or if the birds are frequently affected by either the visual or audible impacts associated with OSV use. However, there is limited potential for impacts on these species because of the low numbers present during the winter, as well as the large expanses of suitable habitat for the species to move through. Although the Scientific Assessment for Yellowstone Winter Use addresses potential impacts on song birds from vehicular use, specifically discussing reduced breeding success when exposed to disturbance by humans, these studies were not specific to winter use and do not indicate that OSV use would impact songbirds in Yellowstone (NPS 2011f). In addition, other studies suggest that noise indirectly facilitates the reproductive success of individuals nesting in noisy areas as a result of the disruption of predator/prey interactions (Francis, Ortega, and Cruz 2009).

In the past, ravens have approached humans and areas of human activity for food and learned how to access storage compartments under snowmobile seats to obtain food. Since 2004, guiding requirements have effectively restricted any feeding of ravens; OSV users have been instructed to store food in places inaccessible to ravens, eliminating the success of ravens at obtaining human-supplied food (Taber 2006). As such, the effects of OSV use on ravens under any alternative would be minimal under the alternatives considered in this plan/SEIS.

In the absence of any data indicating population decline, strong behavioral response, or displacement of bird species in the park, as well as the limited amount of birds present in the winter and limited amount of habitat that would be impacted by OSV use, impacts on birds from OSVs under the alternatives considered in this plan/SEIS would be short term and at most negligible to minor under the action alternatives (alternatives 2, 3, and 4). Under the no-action alternative (alternative 1), no effects would result from the limited administrative use that would occur. Therefore, potential impacts on other bird species from the alternatives under consideration in this plan/SEIS are not analyzed in further detail.

Subnivean Fauna

Subnivean fauna are small mammals that live under snow during winter, including pikas, 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, subnivean fauna are abundant residents of the park and any potential loss of habitat caused by road grooming or plowing operations would be compensated for by the vast amount of area in the park without roads. Also, because OSV travel is only allowed on hard road surfaces that are driven on during non-winter months, no impacts on subnivean species or their habitat would be likely. Research in other areas indicates that subnivean pits and burrows have been found under roads that have been groomed for OSV use and in snowmobile play areas (Wildlife Resource Consultants 2004). These potential impacts were determined to be short term and negligible.

Pikas are likely present in the Sylvan Pass area, including within the approximately 20 named avalanche slide paths in Sylvan Pass proper. When an avalanche occurs, whether it occurs naturally or is triggered by the NPS, there is the potential for pika tunnels to be filled by snow which could result in the injury or mortality of one or more individuals. Under the no-action alternative and an action alternative where Sylvan Pass is closed (alternatives 1 and 3), this risk of injury or mortality could occur from naturally occurring avalanches. Under alternatives where Sylvan Pass is actively managed (alternatives 2 and 4) this same risk could occur from a triggered avalanche as part of Sylvan Pass operations conducted by the NPS. Avalanches that occur naturally are typically less frequent than those caused by humans, but when they do occur they likely have a greater intensity. Human-triggered avalanches may be more frequent, but may be less intense and affect a smaller area. Based on the relationship of avalanches and subnivean species survival, all alternatives, including the no-action alternative, would have a similar potential for impacting subnivean fauna in Sylvan Pass. While there is always the potential for some injury or mortality, the chance for mortality would be the same under all alternatives, with the action alternatives not differing from the no-action alternative. Sufficient subnivean habitat, including pika habitat, is available throughout the park in non-avalanche prone areas and any mortalities related to avalanches, either natural or NPS-initiated, would not result in meaningful effects to species populations. According to the CEQ Regulations for Implementing NEPA (Section 1502.1 and 1502.2) agencies should "focus on significant environmental issues" and for other than significant issues there should be "only enough discussion to show why more study is not warranted." Because potential impacts to subnivean fauna would occur with the same intensity and probability regardless of which alternative is selected for implementation, including the no-action alternative, this issue was not analyzed in further detail.

Reptiles, Amphibians, Fish, and Invertebrates

Reptiles found in the park include the bull snake, prairie rattlesnake, and the sagebrush lizard. Semi-aquatic species include the wandering garter snake, valley garter snake, and rubber boa. Amphibians in the park include the Columbia spotted frog, boreal chorus frog, blotched tiger salamander, and the bullfrog. The boreal toad (*Bufo boreas boreas*) and the northern leopard frog (*Rana pipiens*) are amphibian species of special concern. The northern leopard frog was historically documented to breed in the park, but currently is very scarce (Koch and Peterson 1995); the boreal toad has declined in population. These two species use many aquatic habitats, including ponds, lakes, and other wetlands.

Fish are an important part of the wildlife population in the park, linking terrestrial and aquatic environments, and supplying an important food source for bald eagles and other wildlife. Over 20 species of fish are found in the park, including non-native species, trout, and salmonids. Special-concern fish species include arctic grayling (*Thymus arcticus*), the snake river cutthroat (*Oncorhynchus clarkii bouvieri*), the westslope cutthroat trout (*Oncorhynchus clarkii lewisi*), and the leatherside chum (*Gila copei*). Aquatic invertebrates are abundant in the park because of the wide variety of habitats, including thermally influenced wetlands. About 170 species have been collected and identified.

OSVs and winter recreation would have either no impact or no more than negligible impacts on reptiles, amphibians, fish, and invertebrates under the alternatives considered in this plan/SEIS. Reptiles and amphibians are inactive or hibernate during the winter and are therefore not exposed to the impacts of OSV use; therefore, no impacts would be expected. OSV use would not directly impact fish or aquatic life. Air pollution from OSV engines, subsequent deposition of toxins in the snowpack, and indirect negative impacts on aquatic species from snowmelt were once a concern, but new BAT requirements have reduced emissions and minimized potential impacts. As noted under the water quality dismissal (below), although there is a clear relationship between OSV use and pollutant deposition in the snowpack, monitoring has shown quantities of OSV-related pollution in snowmelt that are in the range of background or near-background levels and would have no measurable effect (Arnold and Koel 2006). Impacts on reptiles, amphibians, fish, and invertebrates would be non-existent (alternative 1) or at most

negligible (alternatives 2, 3, and 4) under the alternatives considered in this plan/SEIS. Therefore, potential impacts on reptiles, amphibians, fish, and invertebrates from the alternatives under consideration in this plan/SEIS are not analyzed in further detail.

WATER QUALITY

Section 4.6.3 of the NPS *Management Policies 2006* (NPS 2006a) states that the pollution of surface waters and groundwater by both point and nonpoint sources can impair the natural functioning of aquatic and terrestrial ecosystems and diminish the utility of park waters for visitor use and enjoyment. In the park, OSV use occurs on established, existing roads. Although there is a clear relationship between OSV use and pollutant deposition in the snowpack, monitoring has not shown more than negligible to minor quantities of OSV-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, Campbell, and McClure 2005). The NPS and U.S. Geological Survey will continue to monitor pollution deposition in the snowpack, and with any of the alternatives, the application of a monitoring program, resource closures, and adaptive management would represent appropriate protective actions regarding water and aquatic resources. Therefore, potential impacts on water quality from the alternatives under consideration in this plan/SEIS are not analyzed in further detail.

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 Yellowstone are well defined. No actions proposed in this plan/SEIS would occur in or encroach on floodplains, and all actions would occur during the winter months when there is little concern for flooding.

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 the alternatives occur and mitigation be designed prior to development in wetlands. No actions proposed in this plan/SEIS would occur in or encroach on wetlands and all actions would occur during the winter months on paved roads that are open for wheeled vehicle travel in the summer. Therefore, potential impacts on wetlands and floodplains from the alternatives under consideration in this plan/SEIS are not analyzed in further detail.

ECOLOGICALLY CRITICAL AREAS

Rare or Unusual Vegetation

Pursuant to Section 4.4 of the NPS *Management Policies 2006* (NPS 2006a), vegetation will be maintained as a part of the natural ecosystem of the park. Most documented vegetation impacts from OSVs, specifically snowmobiles, occur when they are driven away from established roads and trails. In the park, OSV activities are limited to paved roads and along road margins where motorized use is allowed throughout the year. Because little or no vegetation exists on or immediately adjacent to the established OSV routes (which would be the same as the routes under the alternatives considered in this plan/SEIS) during the winter, winter use including OSV use is not likely to impact vegetation. Therefore, potential impacts on rare or unusual vegetation from the alternatives under consideration in this plan/SEIS are not analyzed in further detail.

Unique Ecosystems, Biosphere Reserve, and World Heritage Sites

Section 4.3 of the NPS *Management Policies 2006* (NPS 2006a) states that the NPS recognizes that special designations apply to parts or all of some parks to highlight the additional management considerations that those designated areas warrant. Yellowstone National Park is a designated Biosphere Reserve as well as a designated World Heritage Site.

Because no changes would be made to the designation of, or contributing attributes to the Biosphere Reserve or World Heritage Site from the alternatives considered in this plan/SEIS, potential impacts on these resources are not analyzed in further detail.

Wilderness

Yellowstone contains recommended wilderness. Section 6 of NPS *Management Policies 2006* (NPS 2006a) states: "All NPS lands will be evaluated for their eligibility for inclusion within the national wilderness preservation system. For those lands that possess wilderness characteristics, no action that would diminish their wilderness eligibility will be taken until after Congress and the President have taken final action. Wilderness considerations will be integrated into all planning documents to guide the preservation, management, and use of the park's wilderness area and ensure that wilderness is unimpaired for future use and enjoyment as wilderness."

Impacts on wilderness from OSV use under the alternatives considered in this plan/SEIS may include impacts on the soundscape. Current BAT requirements in Yellowstone limit sound levels per snowmobile to 73 A-weighted decibel (dBA) or lower when measured following the SAE J192 test procedures (NPS 2009a). Nonetheless, snowmobiles and snowcoaches and other human-caused noise can be heard at distances from snow roads. OSV noise can be audible at especially long distances on calm days with temperature inversions. These potential impacts on the recommended wilderness in the park are described in this plan/SEIS in the "Soundscapes and the Acoustic Environment" section. Other attributes related to wilderness that could be impacted are also discussed under other sections of this plan/SEIS such as "Visitor Use, Experience, and Accessibility" and "Air Quality." Regarding impacts to recommended wilderness from avalanche mitigation activities, the map provided to Congress in 1978 is of poor quality and the proposed recommended wilderness boundary demarcation line is not clear. The lower portion of the 20 named avalanche chutes are clearly outside the proposed wilderness boundary as they all basically terminus at the road. It is unclear, based on the 1978 map, if the upper portions of some or all of the 20 avalanche paths are within the recommended wilderness boundary. Avalanches are purposely triggered by NPS staff just after a heavy snowfall or wind event, typically when avalanche danger is at its highest. During these mitigation efforts, the pass and areas around the pass are closed to all visitors. Even if the pass was not closed, it is highly unlikely that backcountry skiers would be skiing within or near the slide paths during a heavy snowfall or wind event given their propensity to slide naturally under such circumstances. Naturally triggered avalanches may occur less frequently than those triggered by avalanche mitigation efforts, but they may be of greater intensity. Human-triggered avalanches may be more frequent, but may be less intense and therefore affect a smaller area. All alternatives, including the no-action alternative, would have a similar potential for impacting recommended wilderness. According to the CEQ Regulations for Implementing NEPA (Section 1502.1 and 1502.2), agencies should "focus on significant environmental issues" and for other than significant issues there should be "only enough discussion to show why more study is not warranted." Because potential impacts to recommended wilderness would occur with the same intensity and probability regardless of which alternative is selected for implementation, including the no-action alternative, this issue was not analyzed in further detail. For these reasons, potential impacts on wilderness (as a stand-alone impact topic) from the alternatives under consideration in this plan/SEIS are not analyzed in further detail.

Wild and Scenic Rivers

The Wild and Scenic Rivers Act was passed in October of 1968 (Public Law 90-542, as amended 16 USC 1271–1287). The goal of the wild and scenic river designation is to preserve the character of the river. Developments that do not damage the resources of a designated river or curtail its free flow are usually allowed. Yellowstone has one designated wild and scenic river, the Snake River Headwaters, which includes portions of both the Lewis and Snake rivers (National Wild and Scenic Rivers System 2010). However, the implementation of a winter use plan, including OSV use, would not have an effect on the rivers because OSV use under the alternatives considered in this plan/SEIS would be confined to a paved, main park entrance road that parallels a portion of the scenic Lewis River. As discussed above, ongoing monitoring has found that pollutants in the melting snowpack are not impacting the water quality in these rivers. Therefore, potential impacts on wild and scenic rivers from the alternatives under consideration in this plan/SEIS are not analyzed in further detail.

IMPORTANT SCIENTIFIC, ARCHEOLOGICAL, AND OTHER CULTURAL RESOURCES, INCLUDING HISTORIC PROPERTIES LISTED OR ELIGIBLE FOR THE NATIONAL REGISTER OF HISTORIC PLACES

Cultural Landscapes

The NPS defines cultural landscapes as geographic areas associated with historic events, activities, or people that reflect that park's history, development patterns, and the relationship between people and the park. Cultural landscapes at the park include Fort Yellowstone, the area of Old Faithful, and areas significant to Native American cultures, such as sacred sites. None of the actions under consideration in this plan are expected to affect the characteristics of these areas that contribute to their designation as cultural landscapes. Therefore, potential impacts on cultural landscapes from the alternatives under consideration in this plan/SEIS are not analyzed in further detail.

Prehistoric/Historic Structures and Districts

According to Director's Order 28: Cultural Resource Management, structures are defined as material assemblies that extend the limits of human capability (NPS 1998c). In plain language, this means a constructed work, usually immovable by nature or design, consciously created to serve some human activity. Examples are buildings, monuments, dams, roads, railroad tracks, canals, millraces, bridges, tunnels, locomotives, nautical vessels, stockades, forts and associated earthworks, Indian mounds, ruins, fences, and outdoor sculptures. In Yellowstone National Park, 17 sites are listed in the National Register of Historic Places. While some of these sites may be near winter use activities, these activities would remain on established routes that would not impact the integrity of these structures. Therefore, potential impacts on prehistoric/historic structures and districts from the alternatives under consideration in this plan/SEIS are not analyzed in further detail.

Ethnographic Resources

An ethnographic resource is a resource under NPS stewardship that is of cultural significance to peoples traditionally associated with it. In other words, the resource is "closely linked [the peoples'] own sense of purpose, existence as a community, and development as ethnically [and occupationally] distinctive peoples." In 2000, researchers identified approximately 300 ethnographic resources and 26 tribes associated with the park (NPS 2005a). The resources include animals, plants, geology, and archeological sites. As part of government-to-government relationships, consultation with affiliated tribes has occurred and will occur on winter use and other planning and management topics. Through this past consultation it

was determined that any potential impacts on these resources would be addressed under other impact topics in this document, such as wildlife and wildlife habitat. Furthermore, the majority of these resources are not in the areas where winter use activities considered in this plan would occur and would not be disturbed; therefore, potential impacts on ethnographic resources from the alternatives under consideration in this plan/SEIS are not analyzed in further detail.

POSSIBLE CONFLICTS BETWEEN THE PROPOSED ACTION AND LAND USE PLANS, POLICIES, OR CONTROLS FOR THE AREA (INCLUDING LOCAL, STATE, OR INDIAN TRIBE)

As noted earlier in this chapter, Yellowstone has engaged in extensive consultation with federal, state, and local agencies, as well as tribal interests, throughout the history of winter use planning. Part of such consultation is the inclusion of cooperating agencies for this plan/SEIS. As further explained in the "Consultation and Coordination" chapter, in January 2010 the NPS sent invitations to federal and state agencies involved in past winter use planning efforts, inviting them to become cooperating agencies for this winter use planning process. The following entities were invited to be cooperating agencies for this effort: the USFWS; U.S. Environmental Protection Agency (EPA); State of Idaho; State of Montana; State of Wyoming; Fremont County, Idaho; Gallatin County, Montana; Park County, Montana; Park County, Wyoming; and Teton County, Wyoming. The U.S. Forest Service (USFS) and USFWS declined the invitation to be cooperating agencies, but the other agencies invited signed Memorandums of Understanding to become cooperating agencies for this effort. In addition, each of these agencies was asked to provide information relevant to this planning process, including any conflicts with their planning efforts, and during this process no conflicts were identified. At the start of the SEIS process in January 2012, these same agencies were invited to be cooperating agencies for the SEIS process. Similar to the 2011 EIS process, all agencies invited, except the USFS and USFWS, agreed to become cooperating agencies for this effort.

This consultation has ensured that the plans and policies of these organizations are taken into account during the planning process, and therefore would have no measurable effect on the land use plans, policies, or controls of local or state agencies or Indian tribes from the alternatives considered in this plan/SEIS. Therefore, potential impacts on the land use plans, policies, or controls of local or state agencies or Indian tribes from the alternatives under consideration in this plan/SEIS are not analyzed in further detail.

ENERGY REQUIREMENTS AND CONSERVATION POTENTIAL

Pursuant to NPS *Management Policies 2006* (NPS 2006a), "The National Park Service will conduct its activities in ways that use energy wisely and economically. Park resources and values will not be degraded to provide energy for NPS purposes. The Service will adhere to all federal policies governing energy and water efficiency, renewable resources, use of alternative fuels, and federal fleet goals as established in the Energy Policy Act of 1992." This plan/SEIS considers the issue of energy resources and sustainability in the "Affected Environment" and "Environmental Consequences" chapters in the "Park Operations and Management" section; therefore, the impacts of such issues were not carried forward as a separate impact topic.

NATURAL OR DEPLETABLE RESOURCE REQUIREMENTS AND CONSERVATION POTENTIAL

Although climatologists are unsure about the long-term results of global climate change, it is clear that the planet is experiencing a warming trend that affects ocean currents, sea levels, polar sea ice, and global

weather patterns. These changes will likely affect winter precipitation patterns and amounts in the park; however, it would be speculative to predict localized changes in snow water equivalency or average winter temperatures, in part because many variables 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.

Yellowstone is actively involved in environmental stewardship, particularly in the last decade, with the implementation of initiatives such as the Greening of Yellowstone. The greening initiative includes recycling, waste reduction, energy reduction, building a compost facility for park waste, Leadership in Energy and Environmental Design building certification, and the use of hybrid vehicles and bio-fuels in summer and winter. The park continues its advances in environmental education and action, including steps to reduce human activities that contribute to climate change. In addition, the park has investigated historical snowpack trends to explore the role of winter use in climate change and conservation potential by tracking both snowmelt and temperatures throughout the winter season (Farnes and Hansen 2005).

OSV use at the park would result in fossil fuel consumption and release of greenhouse gas (GHG) emissions. The NPS, USFS, and USFWS have inventoried the amount of GHG emissions they produce in the greater Yellowstone area ecosystem. The inventory at the park revealed the following:

- Electricity use is responsible for more than 60 percent of the GHG emissions because of the emissions created in producing the electricity (coal mines, power plants, etc.).
- Heating and cooling park buildings contributes 27 percent of the GHG emissions.
- Cars, trucks, heavy equipment, and other vehicles directly emit almost 13 percent of the GHGs at Yellowstone.

As a result of completing the comprehensive GHG emissions inventory, the agencies are developing an action plan to reduce GHG emissions in all their operations across the entire ecosystem (NPS 2010c).

Based on this inventory, mobile sources contribute the smallest amount of GHG emissions in the area, with winter use occurring at such a low volume that it is responsible for only a small proportion of the 13 percent. In addition, all alternatives considered in this plan/SEIS require BAT for all OSVs, which would also contribute to keeping GHG emissions a small overall contributor. Based on the BAT requirement, GHG emissions associated with this plan/SEIS would be expected to be negligible in comparison to local, regional, and national GHG emissions. Therefore, the impacts on climate change through GHG emissions from OSV management and use activities under the alternatives considered were dismissed from further analysis.

INDIAN TRUST RESOURCES AND SACRED SITES

Indian trust resources are land, water, minerals, timber, or other natural resources held in trust by the United States for the benefit of an Indian tribe or individual tribal member. In government-to-government consultations with Native American tribes on planning and management issues, including winter use, a variety of park resources have been identified as being significant to many tribes. None of the alternatives evaluated in this plan/SEIS, with their prescribed mitigation measures, would create adverse effects on sacred sites or Indian trust resources. Scoping for this plan/SEIS did not identify any new issues relative to these resources. The NPS has consulted and will continue to consult with tribes on winter use and other planning and management topics and will continue to manage the park for the benefit of all citizens of the United States. Therefore, potential impacts on Indian Trust resources and sacred sites from the alternatives under consideration in this plan/SEIS are not analyzed in further detail.

RELATED LAWS, POLICIES, PLANS, AND CONSTRAINTS

GUIDING LAWS AND POLICIES

Laws and policies, as well as plans by the NPS, state governments, or agencies with neighboring land or relevant management authority, are described in this section to show the framework and constraints under which this plan/SEIS will need to operate and the goals and policies that will be considered. These related laws, policies, plans, and constraints will guide the development and implementation of this winter use plan.

NPS Organic Act and General Authorities Act

By enacting the NPS Organic Act of 1916, Congress directed the U.S. Department of the Interior and the NPS to manage units of the national park system "to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations" (16 USC 1).

In the administration of authorized uses, park managers have the discretionary authority to allow and manage the use, provided that the use will not cause impairment or unacceptable impacts.

The National Park Service General Authorities Act of 1970 supplemented the Organic Act, providing (as codified at 16 USC 1a-1):

> Congress declares that the National Park Service, which began with establishment of Yellowstone National Park in 1872, has since grown to include superlative natural, historic, and recreation areas in every major region of the United States, its territories and island possessions; that these areas, though distinct in character, are united through their inter-related purposes and resources into one national park system as cumulative expressions of a single national heritage; that, individually and collectively, these areas derive increased national dignity and recognition of their superb environmental quality through their inclusion jointly with each other in one national park system preserved and managed for the benefit and inspiration of all the people of the United States; and that it is the purpose of this Act to include all such areas in the System and to clarify the authorities applicable to the system.

Congress thus required the entire national park system to be managed as a whole, and not as constituent parts.

The 1978 Redwood Amendment reiterates these mandates by stating that the NPS must conduct its actions in a manner that will ensure no "derogation of the values and purposes for which these various areas have been established, except as may have been or shall be directly and specifically provided by Congress" (16 USC 1a-1). Congress intended the language of the 1978 Amendment (which was included in language expanding Redwood National Park) to reiterate the provisions of the Organic Act, not to create a substantively different management standard. The House committee report described the 1978 Amendment as a "declaration by Congress" that the promotion and regulation of the national park system is to be consistent with the Organic Act (NPS 2006a). The Senate committee report stated that under the 1978 Amendment, "The Secretary has an absolute duty, which is not to be compromised, to fulfill the mandate of the 1916 Organic Act to take whatever actions and seek whatever relief as will safeguard the units of the national park system" (NPS 2006a). Although the Organic Act and the 1978 Amendment use different wording ("unimpaired" and "derogation") to describe what the NPS must avoid, both acts define

a single standard for the management of the national park system—not two different standards. For simplicity, NPS *Management Policies 2006* uses "impairment," not both statutory phrases, to refer to that single standard.

Despite these mandates, the Organic Act and its amendments afford the NPS latitude when making resource decisions to allow appropriate visitor use while preserving resources. Because conservation remains predominant, the NPS seeks to avoid or to minimize adverse impacts on park resources and values. The NPS does, however, have discretion to allow negative impacts when necessary (NPS 2006a Section 1.4.3, 10). Although some actions and activities cause impacts, the NPS cannot allow an adverse impact that impairs resources or values (NPS 2006a Section 1.4.3, 10). In the administration of authorized uses, park managers have the discretionary authority to allow and manage uses, provided that the uses will not cause impairment or unacceptable impacts. The Organic Act and 1978 Amendment prohibit actions that impair park resources unless a law directly and specifically allows for the action (16 USC 1a-1) (NPS 2006a, Section 1.4.3.1).

Pursuant to the *NPS Guidance for Non-Impairment Determinations and the NPS NEPA Process* (NPS 2010d), a non-impairment determination for the selected alternative will be appended to the ROD.

Yellowstone National Park Organic Act

Congress established Yellowstone National Park to "dedicate and set apart as a public park or pleasuring-ground for the benefit and enjoyment of the people" and "for the preservation, from injury or spoliation, of all timber, mineral deposits, natural curiosities, or wonders within said park, and their retention in their natural condition" (16 USC 21, 22). The Yellowstone National Park Organic Act, signed March 1, 1872, established the park and set forth its mission. The NPS Organic Act (1916), which came after the Yellowstone National Park Organic Act, built in part upon that landmark law to form the NPS.

National Parks Omnibus Management Act of 1998

The National Parks Omnibus Management Act of 1998 (16 USC 5931 et seq.) provides direction for considering and using appropriate technical and scientific information in park management decisions.

NPS Management Policies 2006

NPS *Management Policies 2006* address management of snowmobiles in Section 8.2.3.2, Snowmobiles. This section states (NPS 2006a):

> Snowmobile use is a form of off-road vehicle use governed by Executive Order 11644 (Use of Off-road Vehicles on Public Lands, as amended by Executive Order 11989), and in Alaska also by provisions of the Alaska National Interest Lands Conservation Act (16 USC 3121 and 3170). Implementing regulations are published at 36 CFR 2.18, 36 CFR Part 13, and 43 CFR Part 36. Outside Alaska, routes and areas may be designated for snowmobile and oversnow vehicle use only by special regulation after it has first been determined through park planning to be an appropriate use that will meet the requirements of 36 CFR 2.18 and not otherwise result in unacceptable impacts. Such designations can occur only on routes and water surfaces that are used by motor vehicles or motorboats during other seasons. In Alaska, the Alaska National Interest Lands Conservation Act provides additional authorities and requirements governing snowmobile use.

> NPS administrative use of snowmobiles will be limited to what is necessary (1) to manage public use of snowmobile or oversnow vehicles routes and areas; (2) to conduct emergency operations; and (3) to accomplish essential maintenance, construction, and resource protection activities that cannot be accomplished reasonably by other means.

Management policies relating to resource protection also were considered in developing this plan/SEIS. For example, NPS *Management Policies 2006* instructs park units to maintain, as parts of the natural ecosystems of parks, all plants and animals native to the park ecosystems, in part by "minimizing human impacts on native plants, animals, populations, communities, and ecosystems, and the processes that sustain them" (NPS 2006a, Section 4.4.1).

Architectural Barriers Act of 1968

The Architectural Barriers Act requires access for the public to facilities designed, built, altered, or leased with federal funds. The Access Board, created under this act, develops and maintains accessibility guidelines under this law. These guidelines serve as the basis for the standards used to enforce the law. Following this act, other acts to promote accessibility were enacted and include the Americans with Disabilities Act of 1990 (ADA) (which was updated in 2010, with an effective date for implementation of March 15, 2012), the Rehabilitation Act of 1973, the Uniform Federal Accessibility Standards of 1984, and the Guidelines for Outdoor Developed Areas of 1999.

National Environmental Policy Act Regulations and Procedures

NEPA is implemented through regulations of the CEQ (40 CFR 1500–1508). The NPS has in turn adopted procedures to comply with NEPA and the CEQ regulations, including the Department of the Interior NEPA Regulations (43 CFR 46), and Director's Order 12: Conservation Planning, Environmental Impact Analysis, and Decision-making (NPS 2011b), and its accompanying handbook (NPS 2001).

NPS Director's Order 77: Natural Resource Protection

Director's Order 77 addresses natural resource protection, with specific guidance provided in Reference Manual 77: Natural Resource Management. Reference Manual 77 (NPS 2011c) offers comprehensive guidance to NPS employees responsible for managing, conserving, and protecting the natural resources found in national park system units. The manual serves as the primary guidance on natural resource management in units of the national park system. Reference manual chapters that are particularly relevant to this plan/SEIS include endangered, threatened, and rare species management; native animal management; and air resources management.

Wilderness Act of 1964

Under the Wilderness Act of 1964, Section 4(b) "Except as otherwise provided in this act, each agency administering any area designated as wilderness shall be responsible for preserving the wilderness character of the area and shall so administer such area for such other purposes for which it may have been established as also to preserve its wilderness character. Except as otherwise provided in this act, wilderness areas shall be devoted to the public purposes of recreational, scenic, scientific, educational, conservation, and historical use." By policy, any action taken by the park, such as allowing for winter use, must comply with this act.

In addition, the park must apply the "minimum requirement" concept to all management activities that affect the wilderness resource. This concept is intended to minimize impacts on wilderness values and resources. Managers may authorize (using a documented process) the generally prohibited activities or

uses listed in Section 4(c) of the Wilderness Act if deemed necessary to meet the minimum requirements for the administration of the area as wilderness and where those methods are determined to be the "minimum tool" for the project.

Director's Order 41: Wilderness Preservation and Management

The purpose of Director's Order 41: Wilderness Preservation and Management (NPS 1999b) is to provide accountability, consistency, and continuity to the NPS wilderness stewardship program, and to otherwise guide servicewide efforts in meeting the letter and spirit of the 1964 Wilderness Act.

Endangered Species Act of 1973

The ESA provides for the conservation of ecosystems on which threatened and endangered species of fish, wildlife, and plants depend. Section 7 requires all federal agencies to consult with the Secretary of the Interior on all projects and proposals with the potential to impact federally endangered or threatened plants and animals. It also requires federal agencies to use their authorities in furtherance of the purposes of the ESA by carrying out programs for the conservation of endangered and threatened species. Federal agencies are also responsible for ensuring that any action authorized, funded, or carried out by the agency is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of designated critical habitat. Section 9 of the act makes it unlawful for a person to "take" a listed animal without a permit. The term "take" is defined in the act as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect or attempt to engage in any such conduct." Through regulations, the term "harm" is defined as "an act which actually kills or injures wildlife. Such an act may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering." Listed plants are not protected from take; however, it is illegal to collect or maliciously harm them on federal land. The act also imposes civil and criminal penalties for violations of any provisions of the act.

Migratory Bird Treaty Act of 1918 and Executive Order 13186, "Responsibilities of Federal Agencies to Protect Migratory Birds"

Migratory birds are of great ecological and economic value to this country and to other countries. They contribute to biological diversity and bring tremendous enjoyment to millions of people who study, watch, feed, or hunt these birds throughout the United States and other countries. The United States has recognized the critical importance of this shared resource by ratifying international, bilateral conventions for the conservation of migratory birds. These migratory bird conventions impose substantive obligations on the United States for the conservation of migratory birds and their habitats, and through the Migratory Bird Treaty Act (MBTA), the United States has implemented these migratory bird conventions with respect to the United States. Executive Order 13186 directs executive departments and agencies to take certain actions to further implement the MBTA. The MBTA implements various treaties and conventions between the United States and Canada, Japan, Mexico, and the former Soviet Union for the protection of migratory birds. Under this act, it is prohibited, unless permitted by regulations, to "pursue, hunt, take, capture, kill, attempt to take, capture or kill, possess, offer for sale, sell, offer to purchase, purchase, deliver for shipment, ship, cause to be shipped, deliver for transportation, transport, cause to be transported, carry, or cause to be carried by any means whatever, receive for shipment, transportation or carriage, or export, at any time, or in any manner, any migratory bird, included in the terms of this Convention…for the protection of migratory birds…or any part, nest, or egg of any such bird" (16 USC 703). Subject to limitations in the act, the Secretary of the Interior may adopt regulations determining the extent to which, if at all, hunting, taking, capturing, killing, possessing, selling, purchasing, shipping, transporting or exporting of any migratory bird, part, nest or egg will be allowed, having regard for

temperature zones, distribution, abundance, economic value, breeding habits, and migratory flight patterns. Pursuant to Executive Order 13186, 66 Fed. Reg. 3853 (January 2001), entitled "Responsibilities of Federal Agencies to Protect Migratory Birds," the NPS and USFWS further signed a Memorandum of Understanding in April 2010 that outlines a collaborative and proactive approach to promote the conservation of migratory birds (http://www.nature.nps.gov/biology/migratoryspecies/Documents/MBMOUNPSSigned041210.pdf).

Bald and Golden Eagle Protection Act

The Bald and Golden Eagle Protection Act (16 USC 668–668d) prohibits anyone, without a permit issued by the Secretary of the Interior, from "taking" bald eagles, including their parts, nests, or eggs. The act provides criminal penalties for persons who "take, possess, sell, purchase, barter, offer to sell, purchase or barter, transport, export or import, at any time or any manner, any bald eagle … [or any golden eagle], alive or dead, or any part, nest, or egg thereof." The act defines "take" as "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb."

Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations"

The NPS must address, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities, including planning projects, on minority populations and low-income populations.

RELATED PLANS, POLICIES AND ACTIONS FOR YELLOWSTONE NATIONAL PARK

Yellowstone National Park Master Plan

The Yellowstone National Park Master Plan addresses winter use by stating, "Yellowstone will be managed on a year-round use basis. There are two defined periods of heavy use, and the management and operation must be geared to such for maximum enjoyment of the resources by the visitor – May 1 through October 31 (summer) and December 1 through March 15 (winter)" (NPS 1974). It is also recognized that OSVs have been in use at the park since 1949 and that snowmobiles have been used for 45 of the park's 136 years. In addition, there can be spatially long distances between park attractions. As one of the park's planning documents that directs future use in the park, including winter use, this document was considered in the development of this plan/SEIS.

Yellowstone National Park Long-Range Interpretive Plan

The 2000 Long-Range Interpretive Plan (NPS 2000a) provides recommendations on programs, technologies, and methods to achieve goals for keeping the park meaningful, valued, and relevant to a diverse visitor population over the next 7 to 10 years. The plan discussed OSV issues at the time the plan was drafted (2000) referring to the 2000 Final Winter Use Plan for further information. Because other planning processes have occurred since this time, recommendations on winter use in the long-range interpretive plan may not be applicable to winter use management today. As one of the park's planning documents that directs future use in the park, including winter use, this document was considered in the development of this plan/SEIS.

Yellowstone National Park Strategic Plan

The Yellowstone National Park Strategic Plan (NPS 2005b) reexamined the park's fundamental mission (from the park's 1974 Master Plan) with a new long-term view of the results or outcomes needed to more

effectively and efficiently accomplish the park's mission. The plan noted that of the 466 miles of road, approximately 184 are groomed for OSV use during the winter. As one of the park's planning documents that directs future use in the park, including winter use, this document was considered in the development of this plan/SEIS.

Construction Projects throughout the Park

Numerous past, ongoing, and planned construction projects have occurred or are occurring throughout the park. These projects have added to or changed the infrastructure in the park during the winter season, impacting both how the park operates and how visitors experience the park during this time. Projects include the following:

- Reconstruction of the East Entrance Road at Sylvan Pass, Yellowstone National Park. This project was completed in 2010 to reconstruct the segment of road at the pass to park road standards. This project also generally moved the road away from avalanche paths and away from the staff's route to the gun mount, which improved safety for avalanche control operations.
- Construction of the West Entrance, Yellowstone National Park. In 2008, Yellowstone completed a new West Entrance immediately east of the existing facility. The West Entrance facility could affect employee and visitor health and safety due to the inclusion of ventilation systems in the booths that reduce staff exposure to air pollutants.

Past, present, and future construction projects in the park have the potential to impact wildlife and wildlife habitat, soundscapes, visitor use, experience, and accessibility, and park operations, and therefore were considered in this plan/SEIS.

Implementation of the Interagency Bison Management Plan

Since the mid-1980s, increasing numbers of bison have moved to low-elevation winter ranges outside the northern and western parts of Yellowstone in response to accumulating snow pack. Such bison movement led to an enduring series of societal conflicts among various public and management entities regarding bison abundance and the potential transmission of brucellosis to domestic cattle with widespread economic repercussions. As a result, the federal government and the state of Montana agreed to an Interagency Bison Management Plan (IBMP) that established guidelines for managing the risk of brucellosis transmission from bison to cattle by implementing hazing, testing for disease exposure, shipments of bison to domestic slaughter facilities, hunting (outside Yellowstone National Park), vaccination, and other actions near the park boundary. This plan also identified the need to conserve bison and established conservation zones encompassing more than 250,000 acres of the northern two-thirds of the park and portions of the adjacent Gallatin National Forest (IBMP 2010).

The ROD for the IBMP was signed in December 2000 to coordinate bison management between the State of Montana and Yellowstone National Park. Five agencies signed or adopted this agreement to work cooperatively within an adaptive management framework to implement the IBMP—the U.S. Department of Agriculture's Animal and Plant Health Inspection Service and USFS; the Department of the Interior's NPS; and the State of Montana's Department of Fish, Wildlife, and Parks and Department of Livestock. The Confederated Salish and Kootenai Tribes, InterTribal Buffalo Council, and Nez Perce Tribe became IBMP agencies in 2009. The plan seeks to maintain a wild, free-ranging bison population, reduce the risk of brucellosis transmission from bison to cattle, manage bison that leave the park and enter the state of Montana, and maintain Montana's brucellosis-free status for domestic livestock. Public scoping raised concerns that OSV traffic and the subsequent grooming of roads would have the possibility of increasing bison movement inside and outside the park, which would trigger bison management under the IBMP. As further described in the "Wildlife and Wildlife Habitat, Including Rare, Unique, Threatened, or

Endangered Species, and Species of Concern" section in the "Affected Environment" chapter, recent publications assert that road grooming is less important to bison population dynamics than other natural factors (Gates et al. 2005; Bruggeman et al. 2009b). These scientists found no correlation between the presence of groomed trails and increased bison movements, and did not find sufficient evidence that groomed roads provided an energy-efficient travel corridor (Cheville et al. 1998; Wagner 2006). Because bison is a species that was carried forward for detailed analysis, any plans or policies that address how this species is managed in the region were considered in this plan/SEIS.

Remote Vaccine Plan for Bison

The NPS is considering the remote delivery of a vaccine to free-ranging bison in the park for the contagious disease brucellosis, which is caused by the non-native bacteria *Brucella abortus*. Remote delivery is distinguished from hand (syringe) delivery, which currently occurs in capture pens near the park boundary because it would not involve the capture and handling of bison. The most logical strategy for remote delivery of vaccine at this time is using a compressed air-powered rifle that delivers an absorbable bullet with a vaccine payload that is freeze dried or photo-polymerized. The purpose for taking action is directed by a 2000 ROD for the IBMP regarding the release of bison outside the park that are untested for exposure to brucellosis. The goal of a remote delivery vaccination program would be to deliver a low risk, effective vaccine to eligible bison inside the park to (1) decrease the probability of individual bison shedding Brucella abortus, (2) lower the brucellosis infection rate of Yellowstone bison, and (3) reduce the risk of transmission to cattle outside the park. Public scoping raised concerns that bison would leave the park as a result of winter use and be removed due to concerns of brucellosis. Because bison is a species that was carried forward for detailed analysis, any plans or policies that address how this species is managed in the region were considered in this plan/SEIS.

OTHER FEDERAL AGENCY PLANS, POLICIES, AND ACTIONS

In addition to the laws and policies above, other federal planning documents exist that directly or indirectly relate to winter use at the park, and were taken into consideration during the development of this plan/SEIS.

The Northern Rockies Lynx Management Direction Final Environmental Impact Statement and Amendments

The Northern Rockies Lynx Management Direction Final EIS and Amendments were developed to conserve the Northern Rockies lynx (*Lynx canadensis*) species, listed as threatened on the endangered species list. The amendments would keep recreation at or near current levels in occupied lynx habitats on USFS lands to ensure species survival. Lynx thrive in areas with deep soft snow, where predators are excluded during the winter months; however, the use of OSVs can cause the snow to become more compacted leaving the area more accessible to predators and other competition to occupy the area. Regulating where OSV use can occur on other federally managed lands in the region would impact both recreational opportunities in the area (visitor use, experience, and accessibility) and habitat available for the lynx (wildlife and wildlife habitat, including rare, unique, threatened, or endangered species, and species of concern). Because lynx is a species that was carried forward for detailed analysis, any plans or policies that address how this species is managed in the region were considered in this plan/SEIS.

Gallatin National Forest Travel Plan Revision

The Gallatin National Forest Travel Plan (USFWS 2006) provides a comprehensive evaluation of how best to provide for road and recreational demands in conjunction with other resource uses and land stewardship needs. The plan examines 39 different wilderness areas in the Gallatin National Forest and

the suitability of these areas for travel. The plan reduced the number of areas where OSV use is approved in the Gallatin National Forest (from about 84 percent of the national forest to about 53 percent) but increased the miles of marked and groomed trail, potentially affecting the availability of winter use recreation opportunities in the region, specifically OSV opportunities. The availability of recreation opportunities on surrounding lands, including the Gallatin National Forest, was considered in this plan/SEIS when analyzing visitor use, experience, and accessibility.

Consolidation of Checkerboard Lands in the Gallatin National Forest

In the last 10 years, the Gallatin National Forest has negotiated several land exchanges that have consolidated some previously checkerboarded holdings. Although 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, with consequent effects on wildlife, air quality, socioeconomics, and visitor access and circulation. The availability of wildlife habitat on surrounding lands, including management of the Gallatin National Forest, was considered in this plan/SEIS when analyzing wildlife and wildlife habitat, including rare, unique, threatened, or endangered species, and species of concern.

Gardiner Basin and Cutler Meadows Restoration

National Park, Gallatin National Forest, and the Center for Invasive Plant Management at Montana State University are working together to restore federally owned sites in Gardiner Basin and Cutler Meadows. The sites were once tilled for agriculture, and those tilled areas now support several invasive non-native species and fewer native plants than desired. The USFS and NPS are implementing long-term projects to restore native plants to these areas. These projects could affect wildlife, such as elk, bison, and pronghorn that use the Gardiner Basin for habitat; therefore, the projects were considered in this plan/SEIS.

Beartooth District of Custer National Forest Travel Management Plan

The Beartooth District of Custer National Forest Travel Management Plan was completed in 2008. The plan identifies a system of roads and trails to be used by public motorized traffic. The plan limits motorized travel to certain roads and trails, and includes restrictions on winter use. This plan allows for snowmobile use throughout the Beartooth District, except in wilderness, research natural areas, and recommended wilderness areas. The extent and availability of snowmobile recreation has the potential to impact visitor use, experience, and accessibility in the region and in the park, as well as available habitat for wildlife and therefore was considered in this plan/SEIS.

EPA Regulations and Improving OSV Technologies

In 2002, the EPA promulgated nationwide regulations for snowmobile emissions. Those regulations were implemented in three phases: model years 2006, 2010, and 2012. The current NPS BAT requirements are more stringent than the 2012 EPA regulations. These EPA regulations are helping spur the development of improved snowmobile technology and reduced emissions nationwide. Similarly, EPA wheeled vehicle emission regulations are being implemented for light-heavy to medium-heavy duty trucks. Many snowcoaches are based on these vehicle classes. Although emission characteristics of a vehicle in a tracked, oversnow mode are not comparable to its performance on wheels, these technological changes may result in lower emissions for snowcoaches. Changes in technologies impact the soundscape and air quality within the park, and therefore were considered in this plan/SEIS.

OTHER STATE AND LOCAL PLANNING DOCUMENTS, POLICIES, ACTIONS

A Toolkit to Protect the Integrity of Greater Yellowstone Area Landscapes

The land area surrounding the park has experienced rapid population growth for the last 20 years. Such growth can lead to more demand for recreation (snowmobiling, cross-country skiing, and snowshoeing), more recreationists in wildlife habitat, and more resulting impacts on air quality, soundscapes, economics, and wildlife. In addition, where and how development occurs is important. To respond to population growth, the Greater Yellowstone Coordinating Committee developed "A Toolkit to Protect the Integrity of Greater Yellowstone Area Landscapes" in 2008 to provide information to agency staff on voluntary options. This toolkit comprises nine topics, all of which work to help restore the natural Yellowstone landscape. These nine topics include the current land status in the greater Yellowstone area, general discussion of land adjustment tools, guidance for public agency participation in local land use, case studies of successful regional conservation efforts, greater Yellowstone area land trusts and conservation partners, conservation buyers in the greater Yellowstone area, sources of funding for land acquisition and easements, sources for land stewardship without land or easement purchase, and key strategies and research data (Greater Yellowstone Coordinating Committee 2008). This toolkit is considered in this plan/SEIS because the measures suggested by the toolkit as a result of population growth have the potential to impact land use and recreational activities in the greater Yellowstone area.

Reclamation of Historic Mines above Cooke City

This ongoing project will reclaim 10–20 mines in more than 1,500 acres in the New World Mining District, which is adjacent to the park. Specific projects include reclaiming high-elevation mining waste dumps and improving water quality at the headwaters of the Yellowstone and Stillwater rivers. A 10-year cleanup program reclaimed a dozen mines and waste dumps, and improved water quality in Fisher, Miller, Daisy, and Soda Butte creeks (GYC 2010). The reclamation of this area has protected the headwaters and the species that rely on the headwaters, such as trumpeter swans, and provided additional habitat and recreational opportunities in the area. Reclamation on surrounding lands impacts the amount of wildlife habitat available in the area, and therefore was considered in this plan/SEIS.

Reclamation of McLaren Mine Tailings Site

The McLaren Mine Tailings Site is near Cooke City, Montana, in a valley drained by Soda Butte Creek, which runs through the site and eventually through Yellowstone, approximately 5 miles downstream. Environmental studies conducted over the past 30 years have determined that the McLaren Mine Tailings Site is a significant source of acid mine drainage contributing to the poor water quality of Soda Butte Creek (MTDEQ 2010b). The project involves stabilization and dehydration of approximately 320,000 tons of mine tailings and upon completing stabilization and removal activities, reclaiming the site. Site reclamation work began in June 2010 and includes active tailings dewatering, the operation of a water treatment system, the lime stabilization of mine wastes, and the construction of an on-site repository (MTDEQ 2010b). Once reclaimed, the site will provide for additional wildlife habitat in the area year-round and improve the water quality in Soda Butte Creek, which is used by wildlife, affecting the overall amount of habitat in the region available for wildlife. Therefore, the site reclamation was considered in this plan/SEIS.

Rendezvous Ski Trail Development Plan

The Rendezvous Ski Trails are located in the town of West Yellowstone, Montana. These trails consist of more than 35 kilometers (approximately 22 miles) of groomed trails located entirely on USFS land. The Rendezvous Ski Trails are managed through a cooperative partnership between the USFS, the West

Yellowstone Chamber of Commerce, and the West Yellowstone Ski Education Foundation. The USFS and 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. Once implemented, this plan would contribute additional non-motorized winter use activities near the West Entrance. The availability of recreation on surrounding lands, including the Rendezvous Ski Trails, was considered in this plan/SEIS when analyzing visitor use, experience, and accessibility.

Reopening of the Sleeping Giant Ski Area

This ski area is approximately 3 miles from Yellowstone and in immediate proximity to the East Entrance. The ski area was originally opened as the Red Star Camp for the 1936/1937 ski season and is one of the oldest ski areas in the United States. In 1938, it was renamed the Sleeping Giant Ski Area. It was closed in 2004 because of financial difficulties when inspectors determined that the T-bar lift was unsafe and funds were not available to repair it. In 2007, Sleeping Giant Ski Area was purchased by a handful of Cody, Wyoming, residents and improvements were made, including the installation of a new chairlift. The ski area reopened during the 2009/2010 winter season (ColoradoSkiHistory.com 2010; Sleeping Giant Ski Area 2010). The reopening and continued operation of this ski area contributes to the winter recreational opportunities in the area during the winter use season. The availability of recreation on surrounding lands, including the Sleeping Giant Ski area, was considered in this plan/SEIS when analyzing visitor use, experience, and accessibility.

Oil and Gas Leasing

Oil or gas leasing activities take place in numerous areas relatively close to the park. The Montana Department of Natural Resources and Conservation, Trust Land Management Division, Mineral Management Bureau maintains information of oil and gas leasing activity in Montana. The Fiscal Year 2010 Annual Report released by this agency reported no oil or gas production in those counties bordering the park (Gallatin and Park counties). Sweet Grass, Stillwater, and Carbon counties—all northeast of Park County, which is adjacent to Yellowstone—reported the production of approximately 851 barrels of oil and 6,716 MCFs (1 MCF = 1,000 cubic feet) of gas in 2010 (State of Montana, Department of Natural Resources and Conservation, Trust Management Division 2010). In Wyoming, gas production and some oil production occurs in the Over Thrust Belt Basin in Sublette, Lincoln, and Sweetwater counties. These counties are south of Teton County, well south of the park. The Bighorn Basin, east of the park, is in eastern Park County and in Hot Springs, Washakie, and Big Horn counties. In 2009, oil production in Park County totaled approximately 7.45 million barrels of oil and 11.17 million MCFs of gas (Wyoming Oil and Gas Conservation 2009). Other areas of high oil or gas leasing activities are located farther east and southeast of the park. The State of Idaho, Department of Lands, reports that there are currently no producing wells or recorded production of oil or gas (State of Idaho, Department of Lands 2010). Oil and gas leasing operations in the area operate year-round and facility operations would result in impacts on regional air quality and socioeconomics. Oil and gas operations on surrounding lands contribute to the air quality of the region and therefore were considered in this plan/SEIS.

Aircraft Overflights

Aircraft overflights (including commercial jets, research flights of low flying propeller planes, corporate and general aviation aircraft, and medical rescue helicopters) cause motorized sounds audible at levels from very quiet to levels that mask other sounds. Relative to snowmobile and snowcoach-related sounds, the duration of audible aircraft overflights is short. The 2005–2010 observational study found that in total, motorized sounds were audible 56 percent of the time. Aircraft accounted for 6.7 percent of the duration of motorized sounds (Burson 2010a). These overflights could affect soundscapes in the park, as well as in the region, during the winter use season. At Fern Lake in Yellowstone's backcountry (a location 8 miles

from the road where no OSVs were audible), aircraft were audible 6 percent of the time between 8:00 a.m. and 4:00 p.m. during the winter use period (Burson 2007). Aircraft overflights contribute to the overall impacts on soundscapes in the area, and therefore were considered in the development of this plan/SEIS.

CHAPTER 2

Alternatives

CHAPTER 2: ALTERNATIVES

The National Environmental Policy Act (NEPA) requires federal agencies to fully evaluate and consider a range of reasonable alternatives that address the purpose of and need for action. Alternatives under consideration must include a "no-action" alternative in accordance with Council on Environmental Quality (CEQ) regulations (40 CFR 1502.14). Action alternatives may originate from the proponent agency, local government officials, or members of the public at public meetings or during the early stages of project development. Alternatives may also be developed in response to comments from coordinating or cooperating agencies.

Alternatives analyzed in this document were developed based on the results of internal and public scoping for the 2011 Winter Use Plan / Environmental Impact Statement (EIS) and this Winter Use Plan / Supplemental Environmental Impact Statement (plan/SEIS) process, as well as public comments received on the draft 2011 Winter Use Plan/EIS and the draft 2012 plan/SEIS. Information from the Yellowstone Science Advisory Team (SAT), resource workshops and cooperating agencies, as well as from past planning efforts was also used to inform development of the action alternatives. The alternatives carried forward for detailed analysis meet, to a large degree, the management objectives of the park, while also meeting the overall purpose and need of the plan/SEIS. Alternatives and actions that were considered but are not technically or economically feasible, do not meet the purpose of and need for the project, create unnecessary or excessive adverse impacts to resources, and/or conflict with the overall management of the park or its resources were dismissed from detailed analysis. These alternatives or alternative elements, including alternatives that were analyzed in detail and considered in the 2011 Winter Use Plan/EIS, and their reasons for dismissal, are discussed at the end of this chapter.

DESCRIPTION OF THE ALTERNATIVES

The National Park Service (NPS) explored and evaluated the following alternatives (summarized in table 11 at the end of this chapter):

- **Alternative 1: No-Action—No Snowmobile/Snowcoach Use**—As of March 15, 2013, the interim regulation that was in effect for the 2012/2013 winter season will expire. Under the no-action alternative, the park would not take any action to promulgate a new regulation, and therefore no public oversnow vehicle (OSV) use would be permitted in Yellowstone. Non-motorized access and wheeled vehicle access (northern road) into the park would continue to be permitted. The East Entrance (Sylvan Pass) would be closed during the winter season.
- **Alternative 2: Continue Snowmobile/Snowcoach Use at 2012/2013 Winter Season Interim Regulation Limits**—Under alternative 2, snowmobile and snowcoach use would be allowed to continue at levels allowed under the interim regulations in effect from December 2009 to March 2013: up to 318 snowmobiles and 78 snowcoaches per day. All OSV requirements under the 2012/2013 interim regulation would continue, including commercial guide requirements, hours of operation restrictions, and existing best available technology (BAT) requirements for snowmobiles. No more than 10 snowmobiles, including the snowmobile operated by the commercial guide, would be permitted per group. This is a change from the 2009–2013 interim regulations that allowed for up to 11 snowmobiles per group. BAT requirements would be implemented for snowcoaches by the 2017/2018 season, as described in the "Elements Common to All Action Alternatives" section and in appendix B.
- **Alternative 3: Transition to BAT Snowcoaches**—Under alternative 3, OSV access to the park over the long term would be via BAT snowcoach. Alternative 3 would initially provide for both

snowmobile and snowcoach access under interim regulation levels of up to 318 snowmobiles and 78 snowcoaches per day until the 2017/2018 winter season. In 2017/2018, all snowcoaches would need to meet BAT requirements (see appendix B). In the 2017/2018 season, snowmobiles would begin being phased out and snowcoaches would completely replace snowmobiles within a 3-year period (by the 2020/2021 winter season). The East Entrance would be closed to OSV use during the winter season from the East Entrance over Sylvan Pass to the Fishing Bridge Developed Area once the phaseout is complete.

- **Alternative 4: Manage OSV Use by Transportation Events**—Under alternative 4, the park would manage OSV use by setting a maximum number of daily transportation events allowed into the park. A transportation event is defined as one snowcoach or a group of seven snowmobiles (averaged seasonally; daily maximum number of 10 snowmobile per event) traveling together within the park, and is based on evidence that, when managed appropriately, New BAT snowmobile and BAT snowcoach transportation events have comparable levels of adverse impacts to park resources and the visitor experience. For a detailed discussion of the relative comparability of impacts of snowmobiles versus snowcoaches, see appendix A.

  The park would permit up to 110 transportation events daily, of which up to 50 daily transportation events may be groups of snowmobiles. Managing by OSV transportation events is an impact-centric OSV management approach that would minimize impacts to park resources, enhance the visitor experience, and permit growth in visitation as new technologies become available. This approach facilitates greater operator flexibility, rewards future OSV technological innovations, and reduces OSV-caused environmental impacts. If OSVs meet enhanced environmental performance standards (described as "E-BAT" in this plan/SEIS), commercial tour operators would be permitted to increase their average transportation event size from one to two snowcoaches and from an average of up to seven to an average of up to eight snowmobiles per transportation event (while keeping snowmobile transportation events at a maximum of 10 snowmobiles per event).

  Four transportation events per day (one per gate) would be reserved for non-commercially guided snowmobile access. Each non-commercial snowmobile transportation event could contain up to five snowmobiles and each non-commercial guide would be allowed to lead up to two non-commercial trips per season. Permits for this opportunity would be allocated via an on-line lottery system (see appendix C for more information regarding the non-commercial guiding program).

  Alternative 4 would be phased in over several seasons to allow the park and operators adequate time to meet the new requirements and amortize existing OSVs:

  – Phase I (winter season 2013/2014): OSV access would be identical to the existing interim regulation levels of up to 318 snowmobiles and 78 snowcoaches per day. Existing BAT standards for snowmobiles would be retained during this season (noise: maximum of 73 dBA via SAE J192 and tailpipe pollutants: 120 g/kW-hr of carbon monoxide (CO) and 15 g/kW-hr of hydrocarbons). Snowcoaches would continue to be exempt from BAT standards for this season.

  – Phase II (beginning in the 2014/2015 winter season): OSV use would be managed by transportation events. New snowcoaches placed in service beginning in the 2014/2015 season would need to meet BAT standards for snowcoaches. Adoption of New BAT standards for snowmobiles would be voluntary during Phase II. New BAT standards for snowmobiles are as follows: noise: maximum of 67 dBA via SAE J1161 at cruising speed and tailpipe pollutants: 90 g/kW-hr of CO and 15 g/kW-hr of hydrocarbons.

    For snowmobile commercial tour operators who do not upgrade their fleets to "New BAT" standards during Phase II, vehicle numbers would be averaged daily. For example, a

snowmobile commercial tour operator allocated three transportation events would not be allowed to operate more than seven snowmobiles per transportation event as averaged daily. The operator would be permitted to have up to ten snowmobiles per single event, provided the daily transportation event size average was seven or less. For example, if a commercial snowmobile tour operator is allocated three transportation events, the operator could achieve a daily transportation event size average of seven snowmobiles through a combination of three events of seven snowmobiles each; two events of eight snowmobiles and one event of five snowmobiles; one event of ten, one event of seven, and one event of four, etc. If no commercial tour operators upgrade their fleets during this interim period, the maximum daily number of commercial snowmobiles in the park would be 322.

For commercial snowmobile tour operators who upgrade at least 10 snowmobiles in their fleets to the New BAT standards for snowmobiles, vehicle numbers would be averaged seasonally for that transportation event allocation. This would allow commercial tour operators to have events with a maximum of 10 snowmobiles each, provided their seasonal transportation event size averages 7 or less. Other snowmobiles in the same operators' fleets that do not meet the New BAT standards would need to be averaged daily, rather than over the season. If all operators upgrade their fleets during this interim period, the maximum daily number of commercial snowmobiles in the park would be 460. The maximum daily average number of commercial snowmobiles in the park if all operators upgrade their fleets during Phase II would be 322.

Up to four transportation events per day may be non-commercially guided, provided that non-commercially guided snowmobiles meet BAT standards (all non-commercially guided snowmobiles would need to be New BAT-compliant no later than the 2017/2018 winter season). Non-commercially guided transportation events could have a maximum of five snowmobiles per group, including the non-commercial guide, and all snowmobiles would be required to meet BAT standards.

For both snowcoaches and snowmobiles, operators could meet voluntary E-BAT standards beginning in the 2014/2015 season, which would allow for up to two snowcoaches per transportation event, and an increased seasonal average group size of up to eight snowmobiles per transportation event (while keeping snowmobile groups at a maximum of ten snowmobiles).

– Phase III: The final phase of the transition to management by transportation events would start no later than 2017/2018 season. By that time, all snowmobiles would be required to meet New BAT standards and all snowcoaches would be required to meet BAT standards for snowcoaches (described in appendix B). In Phase III, all snowcoach standards that applied in Phase II would remain.

  Snowmobile operators would be able to use their allocated transportation events for snowmobiles, snowcoaches, or a mix of both, as long as no more than 50 total events come from snowmobiles on a given day. For example, if a commercial tour operator is allocated a total of three snowmobile transportation events, that operator could run three snowmobile events, two snowmobile events and one snowcoach event, one snowmobile event and two snowcoach events, or three snowcoach events. Daily allocations and entrance distributions for transportation events under alternative 4 are shown in table 1.

TABLE 1: ESTIMATED TRANSPORTATION EVENTS, OSVS, AND VISITATION UNDER EACH ACTION ALTERNATIVE

Alternative	Event Types	Max.[a] number of events	Min. number of events	Max. number of BAT OSVs (daily)	Average[b] number of BAT OSVs (daily)	Max. number of voluntary E-BAT OSVs (daily)	Average number of voluntary E-BAT OSVs (daily)	Max. number of people daily[c] (peak day)	Max. average daily number of people (avg day)	Max. number of people per Season[d]
Alternative 2: Continue Snowmobile / Snowcoach Use at 2012/2013 Winter Season Interim Regulation Limits	Commercial Snowcoaches	78	78	78	78	N/A	N/A	1,069	1,069	96,174
	Commercial Snowmobiles	159	31.8	318	318	N/A	N/A	636	636	57,240
	Non-commercial Snowmobiles	0	0	0	0	N/A	N/A	0	0	0
	SUM	237	110	396	396	N/A	N/A	1,705	1,705	153,414
Alternative 3: Transition to BAT Snowcoaches (after phaseout; before phaseout, visitation is the same as alternative 2)	Commercial Snowcoaches	120	120	120	120	N/A	N/A	1,644	1,644	147,960
	Commercial Snowmobiles	0	0	0	0	N/A	N/A	0	0	0
	Non-commercial Snowmobiles	0	0	0	0	N/A	N/A	0	0	0
	SUM	120	120	120	120	N/A	N/A	1,644	1,644	147,960
Alternative 4a: Manage OSV Use by Transportation Events (pre voluntary E-BAT, maximum number of snowmobiles)	Commercial Snowcoaches	60		60	60	N/A	N/A	822	822	73,980
	Commercial Snowmobiles	46		460	322	N/A	N/A	920	644	57,960
	Non-commercial Snowmobiles	4		20	20	N/A	N/A	40	40	3,600
	SUM	110		540	402			1,782	1,506	135,540

Alternative	Event Types	Max.[a] number of events	Min. number of events	Max. number of BAT OSVs (daily)	Average[b] number of BAT OSVs (daily)	Max. number of voluntary E-BAT OSVs (daily)	Average number of voluntary E-BAT OSVs (daily)	Max. number of people daily[c] (peak day)	Max. average daily number of people (avg day)	Max. number of people per Season[d]
Alternative 4b: Manage OSV Use by Transportation Events (pre voluntary E-BAT, maximum number of snowcoaches)	Commercial Snowcoaches	106		106	106	N/A	N/A	1,452	1,452	130,698
	Commercial Snowmobiles	0		0	0	N/A	N/A	0	0	0
	Non-commercial Snowmobiles	4		20	20	N/A	N/A	40	40	3,600
	SUM	110		126	126			1,492	1,492	134,298
Alternative 4c: Manage OSV Use by Transportation Events (with voluntary E-BAT, maximum number of snowmobiles)	Commercial Snowcoaches	60				120	120	1,644	1,644	147,960
	Commercial Snowmobiles	46				460	368	920	736	66,240
	Non-commercial Snowmobiles	4				20	20	40	40	3,600
	SUM	110				600	508	2,604	2,420	217,800
Alternative 4d: Manage OSV Use by Transportation Events (with voluntary E-BAT, maximum number of snowcoaches)	Commercial Snowcoaches	106				212	212	2,904	2,904	261,396
	Commercial Snowmobiles	0				0	0	0	0	0
	Non-commercial Snowmobiles	4				20	20	40	40	3600
	SUM	110				232	232	2,944	2,944	264,996

[a] Where there is no variation in the number of OSV allowed, maximum and minimum event numbers are the same.

[b] Average refers to the number of OSV allowed seasonally. The possible maximum daily and average number of OSVs differ for alternative 4 but are the same for all other alternatives.

[c] The maximum number of people per snowmobile was assumed to be 2.0; the maximum number of people per snowcoach was assumed to be 13.7. Each of these maximum averages include the guide (snowmobiles) and driver (snowcoaches).

[d] Based on 90-day season.

N/A = not applicable.

At the highest potential level of use, with all 50 snowmobile events used in a single day and all snowmobiles meeting New BAT requirements, there could be a maximum of 480 snowmobiles in the park, as shown in table 1. Although this is the maximum number of snowmobiles that could be permitted into the park on a single day, this level of use would not occur every day because commercially guided transportation events would be required to average no more than 7 snowmobile per event averaged seasonally, and non-commercially guided transportation events could not exceed a maximum group size of 5.

No later than December 2017, the maximum daily average number of snowmobiles would be 342 snowmobiles per day (322 commercially guided snowmobiles plus 20 non-commercially guided snowmobiles).

DEFINITIONS

The following terms are used when describing the range of alternatives:

- **Commercial Tour Operator**—A person or business authorized to operate OSV tours in the park under a concession contract or a commercial use authorization. In this document the terms "commercial tour operator" and "operator" are used interchangeably.
- **Commercial Guide**—A person who operates as a snowmobile or snowcoach guide for a fee or compensation and is authorized to operate in the park under a concession contract or a commercial use authorization.
- **Historic Snowcoach**—A Bombardier snowcoach manufactured in 1983 or earlier. Any other snowcoach is considered a non-historic snowcoach.
- **Snowcoach**—A self-propelled mass transit vehicle intended for travel on snow, having a curb weight of over 1,000 pounds (450 kilograms), driven by a track or tracks and steered by skis or tracks, having a capacity of at least 8 passengers and no more than 32 passengers, plus a driver.
- **Non-motorized Use**—Non-motorized uses include cross-country skiing, backcountry skiing, hiking, and snowshoeing.
- **Oversnow Route**—That 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 oversnow activity. Pullouts or parking areas that are groomed or marked similarly to roadways and are adjacent to designated oversnow routes are also included. An oversnow route may also be distinguished by the interior boundaries of the berm created by the packing and grooming of the unplowed roadway. The only motorized vehicles permitted on oversnow routes are OSVs.
- **Oversnow Vehicle or OSV**—A snowmobile, snowcoach, or other motorized vehicle that is intended for travel primarily on snow and has been authorized by the superintendent to operate in the park. An OSV that does not meet the definition of a snowcoach must comply with all requirements applicable to snowmobiles.
- **Snowmobile**—A self-propelled vehicle intended for travel solely 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. All-terrain vehicles and utility-type vehicles are not snowmobiles, even if they have been modified for use on snow with track and ski systems.
- **Snowplane**—A self-propelled vehicle intended for oversnow travel and driven by an air-displacing propeller. Snowplanes are not allowed under any of the alternatives.

- **Transportation Event—**A transportation event is defined as one snowcoach or a group of, on average, seven snowmobiles travelling together within the park, and is based on evidence that both types of transportation events have comparable impacts to park resources and the visitor experience. Should OSVs meet voluntary E-BAT standards, operators would be permitted to increase their average transportation event group size from one to two snowcoaches and seven to eight snowmobiles per transportation event.
- **Non-commercially Guided Snowmobile Access Program—**An access program that permits duly authorized parties to enter Yellowstone National Park without the requirements of a commercial snowmobile guide. All non-commercial snowmobile operators would be required to have successfully completed a Yellowstone-specific education certification process and one member of the party (the non-commercial snowmobile guide) would need to be in possession of a non-commercially guided snowmobile access permit. The non-commercially guided snowmobile access program may be adjusted or terminated based on impacts to park resources and visitor experiences.
- **Non-commercially Guided Snowmobile Trip—**A trip that is led by a non-commercial guide and is not for profit; to the extent possible costs are evenly shared among all participants. No trip member may be paid to participate on the trip. Trip preparation, costs, and conduct of the trip must be shared by members of the group, including logistics, food, fuel, equipment, transportation, vehicle shuttle, and other costs. Non-commercially guided snowmobile trips must be self-guided and may not hire commercial guides. Non-commercially guided snowmobile trips may not be used by any person or organization in any way to obtain a profit and doing so would result in the revocation of the permit and may jeopardize future non-commercially guided access to Yellowstone National Park by the non-commercial snowmobile guide and other trip members.
- **Non-commercial Snowmobile Access Permit—**A permit that allows access to Yellowstone National Park for a single group of up to five snowmobiles for a specific date range. These permits would be awarded through an annual lottery system.
- **Non-commercial Snowmobile Operator—**A person who has successfully completed the Yellowstone Snowmobile Education Certification Program (explained below) and is certified as having the requisite knowledge and skills to operate a snowmobile in Yellowstone National Park. All non-commercial snowmobile operators must be in possession of a valid state-issued motor vehicle driver's license before entering the park.
- **Non-commercial Snowmobile Guide—**In addition to stipulations outlined above under non-commercial snowmobile operator, a non-commercial snowmobile guide must obtain and be in possession of a non-commercial snowmobile access permit as awarded and obtained through the lottery system. Non-commercial snowmobile guides are directly responsible for the actions of their group. Each non-commercial guide may lead no more than two trips per winter season, and must be at least 18 years of age by the first day of the trip. Non-commercial guides must have working knowledge of snowmobile safety and operation, general first aid, and snowmobile repair. It is preferable that non-commercial guides, or another member of the trip, be familiar with Yellowstone National Park. Non-commercial snowmobile guides may not advertise for profit and may not accept a fee or any type of compensation for organizing or leading a trip. Collecting a fee (monetary compensation), payable to an individual, group, or organization for conducting, leading, or guiding a non-commercially guided snowmobile trip is not allowed. Non-commercial guides will be able to help their group travel safely through the park, and will be familiar with daily weather conditions and hand signals to warn group members about wildlife and other road hazards, indicate turns, and indicate when to turn the snowmobile on or off. They will have knowledge of basic first aid, and are equipped with similar supplies. They will employ a single file "follow-the leader" approach and communicate frequently with group members.

- **Unguided Snowmobile Access—**A visitor or group of visitors who enter the park by snowmobile without obtaining certification through the Yellowstone Snowmobile Education Certification Program, who do not possess the necessary entrance permits, or who are not accompanied by a commercial or non-commercial guide.
- **Yellowstone Snowmobile Education Certification Program**—A to-be-developed online snowmobile education program that all non-commercial snowmobile operators must complete before entering the park via snowmobile. Individuals who successfully complete the Yellowstone Snowmobile Certification Program (appendix C) would receive a certificate of completion, valid for the duration of the season.

ELEMENTS COMMON TO ALL ALTERNATIVES

The following describes elements of the alternatives that are common to all alternatives, including the no-action alternative.

ADMINISTRATIVE USE

Non-recreational, administrative use of snowmobiles would be allowed for park personnel and parties duly permitted under the provisions of 36 CFR 1.6, or other applicable permit authority. Park personnel and permitted parties must use snowmobiles that meet BAT requirements unless specifically otherwise authorized by the park superintendent. Such use would not be subject to guiding requirements. In addition, some snowmobiles that do not meet BAT requirements would be permitted for law enforcement, search and rescue, and other administrative purposes on a limited basis. Administrative use of snowmobiles may be supplemented with administrative snowcoaches.

NPS employees, concession employees, and contract employees and their families living in the interior of Yellowstone (and their guests) must use BAT snowmobiles. The NPS would continue to provide snowcoaches and snowmobiles that meet BAT requirements for NPS employees to use. All administrative use snowmobiles may be used for up to six model years or 6,000 miles, whichever is later. Exceptions, such as use of non-BAT snowmobiles to access power and telephone systems, would be granted on a limited basis.

Administrative OSV travel by NPS employees, their families, and their guests and by concession employees, their families, and their guests would be allowed only on groomed roads that meet safety criteria and that are identified for open for travel (exceptions could be made for administrative law enforcement and administrative search and rescue activities).

ACCESSIBILITY

All alternatives would continue to support the philosophy of universal access in the park. The NPS would continue to make reasonable efforts to ensure accessibility to buildings, facilities, programs, and services.

The NPS would develop strategies to ensure that new and renovated facilities, programs, and services (including those provided by concessioners) are designed, constructed, or offered in conformance with applicable policies, rules, regulations, and standards, including but not limited to the Architectural Barriers Act of 1968, the Americans with Disabilities Act of 1990 (ADA), the Rehabilitation Act of 1973, the Uniform Federal Accessibility Standards of 1984, and the Guidelines for Outdoor Developed Areas of 1999. The NPS would evaluate existing and new programs, buildings, activities, and services, including telecommunications and media, to determine current accessibility and usability by disabled winter visitors.

PLOWED ROADS / WHEELED VEHICLE MANAGEMENT

At a minimum, under all alternatives the following roads would continue to be plowed and private wheeled vehicles would be permitted:

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

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

NON-MOTORIZED ACCESS

- Non-motorized uses include cross-country skiing, backcountry skiing, hiking, and snowshoeing. Where feasible, the park would continue to set tracks for skiing on snow road edges. Backcountry non-motorized use would continue to be allowed in most of the park (see the exception for sensitive areas under "Elements Common to all Action Alternatives" below), subject to the Winter Severity Index program. The program restricts backcountry use of the park when winter snowpack and weather conditions become severe and appear to be adversely affecting wildlife.
- Ski and snowshoe use at the South and East Entrances would be allowed to continue after roads close to motorized winter use (to allow for spring plowing). When spring plowing operations approach entrances, the roads would then be closed to skiing and snowshoeing for safety. Bear management closures of the park's backcountry would continue as in previous years, preventing non-motorized use in these areas.
- Sensitive areas in the inner gorge of the Grand Canyon of the Yellowstone and McMinn Bench bighorn sheep area would continue to be closed to recreational winter use to provide for protection of sensitive resources.

EMERGENCY ACTIONS

None of the alternatives preclude closures for safety or resource protection. The superintendent would continue to have the authority to take emergency action to protect park resources or values.

MANAGEMENT ZONES

For all alternatives, the parks are divided into four management zones, as described below. Zones and their definitions do not change by alternative, although the intensity definition for each impact category may differ among 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 under 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 100 yards on either side of the road's center line. This zone is most similar to ROS class "Roaded Natural." Note that for purposes of this plan/SEIS this zone would not include roads open in the summer to motorized use but closed in the winter to OSV use. Some 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 noise) 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 closed 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 in transition zones. 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 1/2 mile of roadways. From 0.5 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 in 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.

MONITORING

The NPS would continue monitoring park resources; however, this may not be at the same levels or with the same research designs that have occurred in past years. This would provide the NPS with the ongoing information necessary to assess the impacts resulting from implementation of any alternative on park resources and values, visitor access, and to make adjustments, as appropriate, in winter use management.

EDUCATION AND OUTREACH

Under all alternatives, the park would continue to focus on education efforts directed at visitors along the northern road to Cooke City who visit the park using personal wheeled vehicles. The Albright Visitor Center in Mammoth Hot Springs would remain open to the public during the winter.

ALTERNATIVE 1: NO SNOWMOBILE/SNOWCOACH USE (NO-ACTION ALTERNATIVE)

As of March 15, 2013, the interim regulation in effect for the 2012/2013 winter season (allowing up to 318 snowmobiles and 78 snowcoaches in the park per day) will expire. Under alternative 1, the park would not take any action to promulgate a new regulation, and therefore no public OSV use would be permitted in Yellowstone. If this alternative were implemented, Yellowstone would be operated like many northern and high elevation national parks (Glacier, Mt. Rainier, Lassen Volcanic, for example) that have limited wheeled vehicle access during the winter. However, non-motorized access and wheeled

vehicle use along the northern road would still be allowed. Under the no-action alternative, primary visitor access would be via wheeled vehicles from Yellowstone's North to Northeast Entrances. Yellowstone would be accessible for skiing and snowshoeing and the backcountry would remain open. Because there would be no motorized use in the interior of the park, the winter use season would begin once enough snow accumulates to allow for non-motorized uses. The East Entrance Road would be managed as backcountry. No administrative OSV travel would be allowed at the East Entrance, and avalanche control operations would not be conducted along Sylvan Pass during the winter season. The park could be closed for wildlife management; for example, during particularly harsh winters certain portions of the park could be closed to skiing and snowshoeing to minimize impacts on wildlife.

ACTION ALTERNATIVES

Under the action alternatives, OSV use would be allowed and managed in the park. The action alternative descriptions provide details about the types of OSV use, as well as the level and location of OSV use.

ELEMENTS COMMON TO ALL ACTION ALTERNATIVES

The following describes elements of the management actions common to all of the action alternatives.

Best Available Technology

BAT would continue to be required for snowmobiles and would be developed for snowcoaches. BAT requirements would vary by alternative. Specific BAT requirements are described for each alternative below and are expanded upon in appendix B for snowcoaches. Snowmobiles and snowcoaches may be subject to periodic inspections to determine compliance with BAT requirements. To the extent possible, NPS will conduct inspections when it is mutually convenient for the operator and the NPS. This could include off-hours, on days the vehicles are not being used to support concessions operations, or during "testing days" held annually in the park prior to the first day of the winter season. As part of limiting noise and air pollution from OSVs, idling would be limited to no more than 3 minutes at any one time.

Personal Protective Equipment

Personal protective equipment is recommended for snowmobilers, including helmet, snowmobile suit and gloves, proper footwear, and hearing protection. People 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 advised to wear and carry personal protective equipment as appropriate for their winter travel. For all user groups, personal protective equipment including avalanche rescue gear (shovel, probe, and transceiver) is encouraged, but not required.

Licensing and Registration

- All OSV drivers must possess and carry a valid state-issued motor vehicle driver's license at all times. A learner's permit does not satisfy this requirement. This includes non-commercial snowmobile guides and operators.
- Snowmobiles and snowcoaches must be properly registered and display a valid registration from a state or province in the United States or Canada, respectively.

Speed Limits

Maximum speed for all OSVs would be 35 miles per hour (mph), except under alternative 4, which would require a maximum speed for snowcoaches of 25 mph. Speed limits could be lower in more congested areas or in wildlife sensitive corridors, for example, between West Yellowstone and Old Faithful. In developed areas, the speed limit would be as posted, but no faster than 25 mph.

OSV Routes

OSV use would continue to be allowed only on designated routes, which are groomed roads that normally provide wheeled vehicle access in the summer. These winter use roads are shown in figure 2 for the action alternatives (alternatives 2, 3 and 4) and listed below with the exception of Fountain Freight (Flat) Road which will be closed to OSV use. Note that for alternative 3, the East Entrance would be closed once the transition to snowcoaches is complete, and therefore the road between the East Entrance and Yellowstone Lake would be closed at that time. No off-road or off-route OSV use would be permitted. The following routes would be open for OSV use:

- Grand Loop Road, from its junction with Upper Terrace Drive to Norris Junction
- Norris Junction to Canyon Junction
- Grand Loop Road, from Norris Junction to Madison Junction
- West Entrance Road, from the park boundary at West Yellowstone to Madison Junction
- Grand Loop Road, from Madison Junction to West Thumb
- South Entrance Road, from the South Entrance to West Thumb
- Grand Loop Road, from West Thumb to its junction with the East Entrance Road
- East Entrance Road, from Fishing Bridge Junction to the East Entrance
- Grand Loop Road, from its junction with the East Entrance Road to Canyon Junction
- South Canyon Rim Drive
- Lake Butte Road
- Firehole Canyon Drive
- North Canyon Rim Drive
- Riverside Drive
- Roads in the developed areas of Madison Junction, Old Faithful, Grant Village, West Thumb, Lake, East Entrance, Fishing Bridge, Canyon, Indian Creek, and Norris
- The following routes would be open to snowcoach use only:
    - Upper Terrace Drive in Mammoth to Golden Gate
    - Roads in the developed area of Mammoth Hot Springs (rubber-tracked coaches only)
    - Grand Loop Road, from Canyon Junction to the Washburn Hot Springs Overlook.

FIGURE 2: OSV ROUTES UNDER ALL ACTION ALTERNATIVES

The snowmobile route to Cave Falls would continue to operate. This route would be approximately 1 mile into the park to Cave Falls (a dead end). Up to 50 snowmobiles could enter this area per day; these snowmobiles would not be required to meet BAT requirements. This area would be exempt from commercial guiding and BAT requirements because the 1-mile, dead-end route does not connect to other snow roads in the park, and these requirements would be not applicable to a 1-mile stretch of road. The 50 snowmobile limit for the Cave Fall route would not be part of the snowmobile limits discussed below under the action alternatives.

The park may open or close all designated oversnow routes, or portions thereof, in consideration of the location of wintering wildlife, adequate snowpack, public safety, and other factors related to safety and resource protection. All routes designated for snowmobile use would be open to snowcoaches.

OSV Management

Early and late entries (before 7:00 a.m. or after 9:00 p.m.) for special tours would not be permitted, including departures from Snow Lodge. Limited exceptions would be allowed for administrative travel and emergencies.

Non-motorized Use Areas

Approximately 35 miles of road would continue to be groomed for cross-country skiing in the park. These roads are mainly used during the summer, and are closed to OSV use. The roads may be machine groomed for skiing. Existing and new routes could be evaluated in the future, and changes announced through one or more of the methods listed in 36 CFR 1.7(a). Existing groomed areas for cross-country skiing include the following:

- Bunsen Peak Trail: 6 miles
- Indian Creek Loop: 2.2 miles
- Upper Terrace Loop Trail: 1.5 miles
- Old Canyon Bridge Trail: 1 mile
- Lone Star Geyser Trail: 2 miles
- Practice Ovals: 0.3 mile
- Cloverleaf: 0.8 mile
- Cabin Track: 0.4 mile
- East Road Track: 0.9 mile
- Morning Glory Trail: 3 miles
- Blacktail Plateau Trail: 8 miles
- Tower Falls Trail: 2.5 miles
- Chittenden Loop Trail: 5.3 miles
- Riverside Trail: 1 mile

In addition to the machine groomed roads, parallel tracks are set on the sides of some of Yellowstone's snow roads, typically including the West Entrance to Madison (14 miles one way); Madison to Old Faithful (16 miles one way); and Madison to Norris (12 miles one way). These are established each time the road is groomed and may be obliterated by OSVs.

Sylvan Pass Avalanche Control

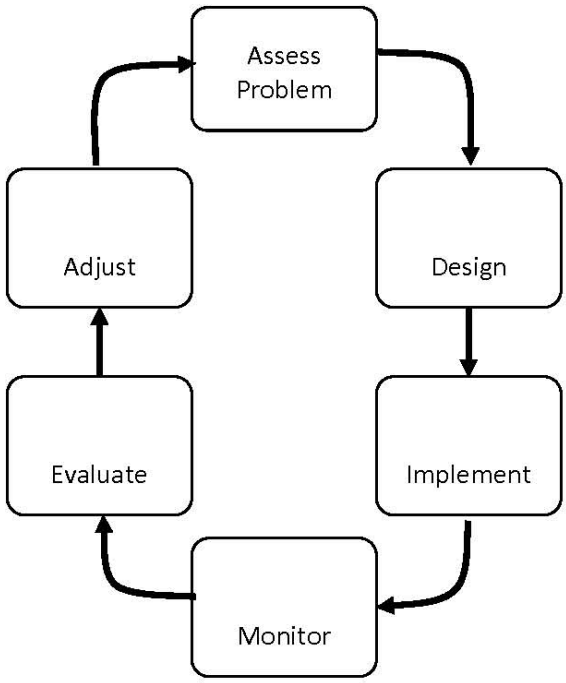
For action alternatives that include maintaining Sylvan Pass for OSV access (alternatives 2 and 4), the pass would continue to be operated in accordance with the Sylvan Pass Working Group Agreement. A combination of avalanche mitigation techniques may be used, including forecasting and helicopter and howitzer dispensed explosives. The results of the most recent safety evaluation of Sylvan Pass by the Occupational Safety and Health Administration (OSHA) and an Operational Risk Management Assessment (ORMA) would be reviewed and the NPS would evaluate additional avalanche mitigation

techniques and risk assessment tools to further improve safety and visitor access. All actions implemented would take into consideration the implementation of the Sylvan Pass Working Group Agreement, allowing for the East Entrance to be open from 8:00 a.m. to 9:00 p.m. with the road open to OSVs from 8:00 a.m. on December 22 through 9:00 p.m. March 1.

Adaptive Management

Adaptive management—learning by doing and then adapting/adjusting—is an important tool for resource management. It is based on the assumption that current scientific knowledge is limited and there is inherent uncertainty in plans. In 2007, the Department of the Interior released its Adaptive Management Technical Guide, defining the term and providing a clear process for building adaptive management processes into natural resource management (Williams et al. 2007). In 2008, the Department of the Interior codified the definition in regulation stating that adaptive management is "a system of management practices based on clearly identified outcomes and monitoring to determine whether management actions are meeting desired outcomes; and, if not, facilitating management changes that will best ensure that outcomes are met or re-evaluated" (43 CFR 46.30). Additional guidance was provided in 2012 with the publication of Adaptive Management: The U.S. Department of the Interior Applications Guide, a new guide that provides federal, state, tribal, and other natural resource managers with tools to more effectively address the complexities and uncertainties involved in natural resource management. The Department regulations also direct its agencies to use adaptive management when appropriate (43 CFR 46.145).

Adaptive management is a continuing iterative process where a problem is first assessed, potential management actions are designed and implemented, those actions and resource responses are monitored over time, that data is evaluated, and actions are adjusted if necessary to better achieve desired management outcomes (see figure 3).



Source: Williams et al. 2007

FIGURE 3: GENERAL ADAPTIVE MANAGEMENT PROCESS DIAGRAM

All action alternatives incorporate adaptive management initiatives that are designed to assist the park in meeting the objectives of this plan/SEIS. The adaptive management framework is provided in appendix D.

DISCUSSION OF ACTION ALTERNATIVES

ALTERNATIVE 2: CONTINUE SNOWMOBILE/SNOWCOACH USE AT 2012/2013 WINTER SEASON INTERIM REGULATION LIMITS

Alternative 2 would continue winter use at the same levels as allowed under the interim regulations in effect from 2009 to 2013, which allowed for up to 318 snowmobiles and 78 snowcoaches per day in Yellowstone on the routes shown in figure 2. This alternative represents the continuation of conditions in the park that were in place for the 2009/2010, 2010/2011, 2011/2012, and 2012/2013 winter seasons and incorporates concepts of fixed management (no daily variability in OSV numbers). Routes open to snowmobiles and snowcoaches would remain the same as detailed in the original 2008 environmental assessment (EA) with the exception of Fountain Freight (Fountain Flat) Road, which would be closed to OSVs. These routes were reiterated in the 2009 interim regulation and 2011 Winter Use Plan/EIS and are restated under "Elements Common to All Action Alternatives" (see figure 2). The East Entrance Road, over Sylvan Pass to Fishing Bridge, would be open for OSV travel in accordance with the Sylvan Pass Working Group agreement.

Snowmobile Management—The NPS would permit up to 318 snowmobiles per day into Yellowstone, all of which must meet BAT requirements. The maximum number per day would not vary. The routes open for snowmobile management are listed earlier in the chapter under "Elements Common to all Action Alternatives" (see figure 2).

All visitors who wish to enter the park via snowmobile would be required to travel with a commercial guide. No more than 10 snowmobiles, including the snowmobile operated by the commercial guide, would be permitted per group. This is a change from the 2009–2013 interim regulations that allowed for up to 11 snowmobiles per group. Visitors would pay the park entrance fee and would pay for the services of the commercial guide.

Entrance allocations would be fixed, meaning each entrance would allow entry up to its assigned number of snowmobiles per day. The exceptions would be Old Faithful and the North Entrance, whose operator (currently Xanterra Parks & Resorts) could share allocations. See table 2 for specific entrance allocation numbers.

TABLE 2: DAILY SNOWMOBILE ENTRY ALLOCATIONS UNDER ALTERNATIVE 2

Entrance	Commercially Guided Snowmobiles
West Entrance	160
South Entrance	114
East Entrance	20
North Entrance	12
Old Faithful	12
Total	318

Table 1 shows estimated maximum daily and maximum average daily use and maximum seasonal use under alternative 2. At maximum use, each snowmobile could hold two riders, resulting in a maximum daily use of 636 people and a seasonal use of 57,240 people.

Snowcoach Management—The NPS would permit up to 78 snowcoaches per day into Yellowstone. Routes open to snowcoaches are listed under "Elements Common to All Action Alternatives."

All snowcoaches operating in the park would be required to operate in accordance with a concessions contract and meet BAT requirements, as described further below. All snowcoaches would be driven by commercial drivers. Entrance allocations would be fixed, meaning each entrance would only allow entry to its assigned number of snowcoaches per day (as with snowmobiles, Xanterra allocations at the North Entrance and Old Faithful could be shared). See table 3 for specific entrance allocation numbers. Visitors would pay the park entrance fee and those charged by the snowcoach operator.

TABLE 3: MAXIMUM DAILY SNOWCOACH ENTRY ALLOCATIONS UNDER ALTERNATIVE 2

Entrance	Commercially Guided Snowcoaches
West Entrance	34
South Entrance	13
East Entrance	2
North Entrance	13
Old Faithful	16
Total	78

In April 2012, the NPS conducted a census of snowcoaches in the current fleet. Based on that census, it was determined that 13.7 was the average maximum number of seats in a snowcoach, including the driver. Using the average maximum capacity of a snowcoach from this census, alternative 2 would result in a maximum daily use of 1,069 people with a possible seasonal maximum of 96,174 people (see table 1).

Wheeled Vehicle Management—Under alternative 2, wheeled vehicle access would continue as described under "Elements Common to All Alternatives."

Non-motorized Use Management—Under alternative 2, non-motorized uses would continue as described under "Elements Common to All Alternatives."

Snowmobile BAT Requirements—Existing BAT standards would continue to be required for snowmobiles. Air emission requirements would continue to be no greater than 120 grams per kilowatt-hour (g/kW-hr) of CO and 15 g/kW-hr for hydrocarbons. Noise restrictions would continue to require snowmobiles to operate at or below 73 decibels (dB) measured using the A-weighted decibel (dBA) scale while at full throttle, according to Society of Automotive Engineers J192 test procedures (revised 2011) (SAE J192). For snowmobiles, if the U.S. Environmental Protection Agency (EPA) adopts standards that are more stringent than the requirements resulting from this plan/SEIS, the EPA standards would become the NPS standards.

Snowcoach BAT Requirements—BAT standards would be implemented for snowcoaches no later than the 2017/2018 season. Noise emissions could not exceed 75 dBA at cruising speed as measured according to Society of Automotive Engineers J1161 test procedures (revised April 2004) (SAE J1161). BAT for

tailpipe emissions is defined as a vehicle that is 2007 or newer for gasoline engines and 2010 or newer for diesel engines (also see appendix B). All existing snowcoaches would either need to meet BAT requirements no later than the 2017/2018 winter season or be removed from service. Any new snowcoaches put in service beginning in the 2014/2015 season would need to meet BAT requirements immediately.

As outlined above, BAT noise standards for snowmobiles and snowcoaches would be measured in different ways due to the type of information available for each type of vehicle. Snowmobiles are tested and certified by the manufacturer; these tests are conducted using SAE J192 test procedures. Under these test procedures, snowmobile noise emissions are tested at full throttle. Full throttle does not necessary mean at top speed, but represents the highest speed the snowmobile reaches along a pre-determined course. Since there are no snowcoach industry specific testing standards for noise emissions, snowcoach measurements for noise would be based on emissions testing that would be conducted in the park. These tests would be conducted at cruising speed, rather than full throttle.

Dates of Operation and Transition to New Plan—Under alternative 2, conditions existing during the 2012/2013 winter season would continue and a transition period would not occur. The winter season dates, December 15 to March 15, would remain the same. Hours of operation for OSV use would be between 7:00 a.m. and 9:00 p.m. As specified in the "Elements Common to All Action Alternatives" section, the East Entrance would be open from December 22 through March 1 from 8:00 a.m. to 9:00 p.m.

ALTERNATIVE 3: TRANSITION TO SNOWCOACHES THAT MEET BAT REQUIREMENTS ONLY

Under alternative 3, OSV access into the park would transition to BAT snowcoaches only. Alternative 3 would initially provide for both snowmobile and snowcoach access under interim regulation levels of up to 318 BAT snowmobiles and 78 snowcoaches per day until the 2017/2018 season. Beginning in the 2017/2018 winter season, all snowcoaches would need to meet BAT requirements as described under alternative 2 and in appendix B and snowmobiles would begin to be phased out. Snowcoaches would completely replace snowmobiles within a 3-year period after the phaseout begins (2020/2021 winter season). Under alternative 3, the East Entrance Road would be closed to all OSVs from the East Entrance to the Fishing Bridge Developed Area, including Sylvan Pass, once the phaseout of snowmobiles is complete. Non-motorized use at the East Entrance would include a backcountry experience along this route. In addition, non-motorized use would continue as described under "Elements Common to All Alternatives" and approximately 10 miles of side roads would become ski/snowshoe routes.

Snowmobile Management—Alternative 3 would initially allow for up to 318 BAT snowmobiles per day into Yellowstone. Daily snowmobile limits and entrance allocations during this time would be the same as listed above for alternative 1 (refer to table 2 for specific entrance allocation numbers). Starting in the 2017/2018 winter season, a 3-year transition to BAT snowcoaches only would begin. As the number of BAT snowcoaches increase, the number of snowmobiles would decrease until there are up to 120 snowcoaches and zero snowmobiles.

Routes available to snowmobile use would be the same as those listed under "Elements Common to All Action Alternatives" (also see figure 2). In addition, once the transition to snowcoaches is complete, the road from the East Entrance and the Fishing Bridge Developed Area would be closed.

Management of snowmobile use under alternative 3 would require all snowmobiles in the park, except those on Cave Falls Road, to travel with a commercial guide. There would be no more than 10 snowmobiles allowed per commercially guided group, including the snowmobile operated by the commercial guide. This is a change from the 2009–2013 interim regulations that allowed for up to 11

snowmobiles per group. Visitors would pay the park entrance fee and would pay for the services of the commercial guide.

Daily snowmobile levels would be fixed and would not vary during the season. As snowmobile numbers are reduced each season beginning in 2017/2018, revised daily entrance levels would also be fixed. See table 4 for specific initial entrance allocation numbers. As the number of snowmobiles in the park decreases, there would be a corresponding decrease to the entrance allocations for snowmobiles.

TABLE 4: INITIAL DAILY SNOWMOBILE ENTRY ALLOCATIONS UNDER ALTERNATIVE 3

Entrance	Commercially Guided Snowmobiles
West Entrance	160
South Entrance	114
East Entrance	20
North Entrance	12
Old Faithful	12
Total	318

As with alternative 2, at maximum use, each snowmobile could hold two riders, resulting in a maximum of 636 passengers daily (see table 1). At the end of the phaseout (winter 2020/2021 season), there would be zero snowmobile passengers.

Snowcoach Management—The NPS would initially permit up to 78 snowcoaches per day into Yellowstone. Daily snowcoach limits initially would be the same as under alternative 2 (refer to table 5 for specific entrance allocation numbers). In the 2017/2018 winter season when all snowcoaches meet BAT requirements, additional snowcoaches would be added with a corresponding decrease in snowmobile use up to a total of 120 BAT-compliant snowcoaches per day. Beginning in the winter season of 2020/2021, only BAT snowcoaches would be permitted in the park.

TABLE 5: DAILY SNOWCOACH ENTRY ALLOCATIONS UNDER ALTERNATIVE 3

Entrance	Commercially Guided Snowcoaches Before Phaseout	Commercially Guided Snowcoaches After Phaseout
West Entrance	34	62
South Entrance	13	10
East Entrance	2	0
North Entrance	13	19
Old Faithful	16	29
Total	78	120

Snowcoach routes under alternative 3 would be the same as those listed under "Elements Common to All Action Alternatives."

All snowcoaches operating in the park would be required to operate in accordance with a concessions contract and meet BAT requirements, as discussed below. All snowcoaches would be driven by a commercial driver. Daily snowcoach levels would be fixed and there would be no variation in the total

number allowed day to day. Table 5 shows the initial daily snowcoach entry limits, and the limits at the end of the phaseout.

At maximum use, prior to phaseout, until the winter season 2020/2021, there would be a maximum snowcoach capacity of 1,069 people, based on an average capacity of 13.7 people per snowcoach as discussed under alternative 2 and table 1.

If all allocations are used, the maximum possible use in winter season 2020/2021 and beyond would be 1,644 people, with a seasonal maximum of 147,960 people (table 1).

Transition Management—To achieve this alternative, the park would issue a prospectus that would allow for guided snowmobile and snowcoach services. Each company that wins a contract could be given an allocation of snowmobiles and snowcoaches. The snowmobile totals of all contracts would not exceed 318. For snowcoaches, each contract would have an allocation that initially would equal a total of 78 coaches among all providers and would increase to a total of 120. At the end of each winter season, the NPS would request the number of BAT snowcoaches coming in service the following season from each OSV tour company. The tour company could request to replace snowmobiles with snowcoaches. For each snowcoach added, a reduction of seven snowmobiles would occur. Once the last BAT compliant snowcoach under each contract is added, any remaining snowmobiles on a given contract would be replaced by the last BAT compliant snowcoach. That is, the last snowcoach might replace anywhere from 7 to 13 snowmobiles. The full transition would be complete, and no snowmobiles would be permitted in the park beginning in the 2020/2021 winter season. All remaining snowmobile allocations would be required to be converted to snowcoach allocations by that time.

Wheeled Vehicle Management—Under alternative 3, wheeled vehicle access would continue as described under "Elements Common to All Alternatives."

Sylvan Pass Management—The East Entrance Road would be open as described under alternative 2 until the 2020/2021 season. Beginning in the 2020/2021 season, the East Entrance Road would be closed to all travel no later than the first Monday following the first full week in November. The East Entrance Road could close earlier if deemed unsafe due to avalanche or weather conditions.

The road from the East Entrance to 1/4 mile east of 5-mile bend would be designated for non-motorized travel (skiing and snowshoeing) and maintained by Resource and Visitor Protection staff using snowmobile-towed grooming equipment to set tracks. This would maintain and support existing skiing and snowshoeing opportunities currently originating from the Pahaska TePee area just outside the park and commensurate with similar opportunities occurring elsewhere in the park such as Blacktail Drive, Bunsen Peak, Tower Falls, Upper Terrace Loop and several trails at the Old Faithful area.

No grooming would occur between Fishing Bridge Developed Area and 1/4 mile east of 5-mile bend on the east side of Sylvan Pass. This section of road would be closed to all OSV travel from 1/4 mile east of 5-mile bend on the east side of Sylvan Pass to the Fishing Bridge Developed Area. This road segment would be designated for non-motorized travel at your own risk. A boundary gate would be installed 1/4 mile east of 5-mile bend demarcating the area beyond the gate as containing significant and concentrated avalanche terrain hazard. The road would be groomed from the East Entrance to 1/4 mile east of 5-mile bend to facilitate access by skiers and snowshoers. No motorized travel would be permitted over Sylvan Pass between the fall closure and spring opening dates except in emergency situations.

There would be no use of explosives to mitigate avalanches on the pass or elsewhere in the park, including howitzer or helicopter dispensed explosives except in emergency situations.

The East Entrance Road would open in the spring when weather and avalanche conditions permit. The road would be open no sooner than the 3rd Saturday in April (theoretically two weeks earlier than the traditional opening day of the first Friday in May). The season would more closely match the public use season for the south end of the park; however, actual opening day for the East Entrance would depend on avalanche and weather conditions. There would be no use of explosives (howitzer or aerial dispensed) to mitigate avalanches on the pass to facilitate spring opening.

Non-Motorized Management—Non-motorized uses, including cross-country skiing, backcountry skiing, hiking, and snowshoeing, would continue as described in the "Elements Common to All Alternatives" section. Additional non-motorized backcountry use opportunities would be present on the east side of the park once the transition is complete and the East Entrance is closed.

BAT Requirements—BAT requirements under alternative 3 would be the same as described under alternative 2 for both snowmobiles and snowcoaches.

Dates of Operation and Transition to New Plan—Because alternative 3 begins with levels that have already been in effect from December 2009 to March 2013, there would be no transition year. Dates of operation and operating hours would be the same as under alternative 2 for all gates except the East gate. The transition to BAT snowcoaches only would begin during the 2017/2018 season.

ALTERNATIVE 4: MANAGE OSV USE BY TRANSPORTATION EVENTS

Under alternative 4 the park would manage OSV use by setting a maximum number of daily transportation events allowed into the park. A transportation event is defined as one snowcoach or a group of seven snowmobiles (averaged seasonally, daily maximum number of 10 snowmobiles per event) traveling together within the park, and is based on evidence that, when managed appropriately, New BAT snowmobile and BAT snowcoach transportation events have comparable levels of adverse impacts to park resources and the visitor experience. For a detailed discussion of the comparability of impacts of snowmobiles versus snowcoaches, see appendix A.

Managing by OSV transportation events is an impact-centric management approach that would minimize impacts to park resources, enhance the visitor experience, and permit modest growth in visitation. This approach would facilitate greater operator flexibility, reward future OSV technological innovations, and reduce OSV-caused environmental impacts. If OSVs meet voluntary E-BAT standards, operators would be allowed to increase their seasonal average transportation event group size from one to up to two snowcoaches and seven to eight snowmobiles per transportation event.

The park would permit up to 110 transportation events daily, of which up to 50 daily transportation events may be groups of snowmobiles. Transportation events would be allocated via concessions contracts. Contract holders (commercial tour operators) would have the ability to decide whether to use their daily allocation for snowmobile or snowcoach transportation events, or a mix of both, but no more than 50 daily transportation events parkwide could come from snowmobiles. The daily limit of 50 snowmobile transportation events would be enforced by limiting the total number of snowmobile events within each operator's contract to ensure that the maximum number of daily snowmobile transportation events never eclipses 50. Checks to ensure this number is never exceeded would come through existing concession contract reporting requirements and at the entrance stations to the park.

Under alternative 4, all snowmobile transportation events would be guided. Forty-six of the allocated 50 snowmobile transportation events would be commercially guided and four transportation events would be reserved for non-commercially guided snowmobile access. Daily, one non-commercial snowmobile transportation event would be authorized per gate and each non-commercial transportation event could

contain up to 5 snowmobiles. Each non-commercial guide would be allowed to lead up to 2 groups per season and permits for this opportunity would be allocated via an on-line lottery system. If non-commercially guided groups desire an overnight stay in the park, each group would need to reserve two consecutive days for its non-commercially guided trip. All non-commercially guided snowmobiles would need to meet BAT standards, as described in detail below. Non-commercial guiding is further described in appendix C.

The East Entrance Road, over Sylvan Pass to Fishing Bridge, would remain open per the Sylvan Pass Working Group Agreement.

Similar to the other action alternatives, all snowcoaches would be driven by a commercial driver.

Alternative 4 would be phased in gradually over several seasons to allow the park and commercial operators sufficient time to amortize existing OSVs and to meet the new requirements. These phases are described below under "Snowmobile Management" and "Snowcoach Management."

Snowmobile Management—Snowmobile use would be managed by transportation events. A transportation event would be one group of snowmobiles and maximum group size would be 10 snowmobiles with a seasonal average of seven or less. The maximum number of guided snowmobiles transportation events would be 50; 46 of those transportation events would be allocated to commercially guided trips and 4 snowmobile transportation events would be allocated to non-commercially guided snowmobile trips. The transition to management by transportation events would be phased in over several winter seasons to provide the park and operators sufficient time to adjust to the new management paradigm and to amortize existing snowmobiles:

- Phase I: The first phase of the transition to management by transportation events would occur during the 2013/2014 winter season and would allow for snowmobile access under interim regulation levels of up to 318 snowmobiles per day. Existing BAT standards for snowmobiles would be retained during this season (noise: maximum of 73 dBA via SAE J192 and tailpipe pollutants: 120 g/kW-hr of CO and 15 g/kW-hr of hydrocarbons).
- Phase II: The second phase of the transition to management by transportation events would begin in the 2014/2015 season when the park would allow up to 110 transportation events daily, of which up to 50 daily transportation events may be groups of snowmobiles. Up to 4 of these transportation events may be non-commercially guided, provided that non-commercially guided snowmobiles meet BAT standards. Operators could voluntarily upgrade their fleets to the New BAT standards for snowmobiles at this time or wait until the New BAT standards become mandatory.

  For snowmobile operators who do not upgrade their fleet to New BAT standards during this phase, vehicle numbers would be averaged daily. For example, if a snowmobile concessioner is allocated three daily snowmobile transportation events but does not have New BAT snowmobiles, that operator would not be allowed to operate more than 7 snowmobiles per event as averaged daily, but would be allowed to have up to 10 snowmobiles per single event, provided the daily event size average was 7 or less. That operator could meet the daily average requirement through a combination of three snowmobile transportation events of seven snowmobiles each, or two snowmobile transportation events of eight snowmobiles each and one transportation event of five snowmobiles, etc. If no commercial snowmobile operators upgrade their fleets during Phase II, the maximum daily number of commercial snowmobiles allowed in the park would be 322.

  For commercial snowmobile tour operators who upgrade at least 10 snowmobiles in their fleets to the New BAT standards for snowmobiles, vehicle numbers would be averaged seasonally for that transportation event allocation. This would allow operators to have events with a maximum of 10

snowmobiles each, provided their seasonal transportation event size averages are 7 or less. Other snowmobiles in the same operator's fleet that do not meet the New BAT standards would need to be averaged daily, rather than over the season. If all operators upgrade their fleets during this interim period, the maximum daily number of commercial snowmobiles in the park would be 460. The maximum daily average if all operators upgrade their fleets during Phase II would be 322.

Up to 4 transportation events per day may be non-commercially guided, provided that non-commercially guided snowmobiles meet BAT standards.

- Phase III: The third and final phase of the transition to management by transportation events would start no later than the 2017/2018 season. By that time, all snowmobiles would be required to meet New BAT standards and the following would occur:
  - Snowmobile operators would be responsible for keeping track of their transportation events and reporting these numbers to the park's Concessions Management Division on a monthly basis. Should operators exceed allowed averages (daily or seasonally, depending on the types of vehicles operated as described above) they would receive unsatisfactory reporting ratings that could result in temporary or permanent suspension of their concession contracts.
  - Snowmobile operators would be able to use their allocated transportation events for snowmobiles, snowcoaches, or a mix of both, as long as no more than 50 total events come from snowmobiles on a given day. For example, if an operator is allocated a total of three snowmobile transportation events, that operator could run three snowmobile events, two snowmobile events and one snowcoach event, one snowmobile event and two snowcoach events, or three snowcoach events. Daily allocations and entrance distributions for transportation events under alternative 4 are shown in table 6.
  - As under Phase II, up to four non-commercially guided transportation events would be allowed in the park per day. Non-commercially guided groups could have a maximum of five snowmobiles per group, including the non-commercial guide, and all snowmobiles would be required to meet New BAT standards.
  - At the highest potential level of use, with all 50 snowmobile events used in a single day and all snowmobiles meeting New BAT requirements, there could be a maximum of 480 snowmobiles in the park, as shown in table 7. Although this is the absolute maximum number of snowmobiles that could be permitted into the park on a single day, this level of use would not occur every day because commercially guided group sizes would be required to average no more than 7 snowmobiles per event averaged seasonally, and non-commercially guided groups could not exceed a maximum group size of 5 snowmobiles per transportation event.
  - No later than December 2017 the maximum daily average number of snowmobiles would be 342 snowmobiles per day (322 commercially guided snowmobiles plus 20 non-commercially guided snowmobiles).

TABLE 6: DAILY SNOWMOBILE TRANSPORTATION EVENT ENTRY LIMITS (ALTERNATIVE 4)

Entrance	Commercially Guided Snowmobiles Transportation Events	Non-commercially Guided snowmobiles Transportation Events	Maximum Daily Number of Commercially Guided Snowmobiles	Maximum Daily Average Number of Commercially Guided Snowmobiles	Maximum Daily Average Number of Commercially Guided Snowmobiles (if all meet voluntary E-BAT Standards
West Entrance	23	1	230	161	184
South Entrance	16	1	160	112	128
East Entrance	3	1	30	21	24
North Entrance	2	1	20	14	16
Old Faithful	2	0	20	14	16
Total	46	4	460	322	368

TABLE 7: MAXIMUM NUMBER OF SNOWMOBILES IN THE PARK IF ALL SNOWMOBILE TRANSPORTATION EVENTS ARE USED

	46 Commercial Snowmobile Transportation Events	4 Non-commercial Snowmobile Transportation Events	Maximum Number of Snowmobile use in the Park for:
Peak Day (46 commercial groups of 10 snowmobiles each, 4 non-commercial groups of 5 snowmobiles each)	460	20	480
Maximum Average Day (46 commercial groups of 7 snowmobiles each, 4 non-commercial groups of 5 snowmobiles each)	322	20	342
Maximum Average Day if all Snowmobiles meet voluntary E-BAT requirements (46 commercial groups of 8 snowmobiles each and 4 non-commercial groups of 5 snowmobiles each)	368	20	388

The snowmobile BAT standards for noise emissions under alternative 4 would initially be 73 dBA and no later than the 2017/2018 winter season, noise emission requirements would be reduced to 67 dBA as discussed below in the "BAT Requirements" section.

All existing oversnow routes in the park, as listed in the "Elements Common to all Action Alternatives" section, would be open to snowmobile use. Commercial operators at a gate would be able to share allocations within that gate (for example, operators at the West Entrance Gate could trade allocations among each other) but allocations could not be traded between different gates. Fees for snowmobile use through commercial operators would continue as described under alternative 2.

Estimated maximum daily and maximum average daily use under alternative 4 would depend on how operators use their transportation events. In the case that all events are used on snowcoaches, up to 20 non-commercially guided snowmobiles would be allowed, resulting in a maximum of 40 people entering the park by snowmobile daily, a seasonal maximum of 3,600 people (see table 1). On the other end of the

spectrum, if all snowmobile events are used, daily maximum and average daily maximum use of snowmobiles would be as follows:

- Prior to voluntary E-BAT standards:
  - Daily maximum use: 920 people
  - Average daily maximum use: 644 people
  - Maximum number of people seasonally: 57,960
- After voluntary E-BAT standards:
  - Daily maximum use: 920 people
  - Average daily maximum use: 736 people
  - Maximum number of people seasonally: 66,240

Non-commercial Guiding—One non-commercially guided snowmobile group (as defined above in the "Definitions" section), with up to 5 snowmobiles per group, would be allowed through each of the four entrances per day. All non-commercial snowmobile operators, including the guide, would be required to successfully complete a training program that would be developed in cooperation with interested parties and stakeholders. Non-commercial allocations would be awarded through an online lottery. Non-commercial guides would be limited to leading two groups per winter season in the park. Further detail on the proposed non-commercial guide program is provided in appendix C.

Snowcoach Management—Snowcoach routes under alternative 4 would be the same as those listed under "Elements Common to All Action Alternatives." Snowcoach use would be managed by transportation events and a snowcoach transportation event would initially equal one snowcoach, regardless of coach size. Like snowmobiles, the transition to management by transportation events would be phased in over four winter seasons to provide the park and operators sufficient time to adjust to the new management paradigm and to amortize existing snowcoaches:

- Phase I: The first phase of the transition to management by transportation events would occur during the 2013/2014 winter season and would allow for would allow for snowcoach access under interim regulation levels of up to 78 snowcoaches per day. Snowcoaches would continue to be exempt from BAT standards for this season.
- Phase II: The second phase of the transition to management by transportation events would begin in the 2014/2015 season when operators would be able to use their allocations of transportation events on snowmobiles or snowcoaches. In total, 106 transportation events would be distributed among the commercial tour operators and entrances (including Old Faithful) to be used for commercial snowmobiles or snowcoaches. As a result, the number of snowcoach events per day could range between 60 and 106, depending on how operators utilize their transportation events. Four transportation events would be reserved for non-commercially guided snowmobile access.

  During Phase II, snowcoaches already in service would not be required to meet BAT; however, any new snowcoach coming into service for the 2014/2015 winter season would be required to meet the BAT standard for snowcoaches (see the "Snowcoach BAT Requirements" section below or appendix B). Park staff would measure the noise emission performance of all snowcoaches proposed for use in the park. BAT for air emissions is defined as the vehicle being 2007 or newer for gasoline engines and 2010 or newer for diesel engines, the equivalent of EPA Tier 2 model year engine and emission control technology requirements (also see appendix B).

Starting in Phase II, operators would have the option to have snowcoaches meet voluntary E-BAT standards. The number of snowcoaches per transportation event could rise from 1 to 2 snowcoaches if both snowcoaches in a transportation event meet the voluntary E-BAT standards of no more than 71 dBA (4 dBA less than the 75 BAT standard), as described in the "Snowcoach BAT Requirements" section below. In order to be considered a single transportation event, the two snowcoaches would be required to travel together closely, keeping a safe distance between them.

Under this framework, the initial maximum number of snowcoaches could be 106 if all transportation events were used for snowcoaches, because 4 of the 110 allocated transportation events would be reserved for non-commercially guided snowmobile access. Should all 50 snowmobile transportation events be used, 60 BAT snowcoaches and 480 snowmobiles per day (as described above in the "Snowmobile Management" section) would be permitted on a maximum use day. These two allocations represent the extreme potentials of this scenario. It is likely that actual use would end up somewhere in between these extremes.

If all snowcoaches meet the voluntary E-BAT standard, the maximum number of snowcoaches in the park on a daily basis could range from 120 snowcoaches (if all 50 snowmobile transportation events are used) to no more than 212 snowcoaches (if all snowcoaches meet the voluntary E-BAT standards and none of the 46 commercial snowmobile transportation events are used; 4 snowmobile events would remain for non-commercially guided use). The entrance distribution for snowcoaches is shown in table 8.

- Phase III: The third and final phase of the transition to management by transportation events would start no later than the 2017/2018 season. By that time, all snowcoaches (existing and those coming into service) would be required to meet the BAT standards. These standards are described below in the "Snowcoach BAT Requirements" section and in appendix B. The allocation of transportation events for snowcoaches, both BAT and those meeting voluntary E-BAT standards, would be the same as described under Phase II.

TABLE 8: MAXIMUM DAILY NUMBERS OF SNOWCOACH ENTRY LIMITS (ALTERNATIVE 4)

Entrance	60 Snowcoach Transportation Events (if all 50 snowmobile transportation events are used)	120 Snowcoach Transportation Events (if all 50 snowmobile events are used and all snowcoaches meet voluntary E-BAT)	106 Snowcoach Transportation Events (if zero commercial snowmobile transportation events are used)	212 Snowcoach Transportation events(if zero commercial snowmobile transportation events are used and all snowcoaches meet voluntary E-BAT)
West Entrance	26	52	47	94
South Entrance	10	20	17	34
East Entrance	2	3	2	4
North Entrance	10	20	17	34
Old Faithful	12	25	23	46
Total	60	120	106	212

Similar to other action alternatives, all snowcoaches operating in the park would be required to operate in accordance with a concessions contract and meet BAT requirements, as described in detail below and in appendix B. Private snowcoaches would not be permitted (all snowcoaches must be driven by a commercial driver) and fees for snowcoach use through commercial operators would continue.

Estimated maximum daily and maximum average daily use under alternative 4 would depend on how commercial tour operators use their transportation events. In the case that all commercial transportation events are used on snowcoaches, daily maximum and average daily maximum use of snowmobiles would be as follows:

- Prior to voluntary E-BAT:
  - Daily maximum/average daily maximum use: 1,452 people
  - Maximum number of people seasonally: 130,698 people.
- After voluntary E-BAT:
  - Daily maximum/average daily maximum use: 2,904 people
  - Maximum number of people seasonally: 261,396 people.

In the case that all snowmobile events are used and the remaining 60 events are all used on snowcoaches, daily maximum and average daily maximum use of snowmobiles would be as follows:

- Prior to voluntary E-BAT:
  - Daily maximum/average daily maximum use: 822 people
  - Maximum number of people seasonally: 73,980 people.
- After voluntary E-BAT:
  - Daily maximum/average daily maximum use: 1,644 people
  - Maximum number of people seasonally: 147,960 people.

Wheeled Vehicle Management—Under alternative 4, wheeled vehicle access would continue as described under "Elements Common to All Alternatives."

Non-Motorized Use Management—Non-motorized uses, including cross-country skiing, backcountry skiing, hiking, and snowshoeing, would continue as described in the "Elements Common to All Alternatives" section.

Snowmobile BAT Requirements—Through no later than March 2017, the existing BAT requirements could be retained. Air emission requirements would be no greater than 120 grams per kilowatt-hour (g/kW-hr) of carbon monoxide and 15 g/kW-hr for hydrocarbons. Noise emission restrictions would continue to require snowmobiles to operate at or below 73 dB measured using the dBA scale while following the Society of Automotive Engineers (SAE) J192 test procedures (revised 1985) (SAE J192).

No later than December 2017, New BAT requirements for snowmobiles would take effect. Air emission requirements would be 90 g/kW-hr of CO and 15 g/kW-hr of hydrocarbons. Noise emissions requirements would be a maximum of 67 dBA, under the SAE J1161 test procedures, which measure noise at cruising speed. The SAE J1161 test procedures allow for a tolerance of 2 dBA over the noise level limit to provide for variations in test sites, temperature gradients, wind velocity gradients, test equipment, and inherent differences in nominally identical vehicles. This means that in order to operate in

the park after New BAT for snowmobiles is implemented, a sample of noise emission measurements for a specific snowmobile make and model may not exceed a mean (average) noise output of 67 dB(A) at 35 mph at 50 feet and no single measurement from the sample may exceed 69 dB(A), using the J1161 test procedures at typical cruising speed.

The adoption of the SAE J1161 testing procedure for measuring snowmobile noise output represents a change from the way snowmobile noise was tested and certified in the past. Under previous winter use plans and BAT snowmobile test procedures, the SAE J192 standard was used. The SAE J192 test represents a full-throttle test designed to measure the maximum noise output of a snowmobiles and was not representative of how snowmobiles are operated in Yellowstone. The park intends to adopt the SAE J1191 test prescription which requires testing vehicles at typical cruising speed to better represent how snowmobiles are operated in Yellowstone. Testing and certifying snowmobiles via the SAE J1161 test at their typical cruising speed will result in more reliable data regarding the impacts of snowmobiles on park soundscapes. Because snowcoaches are tested at cruising speed, results of the SAE J1161 test will allow a more valid and reliable comparison of impacts to soundscapes from snowmobiles versus snowcoaches. Based on available data, the NPS believes that a snowmobile tested under SAE J1161 at 35 mph would produce approximately 2 dBA less than the same machine under a SAE J191 test. BAT certification for a snowmobile would be effective for six consecutive winter seasons following its manufacture or until the snowmobile travels 6,000 miles, whichever occurs later.

Voluntary E-BAT for Snowmobiles—Starting in the 2014/2015 season, if all snowmobiles in a transportation event meet voluntary E-BAT (described below), the average transportation event group size for snowmobiles could increase from a seasonal average of seven to eight snowmobiles per transportation event. In that case, average maximum daily use would be 388 snowmobiles per day (see table 7), of which 368 would be from commercially guided snowmobiles. Maximum group size would remain no more than 10 snowmobiles.

- For tailpipe emissions, voluntary E-BAT would be 60 g/kW-hr of CO and 15 g/kW-hr of hydrocarbons.
- For noise emissions, voluntary E-BAT would be emitting a maximum of 65 dBA (2 dBA less than the New BAT standard of 67 dBA via SAE J192) as measured using the process described above.

Snowcoach BAT Requirements—BAT standards would be required for existing snowcoaches no later than the 2017/2018 season. New snowcoaches entering service beginning in the 2014/2015 season would need to meet BAT requirements at the time they enter service. Specific BAT requirements would include the following:

- Snowcoach BAT would require that snowcoach noise emissions measure 75 dBA or less, at cruising speed as measured according to Society of Automotive Engineers J1161 test procedures (revised April 2004) (SAE J1161). Yellowstone staff would conduct noise emission testing on all snowcoaches proposed for use in the park.
- BAT for air emissions is defined as the vehicle being 2007 or newer for gasoline engines and 2010 or newer for diesel engines (the equivalent of EPA Tier 2 model year engine and emission control technology requirements) and is further described in appendix B of the plan/SEIS.
- All existing snowcoaches would either need to meet BAT requirements no later than the 2017/2018 winter season or be removed from service. All new snowcoach vehicles put in service beginning in the 2014/2015 season would need to meet BAT requirements immediately. Snowcoach BAT is further described in appendix B of the plan/SEIS.

- The NPS would test and approve all snowcoaches for operation in Yellowstone National Park and maintain a list of approved snowcoaches that meet the air and noise emissions requirements. Once approved, a snowcoach may operate in the park through the winter season that begins no more than 10 years following its engine manufacture date. To continue to operate in the park during future winter seasons, a snowcoach must be retrofitted with a new engine and emissions equipment to meet evolving emission requirements, and re-certified for air and noise emissions. For example, a snowcoach with a model year 2010 engine could operate through the 2020/2021 winter season and would cease to be allowed to operate in the park as of March 15, 2021, if it is not retrofitted with a new engine and re-tested. Individual snowcoaches may be subject to periodic and random inspections to determine compliance with BAT requirements.

Voluntary E-BAT for Snowcoaches—The number of snowcoaches per event could rise from 1 to 2 if both snowcoaches meet voluntary E-BAT standards, defined as emitting no more than 71 dBA at cruising speed as measured via the SAE J1161 test procedures (4 dBA less than the 75 BAT standard). To be considered a single transportation event, the two snowcoaches would be required to travel together closely, keeping a safe distance between them.

Dates of Operation and Transition to New Plan—Under alternative 4, date and times of operation would be the same as under alternative 2. The transition to the new plan would occur in phases as described previously.

ALTERNATIVES AND ACTIONS CONSIDERED BUT DISMISSED FROM FURTHER CONSIDERATION

For various reasons, some alternatives or actions were initially considered but eliminated from further study. Those alternatives and actions dismissed from further consideration did not meet the definition of a reasonable alternative, as stated by the CEQ. The CEQ states that, "Reasonable alternatives include those that are practical or feasible from the technical and economic standpoint and using common sense, rather than simply desirable from the standpoint of the applicant." In addition, they also meet project objectives, resolve need, and alleviate potentially significant impacts to important resources. An alternative is not automatically rendered unreasonable if it requires the amending of a park plan or policy; causes a potential conflict with local, state, or federal law; or lies outside the scope of what Congress has approved or funded or outside the legal jurisdiction of the NPS. The rationales for dismissal are presented in this section.

The following alternatives were considered but dismissed. These dismissed alternatives, when combined with the alternatives fully evaluated above, constitute the full range of alternatives the NPS is required to consider under NEPA.

SOUND EVENT MANAGEMENT, WITH VEHICLE LIMITS AND OTHER ELEMENTS FROM THE PLAN/SEIS PUBLIC SCOPING

During public scoping for this plan/SEIS, which occurred in February 2012 the public was presented with a range of alternatives that included two alternatives that managed OSV use by sound events. After public scoping concluded, the NPS analyzed the public comments and revisited the range of alternatives. It was determined that these two alternatives were very similar in nature and therefore they were combined into a single alternative, which is analyzed in this plan/SEIS as alternative 4. This alternative has been renamed "Transportation Events" from "Sound Events" to reflect the variety of impacts, including but not limited to sound, managed by this alternative.

As part of the creation of a single transportation event alternative, the elements of those preliminary alternatives were also reexamined. The element that required operators to offer both snowmobile and snowcoach trips was removed from this combined alternative. Public comments noted that this element would require operators to develop additional infrastructure to accommodate different vehicle types and would require a very large financial output to comply, as well as additional land that is not available in these communities. They also noted that the current operations tend to specialize in one type of OSV transportation over another, and companies would not be able to sustain adding an additional mode of transportation. Because of these factors, commenters felt that this requirement would be unfair and discriminatory for operators. The NPS considered this input and removed this element from consideration in this plan/SEIS because it would be unreasonably expensive to the individual operators and appears to have little relevance to the overall management issues and impacts being analyzed in this plan/SEIS.

The element that limited park entrance to commercial wheeled or rubber-tracked vehicles during the first two weeks and last two weeks of the season (December 15–29 and March 1–15) was removed from further analysis. This element was based on an assumption that recent winter conditions were trending toward later opening and earlier closing dates. Public comment during scoping noted that the historic opening dates that this element was based on were skewed by a few unusually late years within the 10 years considered, and that this was not the general trend for opening dates. In addition, the public felt that if the NPS ceased plowing the roads in November, rather than early December, the likelihood of sufficient snow to facilitate oversnow travel on park roads by December 15 would be higher. Upon reexamination of this element, the assumption underlying this element appears unsupported, so it was removed from consideration in this plan/SEIS. However, as is currently the case, the NPS maintains the authority to open late or close early based on winter conditions in any given year.

Set Maximum Snowmobile and Snowcoach Use at the Average Use Levels Seen Under the Interim Regulations

Under the interim regulations in effect from the 2009/2010 through the 2012/2013 seasons, a maximum of 318 snowmobiles and 78 snowcoaches were allowed in the park per day. These maximum use levels were not met on any day during this time period. During the 2009/2010 through 2011/2012 seasons, there were an average of 191 snowmobiles and 36 snowcoaches in the park per day. This plan/SEIS analyzes an alternative (alternative 2) that would continue those maximum numbers and thus could be predicted to be likely to result in fairly similar actual average numbers. However, the NPS did consider but dismiss from detailed analysis an alternative that would have allowed a maximum of 191 snowmobiles and 36 snowcoaches per day.

The NPS relies on commercial tour operators to provide visitors access to the park in winter. Commercial tour operators submitted significant comments on the draft plan/SEIS stating that authorized use levels at such low numbers of OSVs would not allow them to have commercially viable businesses. Many commenters stated that the authorized number of OSVs is never the actual number (average day or peak day) of OSVs in the park (and therefore is never the maximum expected number of visitors) because it is "impossible" to consistently fill the last snowmobile in a group or last seat or seats on a snowcoach.

Although the NPS conducted its impact analysis in the "Environmental Consequences" chapter on the maximum allowable use, analysis of OSV use for eight seasons (the "managed use era" of 2004/2005 to 2011/2012) shows that maximum allowable use levels have never been met. During the past eight winter seasons, for snowmobiles there was a utilization rate of between 34 and 62 percent of authorized use levels and for snowcoaches there was a utilization rate of between 33 and 49 percent of authorized use levels. During the interim rule period (2009/2010 through present), approximately 60 percent of the maximum allowed snowmobiles used and approximately 47 percent of the maximum allowed

snowcoaches were used. The NPS received many comments regarding this trend. Commenters pointed out that for a number of reasons, the maximum authorized use levels will never be met.

Thus, an alternative that allows a maximum of 191 snowmobiles and 36 snowcoaches per day would be very likely to result in significantly lower actual numbers, and based on those predicted numbers, commercial tour operators would not be able to maintain viable businesses. In the absence of a viable business model, commercial tour operators would likely cease to exist. Without commercial tour operators, visitors would not have the opportunity to visit the interior of the park via OSVs and therefore this alternative could not be implemented. An alternative under which visitors would not have access to the interior of the park, where many of the park's unique winter resources are located, would not meet the purpose and need of this plan/SEIS.

MODIFICATIONS TO DRAFT SEIS ALTERNATIVE 3 INCLUDING IMMEDIATE PHASEOUT OF SNOWMOBILE USE, A REDUCTION IN SNOWMOBILE NUMBERS DURING PHASEOUT, AND REDUCED NUMBER OF SNOWCOACHES

Commenters suggested that alternative 3 be implemented, but requested changes to the alternative including an immediate phaseout of snowmobiles, a reduced number of snowmobiles during the phaseout, and a reduced number of snowcoaches. Eliminating or reducing snowmobiles would not provide operators the opportunity to transition to the new management under alternative 3. By allowing a gradual transition, alternative 3 would allow for operators to better accommodate demand while switching over from snowmobiles to snowcoaches. In terms of total number of snowcoaches, 120 snowcoaches represents 120 transportation events. As shown by the analysis, this number of transportation events allows for visitor use, while minimizing impacts to the park's resources.

ADDITIONAL SUGGESTIONS FOR NON-COMMERCIALLY GUIDED USE

During public scoping for this plan/SEIS, the public offered many suggestions related to how a non-commercially guided program could be executed at Yellowstone. Some of these suggestions included increasing the total number of non-commercial trips permitted daily, allowing one trip a day for each operator, allowing up to five non-commercial trips a day, increasing the percentage of non-commercially guided use (ranging from 10 percent to 25 percent), and considerations regarding training and education for non-commercial guides. These concepts were evaluated and the non-commercially guided element presented during public scoping was modified to allow for one non-commercially guided group per day from each entrance (originally proposed as one non-commercial group per day). These limits would be part of the initial program, which could be expanded in the future. Appendix C of this plan/SEIS provides more information on non-commercially guided use (see also alternative 4).

LIMIT ROUTES WHERE OSVS ARE PERMITTED TO THE SOUTH ENTRANCE ONLY

During public scoping, commenters suggested that, due to potential impacts on animal migration patterns, OSV use should be limited to the South Entrance Road only (to Old Faithful) and that no OSVs should be permitted in the remainder of the park. As stated in the 2011 Winter Use Plan/EIS, the best available scientific evidence regarding the effect of road grooming on bison distribution and population patterns suggests the following: first, the observed changes in bison distribution that have occurred were likely consequences of natural population growth and range expansion, which would have occurred regardless of the presence of snow-packed roads (Bjornlie and Garrott 2001; Coughenour 2005; Gates et al. 2005; Bruggeman et al. 2009a). Second, 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). Third, there is no evidence that bison preferentially used groomed

roads during winter (Bjornlie and Garrott 2001; Bruggeman et al. 2006). Fourth, road segments used for travel corridors appeared to be overlaid on what were likely natural travel pathways, including narrow canyons and stream corridors (Gates et al. 2005; Bruggeman et al. 2009b). And fifth, bison use of travel corridors that include certain road segments would likely persist whether or not the roads were groomed (Gates et al. 2005; Bruggeman et al. 2009a).

Data on the bison population and its movements in the Yellowstone area prior to extensive hunting by humans and in the absence of OSVs are unavailable. Therefore, the vast majority of detailed information on bison was collected during the recent population expansion and in the presence of road grooming. Because bison migrate to lower ranges for improved forage, it is impossible to determine after the fact, and in the absence of a control population, what precise impact, if any, road grooming and winter use have on bison winter range expansion and population growth (Bruggeman et al. 2007, 2009a).

Though it is impossible to conclusively resolve these issues, the park has spent much of the past ten years studying the available data, in numerous studies (as described above, in the "Environmental Consequences" chapter, and in the Scientific Assessment of Winter Use (NPS 2001f)) and previous winter use plans. Based on existing data, it does not appear that migration patterns are affected by OSV use. There is therefore no basis to limit visitation to just one park entrance. Limiting the visitation without such a basis would not meet the purpose of this plan, since limiting motorized use, if it is otherwise appropriate, would deprive most park visitors of this opportunity for no reason. For these reasons, this alternative was dismissed from further consideration. These bison migration issues were also addressed in the 2011 Winter Use Plan/EIS. NPS is aware of no relevant changed circumstances or new information that would alter the analysis of these issues from the 2011 Winter Use Plan/EIS, and thus does not believe it needs to be analyzed again in this plan/SEIS.

CHANGE THE OPENING DATE OF SYLVAN PASS SO IT IS THE SAME AS THE REST OF THE PARK

The operation of Sylvan Pass has inherent safety concerns that are present when working in an avalanche zone. Recognizing the technical and logistical challenges associated with operating Sylvan Pass in the winter, the NPS coordinated with stakeholders to form the Sylvan Pass Working Group. Working cooperatively with this group, the opening and closing dates of Sylvan Pass were determined in order to maximize safety and provide enough time for the NPS to take care of the logistics for opening the pass. In order to change these dates, a separate planning process with the Sylvan Pass Working Group would be required, which is outside the scope of analysis for this plan/SEIS, and therefore it was not carried forward for further consideration.

PROHIBIT CROSS-COUNTRY SKIING ON ROADS GROOMED FOR OSV TRAVEL

During public scoping for this plan/SEIS, commenters suggested prohibiting cross-country skiing (or other forms of non-motorized recreation) on roads groomed for OSV travel.

The purpose of this plan/SEIS is to consider if motorized use is appropriate and if so, when and where it should be allowed in the interior of Yellowstone. The plan considers existing non-motorized uses in the park, such as cross-country skiing, to the extent of making sure that experience is still provided for and does not create visitor use conflicts with motorized uses. The plan/SEIS will analyze any such visitor use conflicts and related impacts. Beyond that consideration, however, wholly prohibiting cross-country skiing or other non-motorized uses on groomed roads would be outside the scope of this planning effort.

Moreover, the NPS feels that the suggested prohibition would restrict the range of visitor activities in the park, and would not be consistent with NPS management policies. Specifically, Section 8.2 of the NPS

Management Policies 2006 states that the NPS will "provide opportunities for forms of enjoyment that are uniquely suited and appropriate to the superlative natural and cultural resources found in the parks." Non-motorized access is also discussed in Section 9.2 which states, "Depending on a park unit's size, location, resources, and level of use, the Service will, where appropriate, emphasize and encourage alternative transportation systems, which may include a mix of buses, trains, ferries, trams, and preferably non-motorized modes of access to and moving within parks. In general, the preferred modes of transportation will be those that contribute to maximum visitor enjoyment of, and minimum adverse impacts on, park resources and values." The NPS believes that maintaining the existing level of non-motorized access to Yellowstone in the winter is consistent with this management policy, and therefore limiting it was dismissed from further analysis in this plan/SEIS.

EXPAND NON-MOTORIZED USES IN YELLOWSTONE

During public scoping for this plan/SEIS, commenters suggested including additional provisions for non-motorized use such as establishing a yurt system, increasing the areas where non-motorized use should be allowed, and providing days where only non-motorized use is permitted.

The purpose of this plan/SEIS is to consider if motorized use is appropriate and if so, when and where it should be allowed in the interior of Yellowstone. The plan considers existing non-motorized uses in the park, such as cross-country skiing and snowshoeing, to the extent of making sure that experience is still provided for and does not create visitor use conflicts with motorized uses. Consideration of new non-motorized uses or infrastructure such as establishing a yurt system is outside the scope of this planning effort, and therefore was not carried forward for further analysis.

ALTER THE ROAD GROOMING SCHEDULE

The existing road grooming schedule is variable and is determined by on-the-ground conditions including road conditions, moisture, snowfall, and temperature. Because grooming can only occur during certain times based on these factors, adjusting grooming to a set schedule is not logistically possible and would not provide the needed results to increase visitor safety in the park, therefore, it was not carried forward for further analysis.

WEIGHT/POUNDS PER SQUARE INCH REQUIREMENTS FOR SNOWCOACHES

The 2011 Winter Use Plan/EIS considered elements that would restrict the pounds per square inch for snowcoaches as a mechanism to address rutting of the groomed roads. However, this element was not carried forward for analysis in the plan/SEIS. The pounds per square inch requirements discussed in the draft 2011 Winter Use Plan/EIS were developed from existing snowcoaches without on-the-ground field analysis. Without detailed study that evaluates variables including pounds per square inch, snow conditions such as density, snow-water equivalency, and other factors like grooming practices and equipment, snowcoach track design and configuration, etc., it is difficult to determine if a maximum pounds per square inch requirements would lessen the potential for rutting of snowroads. The NPS acknowledges that some snowcoaches leave ruts on the roads and that these ruts negatively affect the visitor experience and present a safety hazard to other users. To address this concern, the NPS is currently studying this issue and is working to develop mitigation strategies once the determinants of rutting are positively identified. After further study, should any size, weight, or weight displacement restrictions for snowcoaches be necessary, these restrictions will be incorporated in the concessioners' annual operating plans. Therefore, this element was not carried forward for further analysis.

ALLOW FOR PRIVATE SNOWCOACHES AND SNOWMOBILES

During public scoping for this plan/SEIS, commenters suggested that personal snowcoach use be allowed and/or that operators be able to donate the use of snowcoaches to non-profit groups without having those snowcoaches deducted from their daily allotment. The use of private snowcoaches would create safety concerns for visitors and NPS staff. Winter conditions can be hazardous due to severe expected and unexpected storms and fast changing conditions. Private snowcoaches or snowmobiles may lack the necessary equipment needed in case of emergency. Elements in the alternatives that allow non-commercially guided snowmobiles addressed this concern through required training and required equipment. As detailed in appendix C, non-commercial guides would be required to possess the necessary safety equipment, including but not limited to a radio, tow rope, map, and first aid kit In addition, increased stress would be placed on park operations to address emergency response needs from untrained users. With regard to the donation of OSVs by operators, in order to account for the impacts of use, even donated OSVs must be considered part of the allotment. Therefore, allowing private snowcoaches or snowmobiles, other than those in non-commercially guided groups, would not meet visitor use or health and safety objectives for this plan/SEIS and were not carried forward for further analysis.

MANDATE USE OF E-FUELS

During public scoping for this plan/SEIS, commenters suggested that OSV be required to use ethanol blended fuels (E-10). At this time, this alternative element is not feasible due to the lack of availability in the local area, specifically West Yellowstone, MT. As this technology becomes more available, the NPS may revisit this requirement and can incorporate it into concession contracts as necessary. However, research on OSVs has indicated that E-10 will only benefit OSVs that do not use modern fuel injection engines. All carbureted OSVs (presently only Bombardiers) would see benefits, but few if any of the other vehicles will, including snowmobiles. Further, all carbureted motors will be outlawed no later than December 2017. Since all modern engines fuel inputs are oxygen sensor controlled, when the computer detects extra oxygen in the exhaust, because it has been supplied by the fuel, it injects more fuel to bring the fuel trim back to stoichiometry negating the attempt to lean out the engine. E-10 may also influence the mix of hydrocarbons that will be emitted, most notably a large (on a relative basis) increase in aldehydes, mostly acetaldehyde and some formaldehyde. Because it is not technically feasible at this time and would likely result in negligible improvements to levels of exhaust emissions, this alternative was not carried forward for further analysis.

REVISE BAT REQUIREMENTS FOR SNOWMOBILES TO BE LESS RESTRICTIVE (FOR EXAMPLE, ADOPT EPA STANDARDS)

Currently Yellowstone snowmobile standards are more stringent than EPA standards. The EPA regulations are designed to meet nationwide needs, and do not necessarily provide the added level of protection needed to protect park resources and values. If the current standards were revised to meet EPA regulations, less protective measures would be in place. BAT requirements for Yellowstone allow for hydrocarbon level of 15 grams per kilowatt hour (g/kW-hr), but EPA requirements allow for 75 g/kW-hr. Likewise, for CO, the NPS BAT requirements call for 120 g/kW-hr, but the EPA requirements allow for 275 g/kW-hr. In both cases, the EPA standards are more than double, and in the case of hydrocarbon five times more, than the NPS requirements. With limits increased to twice, or more, than currently permitted, impacts to air quality and visibility in the park would be expected to increase. Additionally, as stated under Section 1.8 of the NPS *Management Policies 2006*, the NPS "has an obligation to demonstrate and work with others to promote leadership in environmental stewardship." The NPS believes that setting BAT requirements above EPA standards (and not allowing lower standards) is consistent with this policy and meets the plan objectives to promote improvements in technologies for winter use. This alternative

was dismissed because the anticipated impacts would not meet the objectives of this plan, as well as NPS policies.

ALLOW SNOWBIKES AND KITE-SKIING (AND OTHER USES)

Snowbikes are modified bicycles with large, low-pressure tires to facilitate use on groomed routes. Kite-skiing is similar to kite-surfing with the exception of using the surface snow and using snow skis. Kite-skiing in the park is currently prohibited under the 2010 Superintendent's Compendium (February 9, 2010) (NPS 2010g). This alternative element is outside the scope of this plan/SEIS as it does not meet the purpose of managing motorized use. Although the plan/SEIS does consider non-motorized uses, it does so in the context of existing uses to ensure they can continue, without conflicting with motorized uses. Similarly, due to impacts on park resources and safety concerns, dog sledding, ski-joring, and snowplanes are outside the scope of this plan/SEIS. Although outside the scope of this planning effort, these uses may be considered at another time through a separate planning effort. The NPS believes that the use of snowbikes and kite-skiing 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, which would not meet the health and safety objectives of this plan/SEIS. These uses may also create potential conflict with park resources, would have unknown impacts to park wildlife, and would not meet natural resource objectives. 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. Opportunities for snowbiking and kite skiing do exist in the area, outside of the park.

ALTERNATIVES CARRIED FORWARD FOR DETAILED ANALYSIS IN THE 2011 FINAL EIS BUT DISMISSED FROM THE SEIS

Allow Winter Use at 2004 Plan Levels (Alternative 3 in the 2011 Winter Use Plan/EIS) or Higher Levels

The 2011 Winter Use Plan/EIS looked at an alternative that would allow for up to 720 snowmobiles and 78 snowcoaches a day. During public scoping for this plan/SEIS, commenters requested that this alternative again be considered or offered other higher number scenarios, such as up to 1,000 snowmobiles, that they felt should be considered in this process. This alternative, or other alternatives that consider higher use numbers, has been considered in numerous past planning processes for winter use at Yellowstone. The most recent completed process, the 2011 Winter Use Plan/EIS, found that at levels of 720 snowmobiles and 78 snowcoaches per day, there would be long-term adverse impacts to soundscapes at moderate to major levels, which would limit the ability of the NPS to minimize impacts. Further, this alternative did not meet objectives related to visitor use, wildlife, and sound as well as other alternatives did. Implementing use levels at the 2004 Winter Use Plan levels or higher was not carried forward for further analysis because the result of the impact analysis showed that the alternative would not meet the objectives of this plan or NPS policies. In addition, implementing use levels at the 2004 Winter Use Plan levels would not meet park mandates to protect the soundscape of the park, a scenario inconsistent with park statements of purpose and significance. The NPS is aware of no changed circumstances or new information that would alter the analysis of these issues in the 2011 Winter Use Plan/EIS, and thus does not believe it needs to be analyzed again in this plan/SEIS.

Mixed-Use: Snowcoaches, Snowmobiles, and Road Plowing for Wheeled Vehicles (Alternative 4 in the 2011 Winter Use Plan/EIS)

The 2011 Winter Use Plan/EIS included at an alternative that would provide a wide range of visitor use and opportunities, managing for commercial wheeled-vehicle use (no private vehicles would be allowed),

OSV use, and non-motorized use throughout the park during the winter use season. This alternative would limit OSV traffic to the South Entrance Road, while allowing commercially guided wheeled vehicles from Mammoth and West Yellowstone. The East Entrance Road (Sylvan Pass) would be closed. The purpose of this plan/SEIS is to establish a management framework that allows the public to experience the unique winter resources and values at Yellowstone National Park. By limiting OSV traffic to one entrance, the nature of this experience would change. While the desire for wheeled vehicle access has been expressed through public comment in past planning process, there was not great support for this element from the public during the planning process. Limiting OSV visitation would not meet the purpose of this plan, as it would change the visitor experience and would deprive most park visitors of this opportunity for no reason (see below under "Limit Routes Where OSVs are Permitted to the South Entrance Only"). Further, as discussed in the 2011 Winter Use Plan/EIS, plowing and using roads in the park in the winter would create safety concerns, including requiring a higher level of emergency response for accidents. Response time would depend on road and weather conditions, making it difficult and unsafe during emergencies. Also, a higher level of road maintenance would be required; therefore this alternative would not meet objectives related to health and safety and park operations and management. Because this alternative does not meet the purpose, need, and objectives of the SEIS, it was not analyzed in this plan/SEIS.

Implement Variable Management (Alternative 6 in the 2011 Winter Use Plan/EIS) and Provide a Variety of Use Levels and Experience for Visitors (Alternative 7 in the 2011 Winter Use Plan/EIS)

The 2011 Winter Use Plan/EIS considered two alternatives that looked at varying the use level, possibly on a daily basis, throughout the winter season. These two alternatives were initially proposed to provide a range of experiences throughout the winter season, including high motorized use days and low (to no) motorized use days. Public comment on these two concepts was received during the comment period on the draft 2011 Winter Use Plan/EIS as well as during public scoping for this plan/SEIS (for alternative 7).

Public comment stated that variability, as set up in these two alternatives, was not desirable for operators or visitors. From the operators' side, it was too complex to implement and too difficult to maintain needed infrastructure. For example, commenters stated that it would not be economically feasible to buy the number of machines needed to take advantage of high use days, when those machines would not be used during other parts of the season. They also noted that visitors with multi-day trips may not be able to get the visitor experience they were looking for throughout their trip if the level of use changed day to day. The variability was also viewed as too complex by visitors, who were looking for more certainty when planning their trip. Other commenters felt that the low and high use days were not equitably distributed, and that the high use days would allow for too much use. For the NPS, this alternative would result in unexpected impacts to park operations since the concept of variability was difficult to communicate and complex in implementation. Based on these comments, the NPS reconsidered the idea of variable use against its objectives and determined that, due to the complexity and confusion evident in public comment, this concept would not meet the objectives to increase visitor understanding or to improve coordination and communication regarding winter use. Because the idea of variable use would not meet the objectives of the plan, and would be difficult to implement technically and logistically for both the NPS and operators, alternatives 6 and 7 from the 2011 Winter Use Plan/EIS were not carried forward for further analysis. Moreover, the NPS is aware of no relevant changed circumstances or new information that would alter the analysis of these issues from the 2011 EIS, and thus does not believe it needs to be analyzed again in this plan/SEIS.

ALTERNATIVES AND ACTIONS CONSIDERED BUT DISMISSED FROM FURTHER CONSIDERATION IN THE 2011 WINTER USE PLAN/FINAL EIS

A number of alternatives and actions were considered but dismissed in the 2011 Winter Use Plan/Final EIS. For the following issues, NPS is aware of no relevant changed circumstances or new information that would alter the analysis of these alternatives and actions, and thus does not believe they need to be analyzed any further in this plan/SEIS.

- Establish a monorail system in Yellowstone
- Allow use of personal vehicles on plowed roads
- Explore options for management of Colter Pass to the east of Cooke City, Montana (US-212)
- Remove limits to OSV use and eliminate BAT requirements (return to 1983 regulations/"pre-managed era"
- Close or provide additional management for the North to Northeast Entrance Road
- Open the interior of the park during spring/fall seasons
- Designate an area for off-trail or extreme snowmobiling
- Manage/limit OSV use on a daily basis, based on weather and other resource conditions.

For a detailed description of why these alternatives and actions were not carried forward, refer to the 2011 Winter Use Plan/Final EIS which can be found at the Yellowstone Winter Use website (http://www.nps.gov/yell/parkmgmt/winterusetechnicaldocuments.htm_).

HOW ALTERNATIVES MEET OBJECTIVES

As stated in the "Purpose of and Need for Action" chapter in this document, all action alternatives selected for analysis must meet all objectives to a large degree. The action alternatives must also address the stated purpose of taking action and resolve the need for action; therefore, the alternatives were individually assessed in light of how well they would meet the objectives for this plan/SEIS, which are stated in the "Purpose of and Need for Action" chapter in this document. Alternatives that did not meet the objectives were not analyzed further (see the "Alternative Elements Considered but Dismissed from Further Consideration" section in this chapter).

Table 9 is a summary of alternative elements. Table 10 compares how each of the alternatives described in this chapter would meet the plan objectives. The "Environmental Consequences" chapter of this document describes the effects of each alternative on each impact topic. These impacts are summarized in table 11. Tables 9–11 are included at the end of this chapter.

CONSISTENCY WITH THE PURPOSES OF NEPA

The NPS requirements for implementing NEPA include an analysis of how each alternative meets or achieves the purposes of NEPA, as stated in sections 101(b) and 102(1). CEQ Regulation 1500.2 establishes policy for federal agencies' implementation of NEPA. Federal agencies shall, to the fullest extent possible, interpret and administer the policies, regulations, and public laws of the United States in accordance with the policies set forth in NEPA (sections 101(b) and 102(1)); therefore, other acts and NPS policies are referenced as applicable in the following discussion.

1. Fulfill the responsibilities of each generation as trustee of the environment for succeeding generations.

   All of the alternatives proposed would manage OSV use in a manner to best protect the resources, but the degree to which they accomplish this goal would vary. Alternative 1 would meet the four resource related objectives (wildlife, soundscapes, air, and wilderness) to a large degree because visitor OSV use would no longer be permitted within the interior of Yellowstone. The absence of visitor OSV use would result in a near absence of air and noise emissions, as well as disturbance to wildlife. Alternative 1 would most fully meet the purpose of fulfilling the responsibilities of each generation as trustee of the environment for succeeding generations, by providing most of the interior of the park free of air and noise emissions, as well as wildlife disturbance, during the harsh winter conditions.

   Alternatives 2, 3, and 4 would allow OSV use in the park. Wildlife, air, and noise monitoring, as well as modeling conducted for this plan/SEIS, has shown that although impacts to these resources would occur, they would be well below any regulatory standard and within NPS *Management Policies 2006*. Monitoring and modeling has also shown that these OSV use levels could occur, and the resources would be preserved for succeeding generations. These alternatives would include OSV management measures such as commercially guided OSV use, BAT snowmobiles, and the conversion to BAT snowcoaches, which would further act to preserve park resources. Alternative 4 would allow for a small amount of non-commercially guided use, up to four trips a day with five vehicles in each group. All members of the non-commercially guided group operating a snowmobile would be required to complete the Yellowstone Snowmobile Education Certification Program, receive an on-site orientation session with a ranger, as well as carry the necessary safety equipment. Although the potential exists for non-compliance with rules and regulations from non-commercially guided groups, Yellowstone law enforcement would be present to ensure compliance. Should there be a high level of non-compliance from these groups, the non-commercially guided program would be re-evaluated through adaptive management.

2. Ensure for all Americans safe, healthful, productive, and esthetically and culturally pleasing surroundings.

   All alternatives meet this purpose to some degree because the park is a safe visitor destination that is both esthetically and culturally pleasing. The action alternatives (alternatives 2, 3, and 4) increase safety to a degree by requiring OSV users in the park to travel with a commercial guide who has been trained in addressing fast changing winter conditions, has the equipment to quickly communicate with the park and others in case of an emergency, and is required to carry emergency equipment. Under alternative 4, the limited groups of non-commercial guides would also be required to attend training and to carry such equipment (see appendix C). These alternatives also require BAT for snowmobiles and the development of BAT for snowcoaches, which would reduce air and noise emissions that can be hazardous to employee and visitor health. Alternative 4 provides for improved BAT for snowmobiles and incentives for developing quieter snowmobiles and snowcoaches. For alternatives 2 and 4, the opening of Sylvan Pass would require NPS to conduct avalanche control activities in this area. There are inherent risks to operating in an active avalanche area, and for this reason, these alternatives would only meet this purpose to some degree. Alternative 3 would include the same OSV management measures as the other action alternatives, but Sylvan Pass would be closed to OSV use and the NPS would not be required to conduct avalanche control operations in that area. Because this risk would be reduced, alternative 3 would meet this purpose to a large degree.

   Alternative 1 would, on the whole, reduce risks associated with OSV use, even OSV use that is managed such as in the case in Yellowstone. Whereas these risks would be reduced, non-motorized users in the interior of the park would face increased risks from the absence of OSVs

or other park facilities to assist in case of emergency. This use, however, especially in the interior of the park, is expected to be low, therefore alternative 1 meets this purpose to a large degree.

3. Attain the widest range of beneficial uses of the environment without degradation, risk of health or safety, or other undesirable and unintended consequences.

   All of the action alternatives offer a wide range of visitor use opportunities, including snowmobile use (which would be phased out under alternative 3) and snowcoach use. Alternative 2 would allow for levels of use that are similar to recent years, which would provide for a variety of uses and resource protection. Based on monitoring results of recent use, visitors would have various opportunities for use and resources would still be offered protection. Alternative 3 would reduce overall OSV use to 120 snowcoaches by the end of the 3-year transition period (winter season 2020/2021). The lower number of OSV use could result in less disturbance to resources than allowed under alternative 2, but because alternative 3 would remove one mode of visitor access, it would only meet this purpose to a moderate degree. Alternative 4 would reduce overall OSV use to 110 transportation events (compared to the average of 123 that would be permitted under alternative 2 and the 120 that would be permitted under alternative 3). This alternative would also allow for a potential increase in visitors should technology improve and OSVs become quieter. The addition of a limited amount of non-commercially guided use under alternative 4 would provide another visitor experience. As detailed in appendix C, this program would be administered in a way that would provide benefits to visitor use and experience without degradation, risk of health or safety, or other undesirable and unintended consequences. The other action alternatives, alternative 2 and 3, would not provide for this additional experience.

   Alternative 1 would allow for non-motorized use within the park, but would not allow for visitor OSV use in the interior of the park. Due to the distance and harsh weather conditions, many visitors would not be able to reach the interior of Yellowstone, and features like Old Faithful, without the use of OSV; therefore, alternative 1 meets this purpose to only some degree.

4. 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.

   Because none of these alternatives would result in impacts to cultural or historic resources that would exceed minor, these topics were dismissed from further analysis in this plan/SEIS. Overall, because any impacts to cultural or historic resources would not exceed minor, all alternatives would preserve important historic and cultural aspects of our national heritage in the long-term and would meet this purpose to a large degree. For natural resources, all alternatives would meet objectives to a moderate degree. However, alternative 4 would more fully meet these objectives because the amount of transportation events would be reduced by approximately 10 percent compared to alternatives 2 and 3. As discussed under criteria 3, alternatives 2 and 4 would best support diversity and variety of individual choice (to a large degree) because of the multiple options provided for experiencing the park in the winter. All of the action alternatives would provide some access to the park, including OSV access. Alternative 1 (meeting the criteria to some degree) would limit the variety of choice by discontinuing visitor OSV use in the interior of the park.

5. Achieve a balance between population and resource use that will permit high standards of living and a wide sharing of life's amenities.

   Balancing population and resource use under this plan/SEIS would include protecting the resources unimpaired for the enjoyment of present and future generations and providing access for visitors to experience the natural resources of the park. NPS *Management Policies 2006* states that the enjoyment contemplated by the Organic Act is broad; it is the enjoyment of all the people of the United States and includes enjoyment both by people who visit parks and by those who

appreciate them from afar. It also includes deriving benefit (including scientific knowledge) and inspiration from parks, as well as other forms of enjoyment and inspiration. For all alternatives, except alternative 1, in which visitors would continue to have opportunities to enjoy from afar through programs such as the Old Faithful webcam, and well as information and literature posted online. As described in this chapter, alternatives 2, 3, and 4 would provide for OSV use in the park, with management measures (BAT for all OSV and guiding requirements) and use levels (at or below recent levels) that would provide a level of protection to park resources to allow for their future enjoyment. Likewise, alternative 1, which would not allow for OSV use, would also protect park resources. All of the alternatives evaluated would meet this purpose.

6. Enhance the quality of renewable resources and approach the maximum attainable recycling of depletable resources.

   For reasons discussed above, the action alternatives (alternatives 2, 3, and 4) would promote enhancing renewable resources such as air quality and soundscapes in varying degrees because all alternatives require the use of BAT for snowmobiles and the development and implementation of BAT for snowcoaches. Under alternative 4, by using quieter OSV technologies, operators would be provided the opportunity to increase use, while minimizing impacts to park resources. The second purpose, "approach the maximum attainable recycling of depletable resources," is less relevant to the development of this winter use plan because it relates to "green" building or management practices. There would be little construction related to any alternatives so this purpose would not apply.

   As discussed in the "Purpose of and Need for Action" chapter in this document, each of the alternatives would require the park to continue to operate under the energy use guidelines and requirements stated in the NPS *Management Policies 2006*, Executive Order 13123, Greening the Government through Effective Energy Management; Executive Order 13031, Federal Alternative Fueled Vehicle Leadership; Executive Order 13149, Greening the Government Through Federal Fleet and Transportation Efficiency; and the 1993 NPS Guiding Principles of Sustainable Design. Therefore each alternative would fully meet this purpose.

ENVIRONMENTALLY PREFERABLE ALTERNATIVE

The NPS is required to identify the environmentally preferable alternative in its NEPA documents for public review and comment. The NPS, in accordance with the Department of the Interior NEPA Regulations (43 CFR 46) and CEQ's Forty Questions, defines the environmentally preferable alternative (or alternatives) as the alternative that best promotes the national environmental policy expressed in NEPA (section 101(b)) (516 DM 4.10). The CEQ's Forty Questions (46 FR 18026) (Q6a) further clarifies the identification of the environmentally preferable alternative stating, "this means the alternative that causes the least damage to the biological and physical environment; it also means the alternative which best protects, preserves, and enhances historic, cultural, and natural resources."

Alternative 1, the no-action alternative, was identified as the environmentally preferable alternative because public OSV use would no longer be permitted within the park. With winter use limited to minimal administrative OSV use, there would be the least amount of impact on the biological and physical environment within the park. As noted in table 10, the no-action alternative meets the objectives related to resources (wildlife, air, sound, and wilderness) to the greatest degree due to the lack of recreational OSV use. By best meeting these objectives, the no-action alternative would cause the least amount of damage to the biological and physical environment. Although administrative OSV use and non-motorized use would occur, the use levels would be low and impacts to resources would be minimal. The no-action alternative does provide for minimal administrative use to "winter keep" structures in the interior of the park, therefore it would also protect and preserve the historic and cultural resources.

NATIONAL PARK SERVICE PREFERRED ALTERNATIVE

The “agency's preferred alternative” is the alternative that the agency believes would fulfill its statutory mission and responsibilities, giving consideration to economic, environmental, technical, and other factors. To identify the preferred alternative, discussions were held among NPS managers, scientists, and environmental specialists regarding the alternatives analyzed in the Draft Supplemental EIS. The deliberations considered the statutory mission of the NPS and Yellowstone National Park, the results of the impact analysis presented in this Supplemental EIS, how well each alternative meets the purpose, need and objectives of the plan/SEIS, and the public and agency comments received on winter use during this and previous planning processes, including those received on the draft SEIS. The structure of the discussions followed guidance from the Council of Environmental Quality, which defines the preferred alternative as the alternative, “which the agency believes would fulfill its statutory mission and responsibilities, giving consideration to economic, environmental, technical and other factors” (Question 4a of the CEQ’s “Forty Most Asked Questions Concerning CEQ’s NEPA Regulations” (1981).

Alternative 4 was identified as the preferred alternative due to its potential to make the park cleaner and quieter than what has been authorized in past winter seasons, while at the same time allowing for increases in park visitation. Rather than focusing solely on numbers of OSVs allowed in the park, alternative 4 focuses on the impacts that result from OSV use, and recognizes that impacts to wildlife, natural soundscapes, and park visitors are affected by groups of vehicles (transportation events), rather than each individual vehicle within a discrete group. This management framework is impact-centric, rather than vehicle number-centric, and is more consistent with the science of winter use, particularly the science related to natural soundscape preservation and wildlife disturbance. This is because by grouping OSVs in discrete groups and proactively limiting the total number of groups allowed entry each day into the park, the park would be able to decrease disturbance to wildlife and increase the time that natural quiet predominates the wintertime landscape.

Alternative 4 would promote advances in OSV innovations and technology by implementing BAT standards for snowcoaches, New BAT standards for snowmobiles, and a commitment to adaptive management. The option for operators to increase the number of OSVs in a transportation event through implementation of voluntary E-BAT standards also would promote further innovation in OSV technology. Because alternative 4 would allow for both snowmobile and snowcoach use, it would allow for a variety of visitor experiences. Alternative 4 also would provide for greater operator flexibility because it would allow the operator to decide whether to use his or her allocation of transportation events on snowmobiles or snowcoaches.

TABLE 9: SUMMARY OF ALTERNATIVE ELEMENTS

	Alternative 1: No Action - No Snowmobile / Snowcoach Use	Alternative 2: Continue Snowmobile/Snowcoach Use at 2012/2013 Winter Season Interim Regulation Limits	Alternative 3: Transition to Snowcoaches that Meet BAT Requirements Only	Alternative 4: Manage OSV Use by Transportation Events
General Description	Once the 2009 interim regulation expires (after the 2012/2013 season) there would be no regulation in its place and OSV use would be no longer permitted. Administrative OSV use would continue as needed. Visitors could ski or snowshoe into the park.	OSV use would continue at levels described under the 2009 to 2013 interim regulations – up to 318 snowmobiles and up to 78 snowcoaches per day.	OSV access into the park would transition to BAT compliant snowcoaches beginning in the 2017/2018 winter season when all snowcoaches must meet BAT requirements. Snowcoaches would replace snowmobiles within a 3-year period (by the 2020/2021 winter season).	OSV access to the park would be managed by transportation events. A total of 110 transportation events would be allowed each day. Operators would have the flexibility to allocate their transportation events between snowmobiles and snowcoaches, but no more than daily 50 snowmobile events would be permitted. If OSVs meet voluntary E-BAT standards, there is the potential for increasing the average group size. Non-commercial guiding would be included under this alternative.
Elements Related to Snowmobile Use				
Daily Snowmobile Limits (with Allocations by Entrance)	n/a	Up to 318 snowmobiles per day (Actual recent average is about 191 per day). Entrance allocations (by number of snowmobiles): • West – 160 • South – 114 • East – 20 • North – 12 • Old Faithful – 12	Up to 318 snowmobiles per day through 2017/2018 winter season. Entrance allocations (by number of snowmobiles): • West – 160 • South – 114 • East – 20 • North – 12 • Old Faithful – 12 No commercial snowmobiles would be permitted after the 2020/2021 winter season.	110 transportation events would be allowed each day, with no more than 50 transportation events from snowmobiles. A transportation event would allow one snowcoach or one group of snowmobiles, with a seasonal average group size of 7 snowmobiles. (Each group of snowmobiles may have up to 10 vehicles, but must average a group size of no more than 7 snowmobiles over the course of a winter season. All snowmobiles will need to meet the New BAT standards no later than December 2017. Until such time when all snowmobiles in a transportation event meet the New BAT standards, use would be averaged daily. However, if New BAT standards are met before December 2017, use would be averaged seasonally for transportation events where all snowmobiles in the event meet the New BAT standard. If all snowmobiles in a transportation event meet voluntary E-BAT standards, there is a potential for an increase in the number of vehicles per transportation event – from a seasonal average of 7 to an average of 8 snowmobiles per group. Snowmobile transportation event entrance allocations (by gate): • West – 23 • South – 16 • East – 3 • North – 2 • Old Faithful – 2 In addition, four non-commercially guided events, with up to 5 snowmobiles per group, would be permitted each day, one from each entrance.
Variable Snowmobile Numbers	n/a	Daily snowmobile levels would be fixed for the season. No variation would occur.		Snowmobile numbers could vary daily, depending on how operators use their transportation events. Up to 50 daily transportation events could be allocated to snowmobiles.
Variable Entrance Allocations	n/a	Entrance allocations would be fixed (may not be shared between entrances).		The total number of transportation events at each gate would be fixed, but transportation events could be traded between operators within each gate. This would not apply to non-commercially guided snowmobile groups.

	Alternative 1: No Action - No Snowmobile / Snowcoach Use	Alternative 2: Continue Snowmobile/Snowcoach Use at 2012/2013 Winter Season Interim Regulation Limits	Alternative 3: Transition to Snowcoaches that Meet BAT Requirements Only	Alternative 4: Manage OSV Use by Transportation Events
Snowmobile Guide Requirements, Including Maximum Group Size (If Applicable)	n/a	100% commercially guided. Group size (including guide's snowmobile):10		100% guided – commercial and non-commercial guiding allowed. Transportation event size for commercial operations (including guide):10 maximum, average of 7 averaged over a season once all snowmobiles in a transportation event meet New BAT. Before meeting New BAT, group size would average 7 daily. Four transportation events (one per gate) of up to 5 snowmobiles each would be reserved for non-commercially guided access. Each non-commercial guide would be allowed to lead up to 2 groups per season and permits for this opportunity would be allocated via an on-line lottery system (see appendix C).
BAT Requirements for Snowmobiles	n/a	BAT required for snowmobiles would be the same as the interim regulations.	No changes to BAT for noise standards because snowmobiles would be phased out.	BAT would be required for commercially and non-commercially guided snowmobiles. Initially (Phase I), the BAT noise standard for all snowmobiles would be 73 dBA (SAE J192) and the CO standard would be 120 g/kW-hr. The hydrocarbon standard would be 15 g/kW-hr. No later than the 2017/2018 season, the BAT noise standard would be reduced to 67 dBA (SAE J1161) and the CO standard would be reduced to 90 g/kW-hr. The hydrocarbon standard would remain 15 g/kW-hr. Starting in Phase II December 2014, snowmobiles would have the option to meet voluntary E-BAT standards of 65 dBA and 60 g/kW-hr for CO.
Cost of Snowmobile Use	n/a	Park entrance fee. Cost of snowmobile guide and rental.	Park entrance fee. Cost of snowmobile guide and rental.	Park entrance fee (for commercially and non-commercially guided groups). Cost of snowmobile guide and rental. BAT snowmobile rental fees. Lottery fees for non-commercially guided groups.
Elements Related to Snowcoach Use				
Daily Snowcoach Limits (with Allocations by Entrance)	n/a	Up to 78 snowcoaches per day. Entrance allocations (by number of snowcoaches): • West – 34 • South – 13 • East – 2 • North – 13 • Old Faithful – 16	Up to 78 snowcoaches per day initially, allocated by entrance the same as in alternative 2. Once all snowcoaches meet BAT, increase to up to 120 BAT snowcoaches per day (with a corresponding decrease in snowmobiles over a 3-year period as snowcoach numbers increase). Entrance allocations after transition (by number of snowcoaches): • West – 62 • South – 10 • East – 0 • North – 19 • Old Faithful – 29	A transportation event would initially equal one snowcoach or one group of snowmobiles (see above under "Daily Snowmobile Limits"). The number of snowcoaches per event could increase from 1 to 2 over time if each snowcoach meets voluntary E-BAT (each snowcoach emits less than 71 dBA of noise). Snowcoach entrance allocations (by transportation events) if all 50 snowmobile events are used: • West – 26 • South – 10 • East – 2 • North – 10 • Old Faithful – 12 Snowcoach entrance allocations (by transportation events) if none of the commercial snowmobile events are used (106 events, with 4 events reserved for non-commercially guided snowmobile use): • West – 47 • South – 17 • East – 2 • North – 17 • Old Faithful – 23

	Alternative 1: No Action - No Snowmobile / Snowcoach Use	Alternative 2: Continue Snowmobile/Snowcoach Use at 2012/2013 Winter Season Interim Regulation Limits	Alternative 3: Transition to Snowcoaches that Meet BAT Requirements Only	Alternative 4: Manage OSV Use by Transportation Events
Variable Snowcoach Numbers	n/a	Daily snowcoach levels would be fixed for the season. No variation would occur.		Snowcoach numbers could vary daily, depending on which vehicles the operators allocate their transportation events to. Up to 50 transportation events may be allocated to groups of snowmobiles daily. If all 50 snowmobile allocations are used, 60 allocations would be available for snowcoach use. If no snowmobile allocations are used, 106 snowcoach transportation events would be available to operators.
Variable Entrance Allocations	n/a	Entrance allocations would be fixed (may not be shared between entrances).		Entrance allocations would be flexible, based on the demand at the entry locations (i.e., sharing of transportation events among operators at a single entrance).
Snowcoach Guide Requirements	n/a	Common to all action alternatives: snowcoach entry by commercial guide only.		
BAT Requirements for Snowcoaches	n/a	BAT would be developed and implemented for snowcoaches by the 2017/2018 season. BAT for snowcoaches would require sound emissions to be less than 75 dBA.		No later than December 2017, BAT requirements for snowcoaches would take effect. At that time, existing snowcoaches would need to meet the BAT requirements, whereas new snowcoaches coming on line would need to meet the BAT standard by the 2014/2015 season. BAT for snowcoaches would require noise emissions to be less than 75 dBA (SAE J1161 at cruising speed) and engines meet EPA Tier 2 standards. With voluntary E-BAT, two snowcoaches would be allowed in a group if both snowcoaches have noise emission of 71 dBA or less.
Wheeled Vehicle Access – Common to all alternatives: Wheeled vehicle access would continue along the road between Mammoth Hot Springs and Cooke City. No other roads would be plowed for wheeled vehicle use.				
Other/General Elements				
Road Grooming	Allow for the minimal road grooming needed to maintain administrative access. Sylvan Pass would not be maintained.	Continued road grooming. Manage Sylvan Pass in accordance with the Sylvan Pass Working Group agreement.	Continued road grooming. Sylvan Pass would be closed to vehicle traffic and would not be maintained.	Continued road grooming. Manage Sylvan Pass in accordance with the Sylvan Pass Working Group agreement.
Zoning –Temporal and Spatial	n/a	Continue temporal and spatial zoning of some side roads (e.g., snowcoaches only in the morning, snowmobiles and snowcoaches in the afternoon).	The east side of the park would only be available for non-motorized use once transition to snowcoaches is complete. OSV use would not be permitted from the East Entrance to the Fishing Bridge Developed Area.	Continued temporal and spatial zoning of some side roads (e.g., snowcoaches only in the morning, snowmobiles and snowcoaches in the afternoons).
Opportunities for Non-motorized Recreation Use	Park would be open for skiing and snowshoe access. Most of the park would be considered “backcountry” for this type of use.	Continue to groom 35 miles of secondary park roads for cross-country skiers and snowshoers. Use will be permitted subject to Winter Severity Index.		
Dates/Length of Winter Season	The season would start when accumulation of snow allows for non-motorized use. It would continue into March, depending on snow levels and any closures for wildlife management and spring road plowing).	Common to all action alternatives: The winter season would take place from December 15 to March 15 each year.		
Estimated Number of Daily Vehicle Passengers (Excludes Mammoth to Cooke City) Maximum Numbers Assume 2 people per Snowmobile and 12.3 per Snowcoach. Average Numbers Assume 1.4 People per Snowmobile and 8 per Snowcoach.	Zero OSVs.	Maximum • Snowmobile = 636 • Snowcoach = 959 • Total = 1,595 Average • Snowmobile = 445 • Snowcoach = 624 • Total = 1,069	Maximum • Snowmobile passengers = 636 (0 after phaseout) • Snowcoach passengers = 959 (1,476 after phaseout) • Total = 1,519 (1,476 after phaseout) Average • Snowmobile passengers = 445 (0 after phaseout) • Snowcoach passengers = 624 (960 after phaseout) • Total = 1,069 (960 after phaseout)	See table 1.

	Alternative 1: No Action - No Snowmobile / Snowcoach Use	Alternative 2: Continue Snowmobile/Snowcoach Use at 2012/2013 Winter Season Interim Regulation Limits	Alternative 3: Transition to Snowcoaches that Meet BAT Requirements Only	Alternative 4: Manage OSV Use by Transportation Events
Transition Period (when Limits under a New Regulation, that are Different from Current Limits, Would Take Effect)	The 2009 to 2013 interim regulations will have expired. No transition period.	The 2009 to 2013 interim regulations would continue. No transition period.	The 2009 to 2013 interim regulations would continue until the 2017/2018 season, after which time a 3-year phaseout of snowmobiles would occur.	There would be a one-season transition period to prepare for implementation of the new winter use plan. Provisions of the 2009 to 2013 interim regulations would continue during this transition.
Adaptive Management Program	No adaptive management program would be implemented.	Adaptive management would be implemented as outlined in appendix D.		

TABLE 10: HOW ALTERNATIVES MEET OBJECTIVES

Objective	Alternative 1: No Action - No Snowmobile / Snowcoach Use	Alternative 2: Continue Snowmobile/Snowcoach Use at 2012/2013 Winter Season Regulation Limits	Alternative 3: Transition to Snowcoaches that Meet BAT Requirements Only	Alternative 4: Manage OSV Use by Transportation Events
Visitor Use, Experience, and Accessibility				
Provide the opportunity for visitors to experience and be inspired by Yellowstone's unique winter resources and values while ensuring resource protection.	Meets objective to some degree because the interior of the park would be closed to OSV use, greatly limiting the visitors that can experience this area. The park would continue to provide a virtual experience for all, including administration of the website to provide understanding and appreciation of the park's winter resources to those unable to visit the park. Visitors could continue to experience the park virtually through the park's website.	Meets objective to a large degree, because visitors would be able to experience the interior of the park with OSVs from all entrances. Daily use limits of 318 snowmobiles and 78 snowcoaches would allow for resource protection. Visitors could continue to experience the park virtually through the park's website and webcam at Old Faithful.	Meets objective to a moderate degree because visitors would be provided the opportunity to experience the interior of the park using OSV; however, after the transition period, visitors would only be able to enter the park via snowcoach. This alternative would reduce overall numbers of OSVs compared to the other action alternatives, and ensure resource protection. Visitors could continue to experience the park virtually through the park's website and webcam at Old Faithful.	Fully meets objective because visitors would be able to experience the interior of the park using OSVs from all entrances. In addition, provisions are made to allow for increases in use, while reducing or minimizing impacts to park. The addition of non-commercial guiding would provide an additional use opportunity. Visitors could continue to experience the park virtually through the park's website and webcam at Old Faithful.
Increase visitor understanding and appreciation of the park's winter resources.	Meets objective to some degree because the interior of the park would be closed to OSV use, greatly limiting the visitors that can experience this area, but the park would continue to provide a virtual experience for all, including administration of the website to provide understanding and appreciation of the park's winter resources to those unable to visit the park.	Fully meets objective because visitors have the opportunity to visit the interior of the park and view Yellowstone in the winter, wildlife, and the park's unique geothermal features. In addition, the park would continue to provide a virtual experience for all, including administration of the website and web cam at Old Faithful to provide understanding and appreciation of the park's winter resources to those unable to visit.	Fully meets objective because visitors have the opportunity to visit the interior of the park and view Yellowstone in the winter, wildlife, and the park's unique geothermal features. In addition, the park would continue to provide a virtual experience for all, including administration of the website and web cam at Old Faithful to provide understanding and appreciation of the park's winter resources to those unable to visit.	Fully meets objective because visitors have the opportunity to visit the interior of the park and view Yellowstone in the winter, wildlife, and the park's unique geothermal features. In addition, the park would continue to provide a virtual experience for all, including administration of the website and web cam at Old Faithful to provide understanding and appreciation of the park's winter resources to those unable to visit.
Provide access for winter opportunities in the park that are appropriate and universally accessible.	Meets objective to some degree because transportation to the interior of the park would no longer be available, but non-motorized uses and virtual visitation would continue.	Meets objective to a large degree because access to winter opportunities in the interior of the park would include both snowmobile and snowcoach use. Access would be provided for a wide range of visitors.	Meets objective to a moderate degree because access to winter opportunities in the interior of the park would include both snowmobile and snowcoach use, with the eventual phaseout of snowmobiles. The lack of snowmobile access would reduce the winter opportunities available. Access would be provided for a wide range of visitors.	Meets objective to a large degree because access to winter opportunities in the interior of the park would include both snowmobile and snowcoach use. Access would be provided for a wide range of visitors.
Resources				
Wildlife: Manage winter use so that it does not disrupt the winter wildlife ecology, including sensitive species.	Meets objective to a large degree because wildlife in the interior of the park, including sensitive species, would no longer have interactions with recreational OSVs. Interactions with non-motorized users would continue on a limited basis.	Meets objective to a moderate degree because wildlife, including sensitive species, in the interior of the park have the potential to be displaced by the use of OSVs. Winter use levels would be the same as recent maximum allowable use, which would minimally disrupt studied wildlife species at the population level.	Meets objective to a moderate degree because wildlife in the interior of the park, including sensitive species, may be displaced by the use of OSVs. This alternative would reduce overall numbers of OSVs compared to the other action alternatives once the transition to snowcoaches is complete, which would minimally disrupt studied wildlife species at the population level.	Meets objective to a moderate degree because wildlife in the interior of the park, including sensitive species, have the potential to be displaced by the use of OSVs. Managing by transportation events would provide for fewer intervals of use and fewer disturbance events for wildlife within the park compared to the other action alternatives. Because there would be approximately 10% fewer transportation events under alternative 4 than alternatives 2 and 3, this alternative meets this objective to a greater degree than the other action alternatives.
Sound: Manage winter use to protect naturally occurring background sound levels and to minimize loud noises.	Meets objective to a large degree because minimal OSV use (administrative use only) would occur in the interior of the park.	Meets objective to a moderate degree because OSV use would occur in the interior of the park, but at levels that still allow for times of natural quiet.	Meets objective to a moderate degree because OSV use would occur in the interior of the park, but at levels that still allow for times of natural quiet.	Meets objective to a moderate degree because OSV use would occur in the interior of the park, but at levels that still allow for times of natural quiet. Because there would be approximately 10% fewer transportation events under alternative 4 than alternatives 2 and 3, and because managing by transportation events would provide for more intervals of quiet within the park, this alternative meets this objective to a greater degree than the other two action alternatives.
Air Quality: Manage winter use to minimize impacts to resources that may be affected by air pollution including visibility and aquatic systems.	Meets objective to a large degree because minimal OSV use (administrative use only) would occur in the interior of the park and air emissions would be at very low levels.	Meets objective to a moderate degree because OSV use, and air emissions from that use, would continue in the interior of the park. Levels of use would be the same as recent maximum allowable use. Air emissions are expected to be below all regulatory standards.	Meets objective to a moderate degree because OSV use, and air emissions from that use, would continue in the interior of the park. Air emissions are expected to be below all regulatory standards.	Meets objective to a moderate degree because OSV use, and air emissions from that use, would continue in the interior of the park. Air emissions are expected to be below all regulatory standards.

Objective	Alternative 1: No Action - No Snowmobile / Snowcoach Use	Alternative 2: Continue Snowmobile/Snowcoach Use at 2012/2013 Winter Season Regulation Limits	Alternative 3: Transition to Snowcoaches that Meet BAT Requirements Only	Alternative 4: Manage OSV Use by Transportation Events
Wilderness: Manage winter use to protect wilderness character and values.	Meets objective to a large degree because minimal OSV use (administrative use only) would occur in the interior of the park.	Meets objective to a moderate degree because OSV use would occur in the interior of the park; however, modeling and observations in the park have shown that disturbances, specifically noise, would be limited in time and duration.	Meets objective to a moderate degree because OSV use would occur in the interior of the park; however, modeling and observations in the park have shown that disturbances, specifically noise, would be limited in time and duration.	Meets objective to a moderate degree because OSV use would occur in the interior of the park; however, modeling has shown that disturbances, specifically noise, would be limited in time and duration. Management by transportation events would further limit the duration of disturbances. Because there would be approximately 10% fewer transportation events under alternative 4 than alternatives 2 and 3 (which would average 123 and 120 transportation events, respectively), this alternative meets this objective to a greater degree than the other action alternatives.
Health and Safety				
Seek to manage access in the winter for the safety of all visitors and employees, including limiting impacts from emissions, noise, and known hazards.	Meets objective to a large degree because recreational OSV use would not occur in the interior of the park. Emissions, noise, and known hazards would be reduced because the interior of the park would be closed to the public, as would Sylvan Pass; however, non-motorized use (skiing and snowshoeing) would be permitted in the interior of the park, resulting in known hazards from harsh winter conditions.	Meets objective to some degree as OSV and non-motorized use would be permitted in the interior of the park, following guidelines and regulations to promote the health and safety of visitors such as hours of operation, BAT and guiding requirements. Visitors would have the potential to be exposed to emissions, noise, and known hazards. Additionally, Sylvan Pass would continue to operate and workers would continue to be exposed to hazardous conditions inherent in conducting operations in an avalanche prone area.	Meets objective to a large degree because OSV and non-motorized use would be permitted in the interior of the park, following guidelines and regulations to promote the health and safety of visitors such as hours of operation, BAT and guiding requirements. Visitors would have the potential to be exposed to emissions, noise, and known hazards. Sylvan Pass would not continue to operate, greatly reducing the risk to park staff that would no longer be exposed to the hazardous conditions inherent in conducting operations in an avalanche prone area.	Meets objective to some degree as OSV and non-motorized use would be permitted in the interior of the park, following guidelines and regulations to promote the over the health and safety of visitors such as hours of operation, BAT and guiding requirements. Visitors would have the potential to be exposed to emissions, noise, and known hazards. Additionally, Sylvan Pass would continue to operate and workers would continue to be exposed to hazardous conditions inherent in conducting operations in an avalanche prone area.
Coordination and Cooperation				
Improve coordination and communication regarding winter use management with park partners, gateway communities, and other stakeholders.	Fully meets objective because the park would continue to coordinate and communicate with park partners, cooperating agencies, gateway communities, and other stakeholders.			
Park Management/Operations				
Develop and implement an adaptive management program that includes monitoring the condition of resources.	Meets objective to a large degree because the adaptive management program under no action would differ from the action alternatives. It would focus on monitoring park resources in the near absence of OSVs and understanding if changes to limited administrative OSV use and non-motorized uses are needed.	Fully meets objective because adaptive management would occur under these alternatives.		
Promote advances of vehicle technology (OSVs) that will reduce impacts and facilitate continuous improvement of technology over time.	Does not meet objective because OSVs would not be allowed into the park, reducing the incentive for the development of new technology.	Meets objective to a moderate degree because BAT requirements would continue to be implemented for snowmobiles and would further be developed and implemented for snowcoaches. No additional steps would be taken to promote technology.	Meets objective to a moderate degree because BAT requirements would continue to be implemented for snowmobiles and would further be developed and implemented for snowcoaches.	Meets objective to a large degree because BAT requirements would continue to be implemented for snowmobiles and would further be developed and implemented for snowcoaches. In addition, incentives to improve environmental performance of OSVs thorough E-BAT would reward innovation and commitment to lower impact OSVs and allow for increased use, without impacting park resources, should these reductions occur.
Provide for winter use that is consistent with the park priority to provide critical visitor services at core locations.	Meets objective to some degree because services in the northern area of the park (Mammoth) would continue to be provided. Due to lack of OSV access, services in the interior of the park would not continue.	Meets objective to a large degree because services in the northern area of the park (Mammoth) would continue to be provided and OSV use would allow for the continuation of services in the interior of the park in the winter.		

TABLE 11: IMPACT SUMMARY

	Alternative 1: No Action - No Snowmobile / Snowcoach Use	Alternative 2: Continue Snowmobile/Snowcoach Use at 2012/2013 Winter Season Interim Regulation Limits	Alternative 3: Transition to Snowcoaches that Meet BAT Requirements Only	Alternative 4: Manage OSV Use by Transportation Events
Wildlife and Wildlife Habitat, including Rare, Unique, Threatened, or Endangered Species, and Species of Concern				
Bison/Elk	Based on an analysis of the available data and literature regarding bison and elk in the greater Yellowstone area, the no-action alternative would result in short- and long-term negligible adverse impacts on bison and elk in the park, because OSV use would be limited to minimal administrative use and non-motorized use would be more limited, resulting in no observable impacts. Human activity during the winter months would be reduced. Cumulative impacts under alternative 1 would be long-term minor to major adverse. Alternative 1 would contribute minimally to cumulative impacts because there would be no visitor OSVs in the park.	Alternative 2 would allow for use levels similar to the 2009 to 2013 interim regulations, with BAT requirements, guiding regulations, speed limits, and restrictions on OSV access to park roads only. Continued monitoring and assessment would allow for additional restrictions to be established if impacts greater than those predicted in this plan/SEIS be observed. Thus, overall impacts on bison and elk under alternative 2 would be short- and long-term minor to moderate adverse. Cumulative impacts would be long-term minor to major adverse, to which alternative 2 would contribute minimally.	The existing data suggest that while the intensity and amount of impact on elk and bison from snowmobiles and snowcoaches differ, overall the impact of these OSVs on elk and bison is comparable. Thus, restricting OSVs to just snowcoaches would not eliminate adverse effects on wildlife. However, the available literature on bison and elk indicate that lower OSV events reduce wildlife displacement, behavior or physiology-related energy costs, and the potential for adverse demographic impacts, resulting in short- and long-term minor to moderate adverse impacts, and impacts under alternative 3 would be expected to be less than those under alternative 2. Cumulative impacts on bison and elk under alternative 3 would be long-term minor to major adverse, to which alternative 3 would contribute only a small amount.	Alternative 4 would allow for use levels similar to those permitted under the 2009 to 2013 interim rules, with an approximately 10 percent reduction in the number of transportation events. Should all OSVs meet voluntary E-BAT standards, group sizes would increase, but the number of transportation events would stay the same. The allowance for up to four non-commercially guided snowmobile groups per day is not expected to increase behavioral, physiological, or displacement responses by bison and elk. Continued monitoring and assessment would allow for additional restrictions to be established should impacts greater than those predicted in this plan/SEIS be observed. Thus, overall impacts under alternative 4 would be short- and long-term minor to moderate adverse. These impacts are expected to be less than those under alternatives 2 and 3 because the transportation events would be packaged and would result in fewer events than other action alternatives. Cumulative impacts would be long-term minor to major adverse, to which alternative 4 would contribute minimally.
Lynx/Wolverine	Alternative 1 would result in short- and long-term negligible adverse impacts on lynx and wolverines in the park because OSV use would be limited to minimal administrative use and there would be no observable impacts, with long-term beneficial impacts from the removal of human presence. Cumulative impacts of alternative 1 would be long-term minor to major adverse, to which alternative 1 would contribute minimally, if at all.	This alternative would maintain and allow OSV use at Sylvan Pass, the area of the park where human/wolverine interactions would be most likely to occur. However, daily entrance limits would restrict the East Entrance to just 20 snowmobiles and two snowcoaches per day, (approximately five transportation events), resulting in little use in this area, and minimal disturbance to wolverines. Restrictions on movements of lynx or wolverines during the winter months due to the presence and use of OSV routes in other areas of the park may limit reproductive success, dispersal, and overall genetic sustainability of the species, but such impacts are difficult to predict. Therefore, impacts predicted under this alternative would be short- and long-term minor adverse, with the potential for moderate adverse impacts if lynx and wolverines travel to other areas of the park or are in areas of active avalanche control activities. Cumulative impacts on lynx and wolverines under alternative 2 would be short-and long-term moderate adverse, to which alternative 2 would contribute a minimal amount.	Under this alternative Sylvan Pass would be closed to OSV use and maintenance activities would cease in the area of the park where human/wolverine and lynx interactions are most likely to occur. With a similar number of transportation events to alternative 2 (120 daily transportation events under alternative 3 versus 123 average events under alternative 2), restrictions on movements of lynx or wolverines during the winter months due to the presence and use of OSV routes in other areas of the park may limit reproductive success, dispersal, and overall genetic sustainability of the species, but such impacts are difficult to predict. Therefore, impacts predicted under this alternative would be short- and long-term minor adverse, and long-term beneficial from the removal of human presence at Sylvan Pass. Cumulative impacts on lynx and wolverines under alternative 3 would be long-term moderate adverse, to which alternative 3 would contribute minimally.	This alternative would allow OSV use at Sylvan Pass, the area of the park where human-wolverine interactions would be most likely. Furthermore, restrictions on movements of lynx or wolverines during the winter months due to the presence and use of OSV routes in other areas of the park may limit reproductive success, dispersal, and overall genetic sustainability of the species, but such impacts are difficult to predict. Therefore, impacts predicted under this alternative would be long-term minor adverse, with the potential for moderate adverse impacts if lynx and wolverines travel outside the eastern sector of the park or in the short term during avalanche control operations. Overall, impacts would be reduced from use levels permitted under the 2009 to 2013 interim regulations, because the number of daily transportation events would be reduced. Should all OSVs meet voluntary E-BAT standards, the overall number of transportation events would not increase and impacts would not be expected to increase. Cumulative impacts on lynx and wolverines under alternative 4 would be moderate adverse, of which alternative 4 would contribute a minimal amount.
Trumpeter Swans/Eagles	Alternative 1 would result in short- and long-term negligible adverse impacts on swans and eagles in the park because OSV use would be limited to minimal administrative use and there would be no observable impacts. Cumulative impacts would be long-term moderate adverse, and alternative 1 would contribute minimally to the overall cumulative impacts on eagles and swans.	Alternative 2 would limit impacts on swans and eagles through use-limits, guiding requirements, and little overlap of OSV use with the active swan nesting season. Given these conditions and the mitigation measures discussed above, impacts on eagles and swans under alternative 2 would be localized short- to long-term negligible to minor adverse. Cumulative impacts would be long-term moderate adverse, and alternative 2 would contribute a small amount to the overall adverse cumulative impacts.	Alternative 3 would limit the impacts on swans and eagles through use limits, guiding requirements, and little overlap between OSV use and the active swan nesting season. Alternative 3 would result in localized short- and long-term, negligible to minor, adverse impacts, with impacts slightly less than alternative 2. Cumulative impacts would be long-term moderate adverse, and alternative 3 would contribute a small amount to the overall adverse cumulative impacts.	Alternative 4 would limit impacts on swans and eagles through use-limits, providing training for and limiting non-commercially guided snowmobile groups, and little overlap of OSV use with the active swan nesting season. Given these conditions and the mitigation measures that would be implemented, impacts on eagles and swans under alternative 4 would be localized short- to long-term negligible to minor adverse, and would be less than under alternative 2 or 3 due to the reduced number of transportation events. Cumulative impacts would be long-term moderate adverse, and alternative 4 would contribute a small amount to the overall adverse cumulative impacts.

	Alternative 1: No Action - No Snowmobile / Snowcoach Use	Alternative 2: Continue Snowmobile/Snowcoach Use at 2012/2013 Winter Season Interim Regulation Limits	Alternative 3: Transition to Snowcoaches that Meet BAT Requirements Only	Alternative 4: Manage OSV Use by Transportation Events
Gray Wolves	Alternative 1 would result in short- and long-term negligible adverse impacts on wolves in the park because OSV use would be limited to minimal administrative use and there would be no observable impacts. The limited human presence would have long-term beneficial impacts. Cumulative impacts would be long-term, minor, adverse, and alternative 1 would contribute a small amount to the overall cumulative impacts.	Alternative 2 would result in short- and long-term negligible to minor adverse impacts on wolves in the park because OSV use levels and guiding requirements use would limit the duration of interaction and the approach distance of OSV users. Cumulative impacts would be long-term minor adverse, and alternative 2 would contribute a small amount to the overall adverse cumulative impacts.	Alternative 3 would result in short- and long-term negligible to minor adverse impacts on wolves in the park because OSV use, or total number of transportation events, would be slightly reduced from the levels permitted under the 2009 to 2013 interim regulations (alternative 2) and the duration of encounters and approach distance of OSV users when encountering wolves would be limited due to guiding requirements. Cumulative impacts would be long-term minor adverse, and alternative 3 would contribute a small amount to the overall adverse cumulative impacts.	Alternative 4 would result in short- and long-term negligible to minor adverse impacts on wolves in the park, less than those expected under alternatives 2 and 4. OSV use, specifically the number of transportation events, would be reduced from the levels permitted under the 2009 to 2013 interim regulations, which would reduce the frequency of OSV encounters with wolves. Should all OSVs meet voluntary E-BAT standards, it would not increase the overall number of transportation events and would not be expected to increase impact levels beyond a minimal level. Cumulative impacts would be long-term minor adverse, and alternative 4 would contribute a small amount to the overall adverse cumulative impacts.
Air Quality	The effects of alternative 1 on air quality and visibility would be long-term minor adverse. Cumulative impacts would result in long-term minor adverse impacts on air quality.	Alternative 2 would have long-term minor adverse impacts on air quality before and after the transition to BAT snowcoaches. Alternative 2 would have long-term negligible adverse effects on visibility, before, during, and after the transition to BAT snowcoaches. There would be long-term minor adverse cumulative impacts on air quality and visibility.	The effects of alternative 3 on air quality would be long-term minor adverse. The effect of alternative 3 on visibility would be long-term negligible adverse. Cumulative impacts on air quality and visibility would be long-term minor adverse.	The effects of alternative 4 on air quality would be long-term minor except for predicted maximum 1-hour NO_2 concentrations under conditions 4a and 4c (the analysis scenarios where transportation event allocations would be used to maximize the number of snowmobile entries) at one site that would result in long-term moderate adverse impacts. All other sites would have minor long-term adverse impacts. The effect of alternative 4 on visibility would be long-term negligible adverse. Cumulative impacts on air quality and visibility would be long-term minor to moderate adverse.
Soundscapes and the Acoustic Environment	The effects of alternative 1 on soundscapes would be long-term, negligible to minor, and adverse due to administrative OSV use. Minor impacts would be limited to travel corridors. There would be long-term minor adverse cumulative impacts on soundscapes.	Alternative 2 would have long-term negligible to moderate adverse impacts on soundscapes due to the level of OSV use permitted. Moderate impacts would be limited to travel corridors. There would be long-term moderate adverse cumulative impacts on soundscapes.	The effects of alternative 3 on soundscapes would be long-term, negligible to moderate and adverse, both before and after the phaseout to BAT snowcoaches only. Moderate impacts would be limited to travel corridors. There would be long-term, moderate adverse cumulative impacts on soundscapes.	The effects of alternative 4 on soundscapes would be long-term, negligible to moderate and adverse. Moderate impacts would be limited to travel corridors. There would be long-term moderate adverse cumulative impacts on soundscapes.
Visitor Use, Experience, and Accessibility	Restricting winter access to the interior of the park by non-motorized means would result in long-term major adverse impacts on visitor use and experience for all visitors, including those with mobility impairments. Winter visitors desiring either or both non-motorized and motorized experiences would be affected by loss of access. Overall cumulative effects would be long-term major adverse.	Under alternative 2, continuing OSV use and access at the same levels as the 2009 to 2013 interim regulation limits would meet recent demand for winter visitation, including visitors with mobility impairments. Both motorized and non-motorized winter users would experience the benefits of continued access to the park's interior Therefore, alternative 2 would result in long-term benefits for visitor use and experience. Cumulative impacts on visitor use and experience under alternative 2 would be long-term and beneficial.	Under alternative 3, changes in visitor experience created by the transition to snowcoach access only would result in parkwide, long-term benefits compared to the no-action alternative. Both motorized and non-motorized winter users would experience the benefits of continued access to the park's interior. However, the opportunity to experience the park by snowmobile would be lost for all park users, including those with mobility impairments. This would result in some visitors' expectations not being met and result in long-term minor to moderate adverse impacts. Overall, alternative 3 would result in long-term beneficial impacts on visitor experience and access, with long-term moderate adverse impacts from the phaseout of the snowmobile experience but the maintenance of other winter experiences in the park. Cumulative impacts on visitor use and experience would be long-term beneficial and long-term moderate adverse.	Under alternative 4, management by transportation events and the inclusion of non-commercially guided snowmobile tours would increase visitor opportunities, resulting in parkwide, long-term beneficial impacts compared to the no-action alternative for visitor use and experience and visitor accessibility. If visitors are able to experience winter use, but not in the mode they desire due to how operators use their allocations, there would be a potential for long-term moderate adverse impacts. The number of visitors who have access to the park would increase compared to the other alternatives. Impacts on all resources, including visitor use, experience, and accessibility, would remain the same or decrease compared to recent maximum allowable use due to a decrease in the number of transportation events compared to the conditions allowed under the 2009 to 2013 interim regulations. Both motorized and non-motorized winter users would experience the benefits of continued access to the park's interior, and operators would have the ability to choose the type of service they provide. Overall, alternative 4 would result in long-term benefits for visitor experience and access. Cumulative impacts would be beneficial.
Health and Safety	Overall, air pollution and noise levels would be limited to administrative OSV use and would be minimal, and the closure of Sylvan Pass would reduce the avalanche risk to staff. Therefore, impacts on health and safety would be long-term negligible adverse and long-term beneficial, with the potential for long-term minor adverse impacts from the possibility of non-motorized users being out in harsh winter conditions with minimal support facilities. Cumulative impacts would be long-term, negligible adverse.	Under alternative 2, impacts on human health and safety would be long-term negligible adverse from air and noise emissions, long-term moderate adverse from the operation of Sylvan Pass, and long-term minor adverse from user conflicts and exposure to the elements. Cumulative impacts under alternative 2 would be long-term minor adverse.	Under alternative 3, impacts on human health and safety would be long-term negligible adverse from air and noise emissions, long-term beneficial from the closure of Sylvan Pass, and long-term minor adverse from user conflicts and exposure to the elements, both before and after the transition to snowcoach only. Cumulative impacts would be long-term negligible adverse.	Under alternative 4, impacts on human health and safety would be long-term negligible adverse from air and noise emissions, long-term moderate adverse from the operation of Sylvan Pass, and long-term minor adverse from user conflicts and exposure to the elements. Cumulative impacts would be long-term minor adverse.

	Alternative 1: No Action - No Snowmobile / Snowcoach Use	Alternative 2: Continue Snowmobile/Snowcoach Use at 2012/2013 Winter Season Interim Regulation Limits	Alternative 3: Transition to Snowcoaches that Meet BAT Requirements Only	Alternative 4: Manage OSV Use by Transportation Events
Socioeconomic Values	The impacts are estimated to be negligible, adverse, and long term for the three-state area, the five-county area and Cody and Jackson, Wyoming. West Yellowstone is projected to experience minor, adverse, long-term impacts. As described earlier, the adverse direct impacts would be most directly felt by communities and businesses near the park, especially in areas that have a higher proportion of business tied directly to park visitation. At the North Entrance, Gardiner, Montana, might experience beneficial impacts if visitors who would have visited the other entrances switch to the North Entrance. The IMPLAN modeling captures the indirect and induced effects as well. As individual businesses are adversely affected, they would reduce purchases of other goods and services from suppliers. Conversely if individual businesses are beneficially affected they would increase the purchase of goods and services from suppliers. These feedback effects impact sectors of the economy beyond those that are influenced directly by visitors. Cumulative impacts would be long-term negligible adverse or beneficial cumulative impacts on the socioeconomic environment. In West Yellowstone cumulative negligible to minor adverse impacts could result.	Compared to alternative 1, alternative 2 would result in beneficial, long-term impacts for the three-state area, the five county area, and the communities of Cody and Jackson. In West Yellowstone, the beneficial, long-term impacts would be larger on average. Alternative 2 would continue recent management, under which there has been some increase in visitation, especially for snowcoach use. Cumulative impacts would be long-term beneficial.	Compared to alternative 1, alternative 3 is expected to have on average beneficial, long-term impacts for all the communities except Cody, as seen in tables 68, 69, and 70. In order to generate larger beneficial impacts under this alternative, demand for snowcoach tours must increase to more than make up for the eventual phaseout of snowmobiles. Cumulative impacts would be long-term beneficial.	Compared to alternative 1, alternative 4 is expected to have on average beneficial, long-term impacts for all the communities, as seen in tables 68, 69, and 70. Cumulative impacts would be long-term beneficial.
Park Operations and Management	Alternative 1 would have long-term negligible adverse impacts on park operations because staffing and resource requirements would be covered by existing funding, as well as long-term benefits from the potential reallocation of staff to other areas of the park during the winter season. In addition, fuel requirements and GHG emissions would be reduced from recent levels because the number of staff members needed in the interior of the park, and therefore OSV use, would be reduced. Cumulative impacts under alternative 1 would be long-term, negligible adverse, of which alternative 1 would contribute a large part.	Alternative 2 would result in long-term negligible to minor adverse impacts because the staffing and resource requirements for the implementation of the alternative would likely be met with existing funding sources. Any additional resources required may impact park operations, but through other funding sources or reallocation of resources, would not have a noticeable impact on park operations. Cumulative impacts under alternative 2 would be long-term negligible to minor adverse, to which alternative 2 would contribute a large part.	Alternative 3 would result in long-term negligible to minor adverse impacts on park operations and management because the staffing and resource requirements for the implementation of the alternative would likely be met with existing funding sources. Cumulative impacts under alternative 3 would be long-term negligible to minor adverse, to which alternative 3 would contribute a large part.	Alternative 4 would result in long-term negligible to minor adverse impacts on park operations and management because the staffing and resource requirements for the implementation of the alternative would likely be met with existing funding sources. Additional management required under this alternative would be accommodated through existing staff or from lottery fees associated with the non-commercially guided program. Cumulative impacts under alternative 4 would be long-term negligible to minor adverse, of which alternative 4 impacts would contribute a large part.

CHAPTER 3

Affected Environment

CHAPTER 3: AFFECTED ENVIRONMENT

The "Affected Environment" describes the current condition of the resources and values of Yellowstone National Park (Yellowstone or the park) that would be affected by the implementation of the proposed winter use alternatives. The resource topics presented in this chapter, and the organization of the topics, correspond to the resource impact discussions contained in "Chapter 4: Environmental Consequences" immediately following this chapter.

WILDLIFE AND WILDLIFE HABITAT, INCLUDING RARE, UNIQUE, THREATENED, OR ENDANGERED SPECIES, AND SPECIES OF CONCERN

Yellowstone provides winter habitat for many terrestrial wildlife species, including bison, elk, mule deer, moose, bighorn sheep, mountain lions, lynx, bobcats, martens, fishers, river otters, wolverines, coyotes, gray wolves, red foxes, and snowshoe hares. Avian species that overwinter in Yellowstone include trumpeter swans, bald eagles, common ravens, gray jays, Clark's nutcrackers, great gray owls, and a variety of waterfowl, raptors, and passerine bird species (Olliff, Legg, and Kaeding 1999). Grizzly and black bears hibernate during winter months, and are rarely encountered by oversnow vehicles (OSVs). Winter conditions, increased energy demands, and decreased mobility due to snow result in stress to active wildlife during the winter months.

Winter conditions, increased energy demands, and decreased mobility due to snow result in stress to active wildlife during the winter months.

In spite of challenges faced by wildlife in the winter, many species of wildlife that spend the winter in the park would be adversely impacted from a negligible to minor level by OSV use. Some of these species have winter ranges primarily outside the park boundaries, or in areas of the park not subject to OSV use. They are rarely exposed to OSVs, are unlikely to suffer higher than minor adverse impacts by exposure to OSVS, and/or are not federally listed or of special concern in the park. These species are dismissed from further discussion as noted in chapter 1. Species that were carried through for analysis include bison, elk, lynx, wolverines, gray wolves, trumpeter swans, and bald eagles.

The park and other researchers have conducted a variety of monitoring projects and other studies on wildlife in the park in the winter. Some of these have focused on interaction with winter recreation; others have been aimed at better understanding the existence and ecology of different species. For example, the park conducted annual winter wildlife monitoring observation studies along motorized OSV routes from the winter of 1999 to the winter of 2009 that focused on the interaction of wildlife and OSVs. Wildlife observed were primarily bison, elk, trumpeter swans, and bald eagles, with rare sightings of gray wolves. In addition, a previous study looked at the interaction of elk and cross-country skiers (Cassirer, Freedy, and Able 1992). Several studies also investigated the relationship between groomed roads and bison movement (Bjornlie 2000; Bjornlie and Garrott 2001; Bruggeman et al. 2006, 2009a; White et al. 2009).

Numerous studies (conducted outside of winter) have focused on the ecological effects of roads, but authors have differed in the summary findings they have offered. Roedenbeck et al. (2007) claimed that the evidence for population effects due to roads is weak for terrestrial organisms. Fahrig and Rytwinski (2009) counter this conclusion with more recent evidence, a review of 79 studies encompassing 131 species. Fahrig and Rytwinski found that the number of negative effects of roads on animal abundance outnumber the positive effects by a factor of 5. Another recent meta-analysis, using 49 data sets spanning 234 mammal and bird species, found that bird populations decline within 1 km and mammals decline within 5 km of roads and other human infrastructure (Benitez-Lopez et al. 2010). In

their review of the potential effects of OSV use at Yellowstone, Olliff, Legg, and Kaeding (1999) devoted two pages of text to the evidence that elk are displaced from road corridors, a finding substantiated by subsequent reviews by Rowland et al. (2000, 2005).

Other species included in this analysis, particularly lynx and wolverines, are secretive, live in forested or mountainous areas with reduced visibility, and/or actively avoid encounters with humans. Because of this, there is limited information on lynx or wolverine ecology, or on the impacts of OSV use and human presence on lynx or wolverine behavior, movements, distribution, or population. Recently, two studies were started to better understand the existence and ecology of wolverines in the greater Yellowstone area. Due to the limited availability of information on lynx and wolverines in Yellowstone, lynx and wolverine behavioral, displacement, and population-level responses to OSVs are based on research observations in available literature regarding the amount of human disturbance, roads, and motorized vehicle use tolerated in lynx and wolverine habitats. Human-caused disturbances in the park due to winter use include OSV traffic, aircraft, non-motorized foot traffic and skiing, and other noise-related disturbances. The following overview is supplemented by the Scientific Assessment of Yellowstone National Park Winter Use Report (NPS 2011f).

RECENT RESEARCH AND MONITORING

From 1999 to 2009, researchers have monitored the behavioral responses of individual bison, trumpeter swans, bald eagles, and elk (and, more rarely, coyotes, wolves and golden eagles) to groups of OSVs passing by or stopping on groomed roads (Borkowski et al. 2006; Bruggeman et al. 2007; Bruggeman et al. 2006; White et al. 2006; White et al. 2009; Fuller, Garrott, and White 2007; Wagner 2006; Geremia et al. 2009; Proffitt et al. 2009, 2010). The types and numbers of OSVs and the activities of their riders were monitored, to identify the contributions of these factors to the probability of wildlife response. In addition, responses to related activities by OSV users, such as dismounting snowmobiles or exiting snowcoaches, were also monitored. Several recent publications have been based, in part, on data from this monitoring. Four of these studies (Borkowski et al. 2006; Bruggeman et al. 2007; Bruggeman et al. 2006; White et al. 2009) were part of a collaboration between the National Park Service (NPS) and Montana State University-Bozeman investigating the effects of winter recreation on Yellowstone's wildlife. Borkowski et al. (2006) included observations of 6,508 encounters between OSVs and OSV users and wildlife between 1999 and 2004, and White et al. (2009) included 5,688 observations of wildlife/OSV user groups and OSV user encounters between 2002 and 2006.

These behavioral response studies provide a wealth of information regarding the animals closest to roads, which are the animals most likely to be affected by each OSV group. However, they do not speak to the issues addressed by the road ecology literature: the combined effect of all road traffic on wildlife densities and habitat utilization near roads. Individuals close enough to the road to be included in the behavioral study may not be representative of the park population as a whole, and the limited behavioral responses of the observed animals does not ensure that road corridor habitats are fully utilized by Yellowstone wildlife. Results from the behavioral studies offer the best tools for evaluating differences among the proposed alternatives, and the landscape scale questions involving road ecology will required broader investigations that encompass summer as well as winter traffic.

In evaluating the effects of winter recreation on wildlife, understanding whether individual animals have habituated to human disturbance, as opposed to simply becoming tolerant of disturbance, is important (Bejder et al. 2009; Cyr and Romero 2009). Habituation is the process by which animals learn to minimize their response to a potential disturbance through repeated neutral or non-threatening exposures to the stimulus. Habituation may result in energy savings to animals not inclined to flee from neutral stimuli, but may also increase vulnerability to disease, natural predators, or increased mortality risks from vehicle collisions (Boyle and Samson 1985; Bejder et al. 2009). Habituation should not be confused with

tolerance, which is defined as the acceptance of disturbance. An animal may tolerate disturbance stimuli for a variety of ecological reasons separate from the behavioral process of habituation. For example, individuals may tolerate disturbance if they cannot afford the energetic cost of response needed to remain in an area to avoid predation risks or competition, or if there are no suitable habitats nearby into which to move (Gill, Norris, and Sutherland 2001; Frid and Dill 2002; Bejder et al. 2009).

It is difficult to generalize about patterns of wildlife habituation to human disturbance because, in many cases, responses are specific to certain species (Belanger and Bedard 1990) and individualistic (Runyan and Blumstein 2004; Ellenberg, Mattern, and Seddon 2009). Further, many factors condition an animal's responses to disturbance, often obscuring the distinction between habituation and tolerance. An animal's decision to move from a disturbed area to another area is based on a number of factors including the quality of the site occupied, the distance to and quality of other sites, the relative risk of predation or competition, the animal's dominance rank, and the investment a given individual has made in its current site (Gill, Norris, and Sutherland 2001). Animals with no suitable habitat nearby or within traveling distance may be constrained from movement despite the disturbance (Frid and Dill 2002).

Studies conducted at the park indicate that animals infrequently demonstrated active responses to OSVs and associated human presence (table 12). Based on these findings it would appear that bison, elk, swans, and eagles have become desensitized to OSV use and other human disturbance in the park during winter to some extent (Borkowski et al. 2006; White et al. 2009). Bison have been documented to be least likely to react to OSV-related disturbances during winters with the greatest visitation, possibly suggesting habituation to high-intensity winter use (White et al. 2009). In contrast, elk did not appear to habituate to the repeated presence of skiers (Cassirer, Freddy, and Able 1992). Although these findings suggest that wildlife responses to OSV use may be conditioned by previous exposure, there is uncertainty regarding the aggregate effects of multiple disturbance events for an individual animal.

TABLE 12: OBSERVED RESPONSES OF WILDLIFE TO OSV USE

	Bison		Elk		Trumpeter Swans	Bald Eagles
Observed Response	Borkowski et al. 2006[a]	White et al. 2009[b]	Borkowski et al. 2006	White et al. 2009	White et al. 2009	White et al. 2009
No Apparent Response	81%	80%	48%	48%	57%	17%
Look-Resume	8%	9%	32%	27%	21%	64%
Alert	2%	3%	12%	17%	12%	9%
Travel	7%	5%	6%	5%	9%	4%
Flight	1%	2%	2%	2%	1%	6%
Defensive	<1%	<1%	<1%	<1%	0%	0%

[a] Findings from Borkowski et al. 2006 are based on over 6500 interactions over five winters between groups of wildlife and groups of snowmobiles and/or snowcoaches. An interaction sampling unit was defined as the interaction between a group of OSVs and associated humans and a group of bison or elk within 1500 feet (500 m) of the road.

[b] Findings from White et al. 2009 are based on approximately 5,688 interactions over four winters between groups of wildlife and groups of snowmobiles and/or snowcoaches. The sampling unit was defined the same as in Borkowski et al. 2006.

Studies suggest that most of the individual wildlife observed in Yellowstone, including bison, elk, trumpeter swans, bald eagles, and coyotes, respond to activities associated with groups of OSVs by reacting to the potential threat, generally observed as vigilant behavior by the animal (ears up, head raised, ceasing a previous activity such as grazing, without additional alert behavior) (McClure et al. 2009; White et al. 2009). If the animal perceives the disturbance as a more serious threat it may

demonstrate an active response including travel away from the threat (walking), flight (running), or defense/attack directed at the threat (charging) (Borkowski et al. 2006; White et al. 2009). In most cases, more active responses require greater energy, reducing the amount of energy available to an animal for winter survival (Parker, Robbins, and Hanley 1984; Cassirer, Freddy, and Able 1992).

Collectively, all species observed in Yellowstone exhibited non-travel responses (no response, look-resume, alert response) to OSV use at least 90 percent of the time (table 12). All species demonstrated active responses (travel, flight, defensive) less than 10 percent of the time. Defensive responses (charging) to OSV-related human activities were rare (Borkowski et al. 2006; McClure et al. 2009; White et al. 2009). In addition, these studies provide evidence to suggest:

- Predictable patterns or 'pulses' of traffic that provides wildlife certainty regarding transportation schedules, lessening the amount of 'alert/travel/flight' behaviors and increasing the percentage of 'no apparent response.' This is the conclusion reached by scientists when they concluded that predictability of OSV traffic has led to some level of habituation (White et al. 2009 or Borkowski et al. 2006);
- Institution of guiding has lessened instances and frequency of disturbance of wildlife; and
- Bison and elk have become generally habituated to winter use OSV traffic patterns (White et al. 2009, Borkowski et al. 2006).

White et al. (2009) assessed the relationship between wildlife behavioral responses and factors including wildlife group size or distance from road, interaction time, group size of snowmobiles or snowcoaches, type of habitat, and cumulative winter OSV traffic. For bison, elk, swans, and bald eagles, the odds of a movement response (travel, flight) decreased with increasing distance of the animals from the road. As the number of individual animals in a group increased, the odds of a movement response generally decreased for bison, swans and elk in thermal habitat, whereas the odds of a movement response increased with larger group size for elk in wetland or unburned forest habitat (White et al. 2009).

Regarding comparability of behavioral responses of bison to snowmobile and snowcoach transportation events, the White et al. (2006) study found that probabilities of a response varied based on increases to OSV types. For example for those animals exposed to snowmobiles; White et al. found that "the odds of observing a movement response were 1.1 times greater for each additional snowmobile" added to the group size. Whereas, they found that there was a "1.5 times greater chance for response for each additional coach" (White et al. 2006, page 12). However, the largest increase was for humans on foot (2 times greater). Overall, the maximum probability of movement was higher for snowcoaches compared to snowmobiles; though "the maximum effect was reached at a threshold of ≤ 3 snowcoaches. The threshold for soliciting a movement response from snowmobiles to bison and eagles was 7-18 snowmobiles. White et al. did not detect any specific thresholds for elk or swans (White et al. 2009).

Apparent habituation could also mean an animal is under physiological stress and would, under healthy circumstances, respond to the threat.

Apparent habituation could also mean an animal is under physiological stress and would, under healthy circumstances, respond to the threat. A method used to determine the impact of OSVs on wildlife is to measure the level of stress hormones or glucocorticoids (GC) levels in blood or feces of the animal. However, GC levels do not allow researchers to differentiate between stressors (e.g., predator pressure, extreme weather, OSV presence), and vary with such factors as the time of year and reproductive and nutritional status of the animal. GC levels of bison, elk, and wolves during the winters of 1999 and 2000 provide an example of the difficulty in interpreting GC levels. The analysis by Creel et al. (2002) from one winter (1999) showed that GC levels in elk were significantly higher during the snowmobile season than during the

wheeled-vehicle season, after controlling for the effects of age and snow depth (Creel et al. 2002). However, Hardy (2001) found that data from winter 2000 showed no obvious trends between daily OSV traffic and GC levels in elk. Hardy (2001) did not detect any significant links between OSV usage and bison GC levels during these two winters (winter 1999 and winter 2000). The disparities in the data interpretation demonstrate the difficulties in interpreting GC data, because many factors are not stress related, including age, seasonal patterns in GC secretion, sex, body condition, diet, social ranking and reproductive status (Hardy 2001; Borkowski et al. 2006). Also, this study took place prior to OSV guiding requirements and the re-introduction of wolves to Yellowstone in 1996, both of which may affect GC levels.

In addition to wildlife monitoring, researchers and NPS staff monitored population and demographic trends for bison, elk, trumpeter swans, and bald eagles in relation to varying levels of OSV use in the park (Fuller, Garrott, and White 2007; Wagner 2006; Bruggeman et al. 2007; Geremia et al. 2009; Proffitt et al. 2009, 2010; White et al. 2009). The data from these studies provides no evidence that OSV use has adversely affected the demography or population dynamics of the wildlife studied compared to other, more important factors. Some of these other factors include bison management and large-scale culling, a decline in cutthroat trout in Yellowstone Lake for eagles, the reintroduction of wolves, vegetation succession following the 1988 fires, early flooding and nest predation on swans, and annual variation in snow pack and winter weather (Garrott, White, and Watson 2009; Baril, Henry, and Smith 2011. Also see the Scientific Assessment of Yellowstone National Park Winter Use (NPS 2011f).

Unless behavioral observational studies are combined with more costly studies that would include tagging individuals, using Global Positioning System (GPS) to track movements, and measuring stress hormone levels in the animals, along with individual mortality and reproductive data, it is difficult to conclude what effect, if any, OSV use has on individuals or populations by observational studies alone. As discussed in the following section, data collected thus far do not indicate that OSV use in the park has population-level effects for any of the species studies to date (White et al. 2009; Plumb et al. 2009).

BISON (*BISON BISON*)

Yellowstone is the only area in the United States continually occupied by wild, free-ranging bison (IUCN 2010; Plumb and Sucec 2006).

Yellowstone is the only area in the United States continually occupied by wild, free-ranging bison (Gates et al. 2010; Plumb and Sucec 2006). Bison are gregarious, social animals and travel together in herds of females and calves. A healthy bull bison stands 6 feet at the withers and weighs about 2,000 pounds (1 ton). Females are slightly smaller than males. Both sexes have horns, a large head, and a heavily muscled neck. Bison forage on sedges and grasses, and during Yellowstone's winters generally split into smaller groups and travel to lower elevations with less snow cover, including open meadows and geothermal areas. Geothermal areas are important to the winter survival of bison in central Yellowstone, providing snow-free or low-snow cover areas where bison can forage and conserve the energy needed to travel in deep snowpack (Gates et al. 2005; Garrott, White, and Watson 2009).

The Yellowstone bison population is subdivided into the central and northern breeding herds, though individuals intermix between herds at various times of year (Meagher 1973; Geremia, White, and Wallen 2011; Halbert et al. 2012). The ranges for both bison and elk are shown on figure 4.

FIGURE 4: RANGES FOR BISON

The northern breeding herd congregates in the Lamar Valley and on adjacent plateaus (Specimen Ridge, Mirror Plateau) for the breeding season during July 15 through August 15. During the remainder of the year, these bison use grasslands, wet meadows, and sage-steppe habitats in the Yellowstone River drainage, which extends 100 kilometers (approximately 62 miles) between Cooke City and Paradise Valley north of Gardiner, Montana (Houston 1982; Barmore 2003). The northern range is drier and warmer than the rest of the park, with average snow-water equivalents (water content of snow pack) ranging from 30 to 2 centimeters (11.8 to 0.8 inches) in the higher and lower elevation portions of the range, respectively (Watson et al. 2009). The central breeding herd occupies the central plateau of Yellowstone National Park, extending from the Pelican and Hayden valleys with a maximum elevation of 2,400 meters in the east to the lower elevation and thermally influenced Madison headwaters area in the west. Winters are often severe, with snow water equivalents averaging 35 centimeters (13.8 inches) and temperatures reaching -42 degrees Celsius (-43.65 Fahrenheit) (Watson et al. 2009). This area contains a high proportion of moist meadows composed of grasses, sedges, and willows, with upland grasses in drier areas. Central herd bison congregate in the Hayden Valley for breeding. Most of these bison move between the Madison, Firehole, Hayden, and Pelican valleys during the rest of the year. However, some animals travel to the northern portion of the park and mix with the northern herd before returning to the Hayden Valley for the subsequent breeding season (Geremia, White, and Wallen 2011).

Winter is a difficult time for many species. Based on data from 1996 through 1997, winterkill (starvation) during severe winters is assumed to be approximately 10 percent of the early winter bison population (NPS 2000e). Under natural conditions, old, young, sick, and disabled bison are the most vulnerable 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 play an important role in park ecology (NPS 1998b). Bison carcasses are especially important as a high-quality food source for species of concern including grizzly bears, bald eagles, and gray wolves (Swensen, Alt, and Eng 1986; Green, Mattson, and Peek 1997; Smith, Murphy, and Guemsey 1998).

Historical and Current Park Management of Bison

Bison management practices in the greater Yellowstone area have progressed through several phases since the park's inception, including protection, intensive husbandry, herd reductions, minimal human intervention, and hunting or culling when animals leave the park boundaries (Gates et al. 2005; NPS 2008a). This long and complex history is summarized in the Gates et al. report (2005), available at http://www.nps.gov/yell/naturescience/gatesbison.htm.

Bison

Long-term data indicate that the population of bison in the park increased from a low of only 23 animals in 1901 to a high of 5,000 animals in 2005, with the bison population fluctuating between 2,000 and 5,000 animals since 1980 (White et al. 2011). An aerial survey of Yellowstone bison in the summer of 2011 counted about 3,700 animals (NPS 2011h). Bison herd numbers have increased following a large drop in population during winter 2008 due to management removals at the Montana border to prevent bison from leaving Yellowstone.

After the cessation of culling in the park's interior in 1968, the bison population generally increased, with minor fluctuations, to a high of 5,000 animals in winter 2005. Most of this increase in population coincided with a substantial increase in OSV recreation, with winter visitors increasing from 5,000 to nearly 100,000 people during this same period (Gates et al. 2005). The number of OSV riders in the west-central region of the park, where bison are common, also increased during this time. Thus, in general the number of bison-OSV interactions has increased steadily since the introduction of OSVs in the park, despite high levels of OSVs pre-management, and there appears to be few population-level impacts on bison. In recent years, use numbers of OSVs have decreased, and since 2004, the number of winter visitors has fallen to between 50,000 and 60,000 people (NPS 2008a).

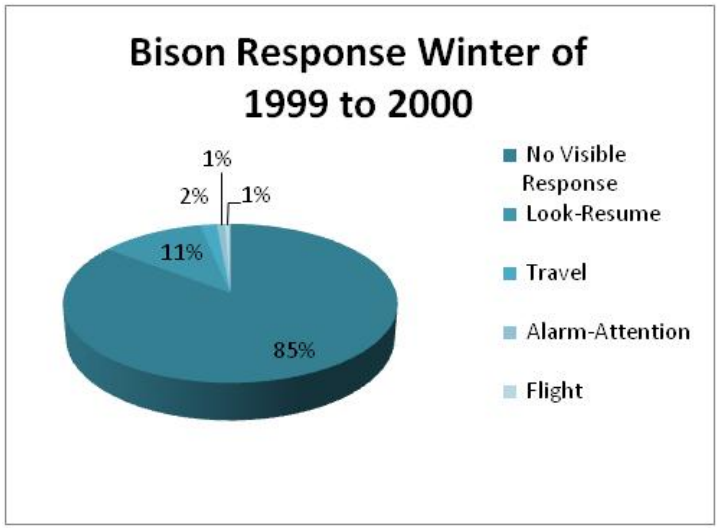
Management removals at (or near) the park boundary along with predation and winterkill (starvation) have been the primary causes of bison mortality in the park. The risk of brucellosis (a contagious bacterial disease associated with spontaneous abortion) transmission from bison to cattle, and the economic cost associated with this risk, prompted the development of various bison management plans over the last 20 years. Starting in the mid-1980s, federal and state agencies negotiated a series of management agreements to manage bison outside the park, the most recent being the Interagency Bison Management Plan (IBMP) in 2000, with subsequent adjustments during 2005 through 2012. Management measures from the 2000 IBMP included hazing bison back into the park, capture, brucellosis testing, removal of bison that repeatedly leave the park, and the culling of bison by agency personnel. An adaptive adjustment to the IBMP in 2005 also includes a measure for hunting bison outside the park. The IBMP is designed to conserve a wild and free-ranging bison population, while reducing the risk of brucellosis transmission to cattle. New policies allow untested females or mixed groups of bison to migrate onto and occupy Horse Butte peninsula and nearby areas each winter and spring. Controls include hazing bison back into the park during mid-May, lethal removal, and retaining animals in facilities for brucellosis testing and eventual release or culling. If populations drop below 2,300 bison, the agencies increase the implementation of non-lethal measures and if populations drop below 2,100 bison, agencies cease lethal management and hunting and shift to non-lethal management measures.

Behavioral Responses of Bison to OSVs and Visitors

Before the implementation of mandatory guiding, conflicts between OSV users and wildlife were common (Dimmick 2003). Rangers were frequently dispatched to the scene of wildlife/visitor conflicts to direct traffic and ensure the safety of both visitors and wildlife. OSV users cited for off-road violations often stated that they were attempting to evade or go around bison (Dimmick 2002, 2003; NPS 2008a).

Bison

The implementation of mandatory guiding has substantially reduced wildlife-visitor conflicts. Guides are knowledgeable about where wildlife is likely to occur and how to avoid harassing behavior. Guides enforce park rules including speed limits and restrictions on off-road travel (Taber 2006; NPS 2008a). Because guides are trained, in part by the NPS, they are able to instruct visitors to observe wildlife in a way that minimizes more energetic behavioral responses, for instance, by limiting interaction time and maintaining an appropriate distance from wildlife groups (NPS 2008a).



Source: McClure et al. 2009

Studies have examined the reactions of bison to OSV users in the park over recent years. White et al. (2009) and Borkowski et al. (2006) reported that OSV use caused active movement responses in less than 10 percent of individual bison observed; 80 percent showed no apparent response. Behavioral monitoring from the winter of 1999 to the winter of 2009 indicates that bison demonstrated no visible response to OSVs 85 percent of the time, with active responses, including travel, alarm-attention, and travel/flight/alarm-attention, observed less than four percent of interactions. "Look-resume" vigilance responses composed the remaining 11 percent of visible responses (McClure et al. 2009). This indicates that the vast majority of bison in winter 2009 appeared undisturbed by OSV users, with minimal energetic responses. One aspect of behavioral response that does not seem to have been measured, however, is the effect, if any, on individual animals of repeated disturbance-based responses over the course of a day. More plainly, there do not appear to be studies where species responses were examined to determine whether there is a limit to disturbance where the response of an individual changes over the course of a day (e.g., for animal A (responses 1–6 travel, then responses 7–11 look-resume)). The value of this type of information is unclear in that it may be difficult to draw conclusions due to the variability in individual response.

Few studies have looked specifically at the population-level effects of winter use on distribution patterns of elk, bison, and wolves (Messer et al. 2009; Smith et al. 2007; Bruggeman et al. 2009a). White et al. (2009) report that human disturbance associated with OSVs did not appear to be a primary factor influencing the distribution or movement of bison, and concluded that individual responses that resulted in flight or other active behavior were apparently short-term behavioral responses and did not have a lasting influence on the pattern of bison distribution. The data suggest that individual bison are sometimes affected by winter use in the park as indicated by movement responses 8 percent to 10 percent of the time, and look-resume response behavior. Based on monitoring, these individual-level disturbances have not affected the abundance, distribution, or movement of bison compared to other factors such as brucellosis risk management (Bruggeman et al. 2006; Borkowski et al. 2006; White et al. 2009; Plumb et al. 2009).

Studies conducted by the Yellowstone Center for Resources and the Resource Management & Visitor Protection Office from winter 2006/2007 through winter 2008/2009 further support the conclusion that OSVs do not appear to be a primary factor influencing the distribution or movement of bison (Davis et al. 2007; McClure et al. 2008; McClure et al. 2009). As detailed in table 13, bison exhibited either no apparent response or look-resume responses to OSV use between 92 and 99 percent of the time. Movement response behavior accounted for between 0.7 and 5.6 percent of bison observations over the three winter seasons.

TABLE 13: BISON – BEHAVIORAL RESPONSES TO SNOWMOBILE AND SNOWCOACH TRANSPORTATION EVENTS

	Guided Snowmobile Transportation Events			Snowcoach Transportation Events		
	2007 Annual Report (N=133)	2008 Annual Report (N=150)	2009 Annual Report (N=72)	2007 Annual Report (N=145)	2008 Annual Report (N=126)	2009 Annual Report (N=82)
No apparent response (none)	90.2%	80.7%	89.4%	92.4%	82.5%	90.2%
Look-Resume	6.7%	11.3%	7.0%	6.9%	8.7%	6.1%
Travel	1.5%	4.0%	2.8%	0.0%	5.6%	3.7%
Alarm-Attention	.8%	3.3%	.7%	0.0%	3.2%	0.0%
Flight	.8%	0.7%	0.0%	0.7%	0.0%	0.0%

Note: Data are from the 2007, 2008, and 2009 "Wildlife Responses to Motorized Winter Recreation in Yellowstone" Reports (available via the Yellowstone National Park website).

Bison Use of Groomed Roads in Bison Range Expansion and Population Growth

Bison use of the Madison headwaters region between Old Faithful, West Yellowstone, and Mammoth occurs where road grooming and OSV travel by winter visitors is concentrated.

Historically, the bison winter range included the Lamar Valley, Pelican Valley, Hayden Valley, and Firehole River drainage (Meagher 1970, 1973). Over time, bison use of the northern and western regions of the range gradually increased, roughly correlating with the start of OSV use and trail grooming in 1971. In 1980, bison were first observed using a packed road surface to travel west of Pelican Valley (Meagher 1998). Since then, bison were often observed traveling along groomed road corridors, and air surveys observed bison using road corridors in traveling out of the park (Meagher 1998). Bison use of the Madison headwaters region between Old Faithful, West Yellowstone, and Mammoth occurs where road grooming and OSV travel by winter visitors is concentrated.

Meagher (1998) suggested that groomed roads directly contributed to an increased bison population and observed changes in bison range distribution by providing energy-efficient travel corridors. The study also suggests that bison selectively choose to travel on groomed roads because the roads are packed and easier to travel on, and that bison traveling on roads save energy. It was hypothesized that this has resulted in bison population growing to higher levels and at a faster rate than they would have in the absence of groomed roads, thus altering bison distribution in Yellowstone. The study contends that road use by bison is particularly important during stress-induced, exploratory dispersal. Based on research observation, the availability of groomed routes may influence whether bison travel and may direct bison movements by providing an energy efficient route (Meagher 1989, 1993, 1998). (See discussions of Meagher's research in NPS 2000b: 143–147, 2003d: 117–120, 2004a: 80–81.)

Recent publications, however, assert that road grooming is less important to bison population dynamics than other natural factors (Gates et al. 2005; Bruggeman et al. 2009b). These scientists found no correlation between the presence of groomed trails and increased bison movements (Cheville et al. 1998; Wagner 2006). Instead, the publications attribute bison population growth to a natural increase in population following the cessation of active herd reductions by the NPS in the 1960s. As population density increased, nutritional intake and foraging efficiency for individual bison were reduced and bison began to move to lower elevation winter ranges inside and outside the north and west boundaries of the park (Taper, Meagher, and Jerde 2000). In other words, increases in bison abundance were followed by range expansion, often triggered by severe snow events (Gates et al. 2005). The requirement for

additional winter habitat due to higher population density and the ability of bison to travel through deep snow, resulted in necessary range expansion, in search of new foraging areas and migration westward to the Madison headwaters (Bjornlie and Garrott 2001; Gates et al. 2005; Bruggeman et al. 2009a, 2009b; Plumb et al. 2009). Also, winter bison movements from the central to northern parts of the park may have started in the 1980s (Coughenour 2005; Fuller, Garrott, and White 2007), but these movements became more common and included greater numbers of bison after 1996 (NPS 2008a).

While Meagher (1993, 1998, 2001) and Coughenour (2005) suggest that over time, OSVs and groomed trail corridors may have made small contributions to the western migration trends of the central herd bison, most researchers conclude that the changes in bison movement and range over the last 20 years are primarily in response to population-level dynamics (Gates et al. 2005; Fuller, Garrott, and White 2007; Coughenour 2005; Taper, Meagher, and Jerde 2000; Plumb et al. 2009). These changes have resulted in movement from the central interior portions of Yellowstone to the northern and western portions of the park, regardless of winter use occurring in Yellowstone's central region (Gates et al. 2005; Fuller, Garrott, and White 2007; Coughenour 2005; NPS 2008a).

In summary, the best available evidence regarding road grooming and bison distribution suggests the following.

- First, observed changes in bison distribution were likely consequences of natural population growth and range expansion that would have occurred regardless of the presence of snow-packed roads (Bjornlie and Garrott 2001; Coughenour 2005; Gates et al. 2005; Bruggeman et al. 2009a).
- Second, 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).
- Third, there is no evidence that bison preferentially used groomed roads during winter (Bjornlie and Garrott 2001; Bruggeman et al. 2006).
- Fourth, road segments used for travel corridors appeared to be overlaid on what were likely natural travel pathways, including narrow canyons and stream corridors (Gates et al. 2005; Bruggeman et al. 2009b).
- Fifth, bison use of travel corridors that include certain road segments would likely persist whether or not the roads were groomed (Gates et al. 2005; Bruggeman et al. 2009a).

Data on the bison population and their movements in the Yellowstone area prior to extensive hunting by humans and in the absence of OSVs are unavailable. Therefore, the vast majority of detailed information on bison was collected during the recent population expansion and in the presence of road grooming. Because bison now migrate to lower elevation ranges for forage during winter, bison movement and population data in the absence of OSVs are impossible to determine after the fact, and in the absence of a control population, what precise impact, if any, road grooming and winter use has on bison winter range expansion and population growth (Bruggeman et al. 2007, 2009a).

ELK (*CERVUS ELAPHUS*)

Elk were nearly extirpated from North America by the early 1900s, due to human hunting, competition with domestic grazing animals, and habitat shift and loss (Clark 1999). Most of the surviving elk in North America found refuge in the greater Yellowstone area due, in part, to strict hunting regulations and enforcement in the park after 1886. Elk herd summer ranges are found throughout Yellowstone (Clark 1999).

Elk were nearly extirpated from North America by the early 1900s, due to human hunting, competition with domestic grazing animals, and habitat shift and loss (Clark 1999).

Historic and Current Park Management of Elk

More than 10,000 elk from seven to eight different herds likely spend summer in Yellowstone, but this number decreases to a few thousand during winter. Elk choose habitat based on the preferred mix of topography, weather, vegetation, and factors that reduce their vulnerability to predation. Grasses are the primary forage, followed by forb species and conifers (Clark 1999). Their summer range is extensive and is based primarily on vegetation productivity. Elk winter range is limited to lower elevation and snow depth and is much smaller.

Elk

Elk play an important role in the ecology of the Yellowstone area. Winter-kill carcasses, young calves, and adults are an important food source for many key park species including bald eagles, wolverines, wolves, coyotes, and grizzly bears. Elk make up more than 90 percent of the diet of gray wolves. Newborn or young elk are often killed and consumed by grizzly bears (Swensen, Alt, and Eng 1986; Smith, Murphy, and Guemsey 1998; Barber, Mech, and White 2005). Browsing by elk and the nitrogen deposits in elk droppings can affect vegetation productivity, location, and diversity, and soil fertility. Changes in elk abundance and distribution can alter plant and animal ecology, composition, and structure in Yellowstone.

Elk in the non-migratory Madison headwaters herd are exposed to high levels of OSV use. From 1968 to 2004, when winter visitors to the park expanded from just 5,000 to over 100,000, the Madison headwaters elk herd population remained around 500 animals (Garrott, White, and Watson 2009). Before the introduction of wolves to the park, female elk had a 90 percent annual survival rate, with healthy recruitment and high birth and survival rates of calves (Garrott et al. 2003).

Elk play an important role in the ecology of the Yellowstone area. Winter-kill carcasses, young calves, and adults are an important food source for many key park species including bald eagles, wolverines, wolves, coyotes, and grizzly bears.

Behavioral Responses of Elk to OSVs and Visitors

Elk are not observed to use groomed roads as travel corridors to the same extent as bison. However, as discussed previously, individual elk can occasionally be visibly bothered by OSV travel, demonstrated by increased attention/alert or active movement/fleeing (Hardy 2001; Bjornlie 2000). Studies reported in Borkowski et al. (2006) and White et al. (2009) indicate that 48 percent of individual elk had no apparent response to OSV use, 27 to 32 percent exhibited a "look-resume" response, 12 to 17 percent "alert," 5 to 6 percent "travel," and 2 percent "flight." Most interactions between OSV users and elk occur along the groomed road corridor used by OSVs in the upper Madison River drainage between West Yellowstone, Montana, and Old Faithful.

There is some evidence that elk were displaced approximately 60 meters (197 feet) from roads with mostly unguided OSV-use during observations from winter 1998 to winter 2001 (Hardy 2001; NPS 2008a). Observations of behavioral responses and apparent avoidance of humans in the vicinity of the roads were short-term changes and did not have a lasting influence on species distribution patterns. Later studies found that the use of guides may help reduce interactions that result in energetically costly movement responses by wildlife (e.g., flight) because guides are trained to limit their groups' interaction time with animals, prevent wildlife harassment and chasing, and control the distance at which their groups approach animals (NPS 2008a).

Studies conducted by the Yellowstone Center for Resources and the Resource Management & Visitor Protection Office from winter 2006/2007 through winter 2008/2009 suggest that OSV use may sometimes affect elk but that it does not appear to be a primary factor influencing elk distribution or movement (Davis et al. 2007; McClure et al. 2008; McClure et al. 2009). As detailed in table 14, elk exhibited either no apparent response or look-resume responses to OSV use between 79.5 and 100 percent of the time. Movement response behavior accounted for up to 6.8 percent of elk observations over the three winter seasons, while alarm-attention responses accounted for up to 13.7 percent.

TABLE 14: ELK – BEHAVIORAL RESPONSES TO SNOWMOBILE AND SNOWCOACH TRANSPORTATION EVENTS

	Guided Snowmobile Transportation Events			Snowcoach Transportation Events		
	2007 Annual Report (N=69)	2008 Annual Report (N=61)	2009 Annual Report (N=23)	2007 Annual Report (N=58)	2008 Annual Report (N=44)	2009 Annual Report (N=35)
No apparent response (none)	55.1%	49.2%	80.4%	67.2%	56.8%	80.0%
Look-Resume	44.9%	39.4%	19.6%	32.8%	22.7%	20.0%
Travel	0.0%	1.6%	0.0%	0.0%	6.8%	0.0%
Alarm-Attention	0.0%	8.2%	0.0%	0.0%	13.7%	0.0%
Flight	0.0%	1.6%	0.0%	0.0%	0.0%	0.0%

Note: Data are from the 2007, 2008, and 2009 "Wildlife Responses to Motorized Winter Recreation in Yellowstone" Reports (available via the Yellowstone National Park website).

CANADA LYNX (*LYNX CANADENSIS*)

Canada lynx once ranged throughout the boreal forests of North America from Alaska to Canada and into the northern United States. Below the Canadian border, lynx are listed as a threatened species in 14 states that support boreal forest types and have verified records of lynx occurrence: Colorado, Idaho, Maine, Michigan, Minnesota, Montana, New Hampshire, New York, Oregon, Utah, Vermont, Washington, Wisconsin, and Wyoming (Yellowstone) (USFWS 2005). Based on declining populations and continuing threats from logging, recreation and development to their remaining habitat, Canada lynx were listed as threatened in the lower 48 states in March 2000 (USFWS 2005).

Based on declining populations, and continuing threats from logging, recreation and development to their remaining habitat, Canada lynx were listed as threatened in the lower 48 states in March 2000 (USFWS 2005).

Lynx are rarely found in Yellowstone and accurate historical population records are limited. Potential habitat for lynx is shown in figure 5. A total of 73 lynx sightings or tracks were reported in Yellowstone from 1887 to 1993, but the reliability of many reports is questionable and cannot be verified (Yellowstone National Park files; Consolo-Murphy and Meagher 1995). A survey conducted from 2001 to 2004 for lynx in Yellowstone National Park found DNA and track evidence for three lynx, a female and two kittens, all east of Yellowstone Lake (Murphy et al. 2005). This area also contained the highest indices of abundance for snowshoe hare and red squirrel, 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 based on their data, they believe lynx are primarily found in the eastern portions of the park. Lynx are also occasionally seen in other areas of the park, such as Indian Creek (just south of Mammoth) and in the Beryl Springs area (between Norris and Madison). Both times, the lynx were traveling near a road that was groomed for OSV travel.

Data on lynx/human encounters suggest that lynx are generally intolerant of continued human presence, human scent, disturbance, and agricultural or housing development (Brand and Keith 1979; Fortin and Huot 1995; Staples 1995; Aubry, Koehler, and Squires 1999). Mowat, Poole, and O'Donoghue (1999) state that based on their observations and research, lynx in Canada and Alaska likely tolerate moderate levels of snowmobile traffic throughout their winter ranges, readily cross highways, and appear comfortable near roads. However, Apps (1999) reports that lynx in the southern parts of their range, including the lower 48 states, are generally more sensitive to road fragmentation of habitat due to the relative scarcity of prime habitat and reduced prey availability compared to that available to lynx in the boreal forests of Canada and Alaska. Although some research suggests that lynx tolerate moderate levels of snowmobile traffic, there is debate about whether this tolerance is due to a level of comfort with human disturbances or a lack of suitable alternative habitats. Observations in Washington found that logging and U.S. Forest Service (USFS) roads that were little used in the summer but frequently used by snowmobiles in the winter and roads less than 15 meters (49 feet) wide did not appear to affect lynx movements or habitat use (Koehler and Brittel 1990; McKelvey et al. 1999). While these little-used roads do not appear to affect lynx, research in the southern Canadian Rockies indicates that wider, more heavily used paved roads may influence lynx spatial organization, and lynx appear to avoid crossing highways (Apps 1999). Thus, lynx movements in the lower 48 states may be restricted by roads and highways due to direct avoidance of roads and habitat alteration and fragmentation. Ruediger (1996 unpublished report) found that traffic volumes were also a factor and volumes must generally exceed 2,000 to 3,000 vehicles a day in order for lynx to be affected. Thus, wide paved roads and those with higher traffic volume appear to have the most influence on lynx movements and habitat use. Many lynx are reported to have been killed by automobiles in other parts of the country and in Canada (Brocke, Gustafson, and Fox 1992; Weaver 1993; Staples 1995; Gibeau and Heuer 1996; Halfpenny, Murphy, and Reinhart 1999; Murphy et al. 2006). There have been no reported lynx strikes in the greater Yellowstone area (Murphy et al. 2006).

FIGURE 5: LYNX HABITAT IN YELLOWSTONE NATIONAL PARK

Groomed trails alone also may affect lynx dispersion and predator-prey dynamics in lynx habitat. Groomed trails may facilitate access to lynx habitat by competing predators such as coyotes. Bunnell, Flinders, and Wolfe (2006) used observations of coyote tracks from two field studies and found a strong association between coyote movements and OSV routes in deep snow areas. In contrast, Kolbe et al. (2007) found that coyote trails were generally associated with firmer snow conditions but not necessarily with compacted OSV trails. They also found snowshoe hare to be a rare component of the coyote winter diet. Both studies found that lynx show a greater preference for higher elevations than coyotes. Areas of higher elevations, except the Sylvan Pass area, are areas where OSV use does not occur.

Due to lynx range distribution, there have been fewer studies on lynx inhabiting the lower 48 states and in the southern part of their range, than on lynx in the boreal forests of Canada and Alaska. Studies conducted on the Rocky Mountain lynx populations have found that lynx may avoid crossing highways, avoid areas of human presence, and use roads as territory boundaries (Apps 1999). Lynx do not appear to avoid crossing logging roads, or roads with lower levels of vehicle use (Koehler and Brittel 1990, McKelvey et al. 1999). Lynx may also be affected by human facilitation of access to their habitat by competing predators (or predators that may prey upon lynx) (Koehler and Aubry 1994). Lynx habitat in Yellowstone is likely limited to the eastern portion of the park, crossed by only one lightly used OSV snow road (with fewer than 10 OSVs per day, on average). The presence of kittens and the two recent sightings of lynx next to roads groomed for OSV use in other areas of the park indicate that lynx are likely traveling in and out of this area, particularly during breeding and dispersal. Traveling lynx would likely encounter groomed winter trails, and OSVs and humans traveling these trails both within and outside the park. Lynx movements and ability to disperse could be adversely affected by OSV-associated noise and human presence on these groomed snow roads. Groomed roads make up very little of the total land area in Yellowstone and not all summer use roads are plowed or groomed in Yellowstone in the winter, so the amount of exposure to groomed trails would be small. Because of the secretive nature of lynx, their rarity, and their use of heavily forested habitat, few ecological studies have been conducted on lynx, and even fewer researchers have looked into the effects of winter recreation on this species. Therefore, it is difficult to determine how OSV use in Yellowstone would affect lynx habitat use, behavior, or distribution. Most of the park does not contain suitable habitat for lynx, and thus the majority of lynx that would encounter heavily used groomed trails and OSVs would be traveling from one area of prime habitat to another for dispersal or breeding purposes. This travel is important to lynx ecology for genetic dispersion and habitat use. Lynx are mobile in the winter, and there is a potential for this species to encounter groomed roads and/or OSVs during their travels. However, evidence suggests that lynx travel through Yellowstone, rather than inhabiting the park permanently.

WOLVERINE (*GULO GULO*)

The wolverine is a rare and sparsely distributed member of the weasel family that inhabits remote areas of the circumpolar boreal forests. Even though wolverines only weigh from 6 to 18 kilograms, they are fierce predators and are able to successfully hunt large ungulates (hoofed mammals), including adult elk. Wolverines have rarely been studied by scientists (with a total of only about 25 publications worldwide) due in part to their scarcity, elusive behavior, and large home range size, as well as the inaccessible, rugged terrain they inhabit.

Until recently, wolverine populations in the lower 48 states were thought to be limited to the northern Cascade region of Washington and the Northern Rocky Mountain region in Idaho, Montana and Wyoming.

As of 2001, there were six studies published on North American wolverines, with only two in the United States (Heinemeyer, Abler, and Doak 2001). Until recently, wolverine populations in the lower 48 states were thought to be limited to the northern Cascade region of Washington and the Northern Rocky Mountain region in Idaho, Montana, and Wyoming. However, scientists have now documented wolverines in California's Sierra Nevada Mountains and in Colorado's southern Rocky Mountains (USFWS 2010c). Due in part to the limited amount of information on wolverines, especially those living in the lower 48 states, and the recently observed populations in Colorado and California, the U.S. Fish and Wildlife Service (USFWS) initiated a status review of the North American wolverine population to determine whether this population should be listed as threatened or endangered under the Endangered Species Act (ESA). In December 2010, the USFWS ruled that the wolverines in the contiguous United States were a distinct population segment that warranted being added to the Lists of Endangered and Threatened Wildlife and Plants (USFWS 2010e). However, at that time this listing was precluded by higher priority actions and, instead, the contiguous U.S. distinct population segment of the wolverine was added to the candidate species list, or is currently proposed for listing. As of February 4, 2013, the USFWS published a rule to list the distinct population segment of the North American wolverine occurring in the contiguous United States, as a threatened species under the ESA. At the time this plan/EIS was published, this rule was under public review (78 FR 7863). The USFWS considers the current range of the species to include portions of Washington, Idaho, Montana, Wyoming, Colorado, Utah, Oregon, and California.

Potential threats identified by the USFWS that contribute to the wolverine's status as a candidate species include climate change, which is noted as the threat with the greatest potential to impact it. A warming climate will likely result in a loss of suitable habitat due to increased summer temperatures and a reduced incidence of persistent spring snowpack. According to analyses completed by the University of Washington's Climate Impacts Group and the USFS Rocky Mountain Research Station, wolverine habitat in the contiguous United States is likely to decrease in area by 23 percent by 2045 and 63 percent by 2099. With lower elevation habitats becoming unsuitable, remaining wolverine habitat is likely to become more fragmented. Connectivity between remaining wolverine habitats will be reduced, increasing rates of loss of genetic diversity and making the retention of small populations more difficult. The USFWS also notes other threats, such as recreation, because mother wolverines tend to move their kits to alternate denning areas once humans have been detected nearby. Recreational activities such as snowmobiling and backcountry skiing have the potential to affect wolverines. However, further research is needed to confirm whether these activities have measurable impacts on the species (USFWS 2012).

Wolverines rely on carrion as a food source but are also known to prey on large ungulates (Magoun and Valkenburg 1983), snowshoe hares, and ground squirrels in areas of Alaska and the Yukon (Gardner 1985; Banci 1987). In the Yellowstone area, researchers found that wolverines primarily feed on ungulate carcasses, including elk, moose, and deer (Packila et al. 2007a). During winter, wolverines generally scavenge carcasses of adults, whereas in the spring they take young or newborn calves. They consume marmots and ungulates during late spring and summer. These prey items are supplemented with small mammals and birds. Some researchers suggest that year-round food supply is an important consideration for den location (Banci and Harestad 1990). Sylvan Pass is the closest known location of a wolverine to an OSV corridor and contains suitable denning habitat, and known prey species (primary winter killed deer and elk) are not generally present in the Sylvan Pass area in winter. Wolverine tracks were seen on Sylvan Pass during the winter of 2009 (Sacklin pers. comm. 2010).

Wolverine distribution and population characteristics in Yellowstone National Park and neighboring wilderness areas along the park's east, northeast, and south boundaries were investigated during 2005 to 2009 by capturing and monitoring radio-marked individuals, and conducting surveys for their tracks during winter. Four wolverines were captured during intensive trapping efforts. Two wolverines were trapped and radio collared in the winter of 2006, one near Sylvan Pass. The closest preferred denning

habitat to an OSV corridor in this area occurs at the pass itself (Landa et al. 1998; Banci and Harestad 1990). In the winter of 2007, researchers trapped two young wolverines, both north of Yellowstone. One additional wolverine was captured during winter 2008, and none were captured during winter 2009. One wolverine's home range was in the southeast corner of the park, and another overlapped this same area, with its home range also extending southwest of the park boundaries. The two other wolverine home ranges were respectively north and south of the park boundaries (Murphy et al. 2011).

The Greater Yellowstone Wolverine Program, established by the Wildlife Conservation Society, has conducted extensive research on wolverines in the greater Yellowstone area. During extensive trapping efforts from 2001 to 2007, 28 wolverines, none of which were found in Yellowstone were captured and fitted with GPS collars. Preliminary research results show that, of the collared wolverines, male wolverines had an average home range size of 1,160 square kilometers (448 square miles), and female wolverines had an average home range size of 453 square kilometers (175 square miles). Of the 28 wolverines captured and collared, 17 were females. Females give birth in mid-February to only 1 kit and give birth on average every 2.5 years. Seven females denned up and gave birth to young, with 6 using designated wilderness areas; one den (not in designated wilderness) was in Yellowstone. One female's natal den was in an area that was occasionally subject to snowmobile activity. Dens were at high elevation (7,200 to 9,300 feet), and usually found within areas of avalanche debris, at subalpine sites near timberline, and among boulder talus. The birthing dens were occupied until late April. Young wolverines dispersed from their mother's home range when they were about a year old. Over three winters, eight wolverines (five females, three males) were captured and fitted with collars that recorded continuous activity levels during the winter. Male activity peaked in the morning and evening, whereas non-reproductive female activity peaked during morning. The reproductive female showed little activity for two weeks following the birth of her kit. The wolverines inhabited areas with varying levels of OSV use (McCue et al. 2007). Yellowstone OSV use peaks in the morning, early afternoon, and late afternoon, likely corresponding with active periods for wolverines.

The Wildlife Conservation Society also conducted research on wolverine road crossing patterns and occurrence in the greater Yellowstone area, focusing on a crossing near the Henry Lakes Range at Earthquake Lake (U.S. Highway 287) and Raynolds Pass (ID/MT87) west of Yellowstone National Park. The results demonstrate that wolverines cross roads to navigate their home ranges, and that linkage of home ranges via road crossing (and very likely snowmobile trail crossing) is critical to the maintenance of the greater Yellowstone area wolverine population (Packila et al. 2007b unpublished).

Wolverines tend to avoid humans. Human disturbance in the vicinity of a natal den may cause the wolverine to abandon her den for a less desirable den site, possibly resulting in reduced reproductive success (Banci 1994). This behavior has been observed in wolverines subject to human disturbance in both Norway (Myrberget 1968) and Finland (Pulliainen 1968). Wolverines also appear to avoid areas of human activity for den choice, including areas of OSV use, because aerial surveys in the greater Yellowstone area in 2001 noted few wolverine tracks or foraging evidence in areas of heavy snowmobile use (Heinemeyer, Aber, and Doak 2001). The effects of OSV use in the park and the greater Yellowstone area on individual behavior and overall population are unknown, due to lack of long-term data and difficulty in observing or tracking individuals because they avoid humans and because of low population numbers.

TRUMPETER SWAN (*CYGNUS BUCCINATOR*)

Hunted to near extinction in the early 1900s, trumpeter swans benefited from protections through the passage of the Migratory Bird Treaty Act (MBTA) in 1918 that helped reduce illegal hunting of trumpeter swans; however, habitat changes and hunting continued to reduce swan numbers. The tri-state area (Wyoming, Idaho, and Montana) flock of trumpeter swans was petitioned for listing under the ESA in 2003, but the USFWS did not find enough evidence for listing. Currently, the greater Yellowstone area population of swans is again under review for listing due to recent declines in the region (USFWS 2010d).

During the breeding season, two nesting pairs of resident swans were found, but neither successfully produced young. Only two nesting pairs were observed over the past three seasons. Since 2001, there were at most four annual nesting attempts by trumpeter swan pairs in the park.

The park has both a resident population and a migratory winter population. Migrants that visit Yellowstone in the winter are a combination of swans from the Yellowstone/greater Yellowstone area and swans from Canada (primarily Grande Prairie, Alberta) (Proffitt et al. 2009). The resident population in the park is less than 10 swans, with fall migratory populations numbering as high as 500 (Baril, Henry, and Smith 2010). Resident trumpeter swans display strong site fidelity to breeding areas and nest sites, and winter habitat is generally associated with areas of ice-free, open water (Baril, Henry, and Smith 2010). The winter habitat of swans and eagles is shown in figure 6.

The resident Yellowstone trumpeter swan population is considered at risk, due to decreasing numbers of swans and cygnets from 1961 to present. Surveys in 2011 counted 167 swans in Yellowstone, in Paradise Valley, and on Hebgen Lake during midwinter, and 9 adults and no cygnets in autumn. The estimated abundance of resident trumpeter swans in Yellowstone National Park decreased from a high of 59 individuals in 1968 to 3 individuals in 2010 (Baril, Henry, and Smith 2010). There was some evidence that this decrease in abundance became more dramatic after supplemental feeding of swans outside the park (in Centennial Valley, Montana) was terminated in the winter of 1992/1993 (Proffitt et al. 2009). There was little evidence that numbers of migrants affected the abundance of the resident population, but growth rates were lower following severe winters, wetter springs, and warmer summers (Proffitt et al. 2009). During 1987 through 2007, the proportion of adults breeding annually ranged from 0.27 to 0.67, an average of 6.1 pairs nested in Yellowstone National Park, and an average of 2.7 cygnets survived until September (Proffitt et al. 2010). This overall low productivity of trumpeter swans suggests that the decrease in resident swan abundance will likely continue unless swans dispersing from other areas immigrate to Yellowstone National Park. Trumpeter swan presence may be limited to ephemeral residents and wintering aggregations of migrants from outside the park (Proffitt et al. 2009, 2010).

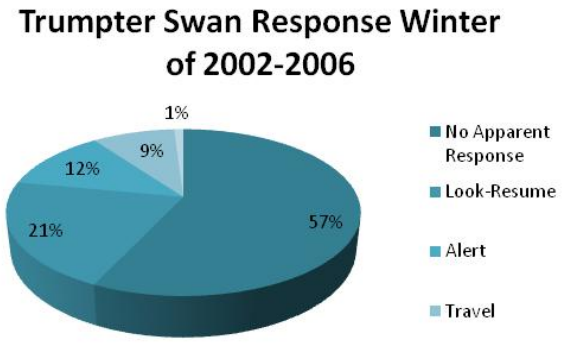
There was no swan reproduction in Yellowstone National Park during 2011. Only two nesting pairs were observed over the past four seasons. Since 2001, there were at most four annual nesting attempts by trumpeter swan pairs in the park. More than 53 percent of nest attempts failed to raise any young, which researchers attribute to predation and early season flooding (Proffitt et al. 2010). Overall, the attempts of resident swans to nest in the park have declined since 1987, but numbers have fallen even more steeply over the last decade (Baril and Smith 2009).

FIGURE 6: EAGLE AND SWAN WINTER HABITAT

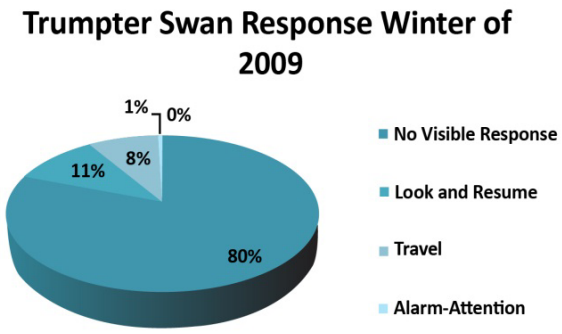
Behavioral Responses of Swans to OSVs and Visitors

The resident Yellowstone trumpeter swan population is considered at risk, due to decreasing numbers of swans and cygnets from 1961 to present.

Swans have also been the subject of study regarding reactions to OSV presence, with results indicating that human disturbance did not appear to be a primary factor influencing the distribution or movement of swans. White et al. (2009) report on the results of winter monitoring that occurred in the park from 2002 to 2006, characterizing trumpeter swan responses to OSVs as 57 percent "no apparent response," 21 percent "look-resume," 12 percent "alert," 9 percent "travel," and 1 percent "flight." In 2009 winter wildlife monitoring (McClure et al. 2009), 80 percent of trumpeter swans had no reaction to OSVs, 11 percent responded with "look-resume," 8 percent "travel," and 0.5 percent "alarm-attention." No swans had a flight response. As with other species, the odds of a reaction increased with variables including time of interaction, distance to road, and human behavior (McClure et al. 2009). Because nesting pairs may be extremely sensitive to human disturbance, park researchers recommend that nesting areas remain closed from April 30 to August 15 in order to allow time for cygnets to mature. This does not overlap with the winter use season.



Source: McClure et al. 2009



Source: White et al. 2009

It is also unlikely that poor production across the greater Yellowstone area has resulted from OSV use in the park. Swans generally return to their breeding territories between February and late May, with young hatching in late June when OSVs are no longer present in greater Yellowstone area parks (Stalmaster and Kaiser 1998; Steidl and Anthony 2000; Gonzalez et al. 2006; Olliff, Legg, and Kaeding 1999; NPS 2008a). A site along the Madison River, less than 100 meters (328 feet) from the park'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 the park. Researchers attribute the overall decline in the greater Yellowstone area to drought and wetland loss, low immigration rates, predation, and competition with other migrants, particularly snow geese (Baril and Smith 2009).

Studies conducted by the Yellowstone Center for Resources and the Resource Management & Visitor Protection Office from winter 2006/2007 through winter 2008/2009 suggest that OSV use may sometimes affect swans but that it does not appear to be a primary factor influencing population distribution or movement (Davis et al. 2007; McClure et al. 2008; McClure et al. 2009). As detailed in table 15, swans exhibited either no apparent response or look-resume responses to OSV use between 86.2 and 100 percent of the time. Travel response behavior accounted for up to 12.1 percent of observations over the three winter seasons. No flight responses were observed.

TABLE 15: SWANS – BEHAVIORAL RESPONSES TO SNOWMOBILE AND SNOWCOACH TRANSPORTATION EVENTS

	Guided Snowmobile Transportation Events			Snowcoach Transportation Events		
	2007 Annual Report (N=62)	2008 Annual Report (N=58)	2009 Annual Report (N=58)	2007 Annual Report (N=43)	2008 Annual Report (N=27)	2009 Annual Report (N=58)
No apparent response (none)	93.5%	91.4%	91.4%	93.0%	96.3%	72.4%
Look-Resume	1.6%	5.2%	5.2%	7.0%	3.7%	13.8%
Travel	4.8%	3.4%	3.4%	0.0%	0.0%	12.1%
Alarm-Attention	0.0%	0.0%	0.0%	0.0%	0.0%	1.7%
Flight	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Note: Data are from the 2007, 2008, and 2009 "Wildlife Responses to Motorized Winter Recreation in Yellowstone" Reports (available via the Yellowstone National Park website).

BALD EAGLE (*HALIAEETUS LEUCOCEPHALUS*)

Since their federal listing as an endangered species in 1967, bald eagle populations in the lower 48 states have increased dramatically, with nesting territories recorded in nearly every state. As a result, this species was removed from the Endangered Species List in August 2007, but protection for bald eagles remains in place under the Bald and Golden Eagle Protection Act and the MBTA.

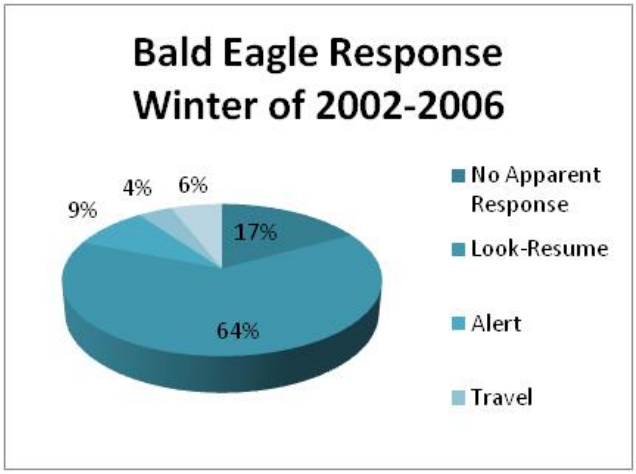
The park has a substantial resident population of eagles that may migrate short distances in winter to be near open water. This population expands seasonally with the addition of migratory eagles.

The park has a substantial resident population of eagles that may migrate short distances in winter to be near open water. This population expands seasonally with the addition of migratory eagles. Bald eagles are found in Yellowstone throughout the year, nesting in large trees generally near open water (Stangl and Anthony 1999; Swensen, Alt, and Eng 1986; Alt 1980). Bald eagle winter habitat is usually near areas of unfrozen rivers or lakes, which provide access to freshwater fish. Winter habitat for eagles is shown in figure 6. Bald eagles also feed on carrion, upland small species, and waterfowl. Nest building occurs between October and April, with actual nesting beginning in mid-February. Incubation occurs for 35 days, with hatching taking place in late March. Bald eagle surveys in 2011 found 25 occupied territories and 13 young were fledged from 10 successful nests (59 percent nest success). The numbers of nesting and fledging bald eagles in the park increased incrementally from 1987 to 2005, but were not significantly correlated with cumulative winter visitation (White et al. 2009). Also see the Scientific Assessment of Yellowstone National Park Winter Use (NPS 2011f). The overall bald eagle population remains stable in Yellowstone National Park, but decreased reproductive success has been observed for eagles nesting in the Yellowstone Lake area in recent years, possibly due to reductions in cutthroat trout abundance, human disturbance, climate change, or other unidentified reasons. For the Yellowstone Lake population, nest success was only 44 percent compared with 75 percent in all other areas of Yellowstone. Similarly, productivity was just 0.56 at Yellowstone Lake, but 1.00 elsewhere. Thus, bald eagle populations may gradually decline (Baril, Henry, and Smith 2010).

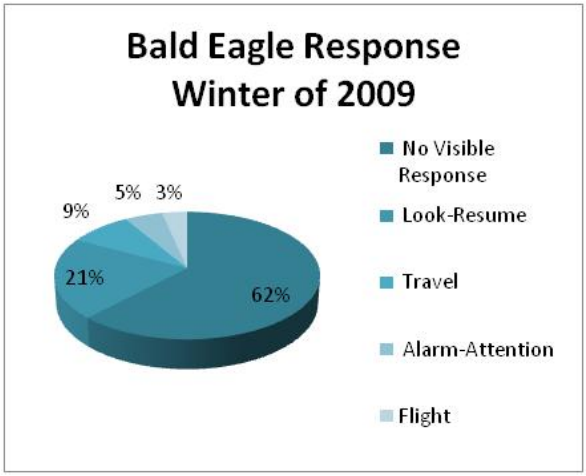
Behavioral Responses of Eagles to OSVs and Visitors

Eagle Nesting in Yellowstone

Based on wildlife monitoring the NPS performed in the park from winter 2002 to winter 2006 (White et al. 2009), bald eagle responses to OSVs and human activity were categorized as 17 percent "no response," 64 percent "look-resume," 9 percent "attention-alarm," 4 percent "travel," and 6 percent "flight." Annual monitoring reports from 2009 (McClure et al. 2009) recorded 58 total interactions between winter recreationists and eagles. Of these, 62 percent initiated no response from the eagles, 21 percent resulted in "look-resume," 9 percent in "travel," 5 percent in "alarm-attention," and 3 percent in "flight." The combined percentage of travel and flight, the most active responses, was lower (12 percent) than that recorded in 2008 (16 percent), while the percentage of no response increased from 59 percent in 2008 to 62 percent in 2009 (McClure et al. 2009).



Source: McClure et al. 2009



Source: White et al. 2009

White et al. (2009) concluded that human disturbance did not appear to be a primary factor influencing the distribution of movement of bald eagles and that individual responses that resulted in flight or other active behavior were apparently short term and without lasting influence on species distribution patterns. A pair of bald eagles nesting near the West Entrance Road, where OSV traffic routinely passed within 55 meters (180 feet) of the nest, successfully fledged young in 2001. Buffer areas of 400 to 800 meters (0.25 to 0.50 miles) have been recommended where watercraft or vehicles are not permitted to stop (Stalmaster and Kaiser 1998; Grubb, Robinson, and Bowerman 2002; Gonzalez et al. 2006). Grand Teton maintains a 0.5-mile closure around all bald eagle nests from February 15 to August 15. In Yellowstone,

White et al. (2009) concluded that human disturbance did not appear to be a primary factor influencing the distribution of movement of bald eagles and that individual responses that resulted in flight or other active behavior were apparently short-term and without lasting influence on species distribution patterns.

this type of closure is difficult, because roads are often sited in steep canyons along the river courses where bald eagles nest and feed. Thus, Yellowstone manages bald eagle nest sites on a case-by-case basis. Additionally, during OSV use season, the park enforces a 400-meter (0.25 mile) no-stopping buffer zone for all eagle nests.

About one month of the eagle breeding and nesting period coincides with the OSV use season in the park, during which time nests are being prepared and eggs laid and incubated. The presence of OSVs during this month creates a small risk that birds displaced by noise or disruption might have less foraging time and be less successful in raising offspring due to increased energy expenditure for flight, decreased pair bonding and reduced nest building time, and possible poor incubation. There is no overlap or potential for disturbance from OSV use after chicks have hatched. Nesting success and numbers of fledgling bald eagles in Yellowstone increased during a period of intense OSV use (1987 to 2005) and were not correlated with cumulative OSV traffic.

GRAY WOLF (*CANIS LUPUS*)

Historically found throughout North America, gray wolves were extirpated from the Yellowstone area by the mid-1930s by hunters and trappers. Listed as endangered under the ESA in 1974, wolves were reintroduced into the park between 1995 and 1997. Wolves in the Yellowstone area are classified as a non-essential, experimental population by the USFWS and per the ESA, Section 10(j) and are managed in Yellowstone as a threatened population. Recently wolves have been delisted in Idaho, Montana, and Wyoming, and the U.S. Department of the Interior reached an agreement in August 2011 on how to end federal protections for wolves in the state of Wyoming (USFWS 2011).

During winter foraging, gray wolves typically frequent ungulate winter ranges, including the Yellowstone northern range, Hayden and Pelican valleys, Madison headwaters, upper Gallatin drainage, the North Fork of Shoshone basin, and the Clark's Fork River (Green et al. 1997).

Wolves in the Yellowstone region feed primarily prey on elk, which made up 83 percent of their diet in 2009 (Smith et al. 2010). Moose, deer, pronghorn, and bison make up the bulk of the remainder of their diet (Phillips and Smith 1997; Smith et al. 2010). Wolves hunt ungulates year-round and feed on ungulate carcasses when available (Becker et al. 2009; Metz et al. 2012). During winter foraging, wolves typically frequent ungulate winter ranges, including the Yellowstone northern range, Hayden and Pelican valleys, Madison headwaters, upper Gallatin drainage, the North Fork of Shoshone Basin, and the Clark's Fork River (Green, Mattson, and Peek 1997, Kaufmann et al. 2007, Smith et al. 2009). Figure 7 shows the ranges of Yellowstone wolf packs.

Until 2003, wolf numbers in the park increased following reintroduction. Between 2003 and 2012, density-dependent natural factors, such as fighting between and within wolf packs resulting in wolf mortality, food stress, and mange, caused declines. In December 2011, researchers observed 98 wolves in the park in 10 packs with 7 breeding pairs. This is a decline of 23 percent from 124 wolves in 2008. Pack size ranged from 3 (Agate pack) to 19 (Mollie's pack). The number of pups per pack in early winter ranged from 0 to 7 (NPS 2011e).

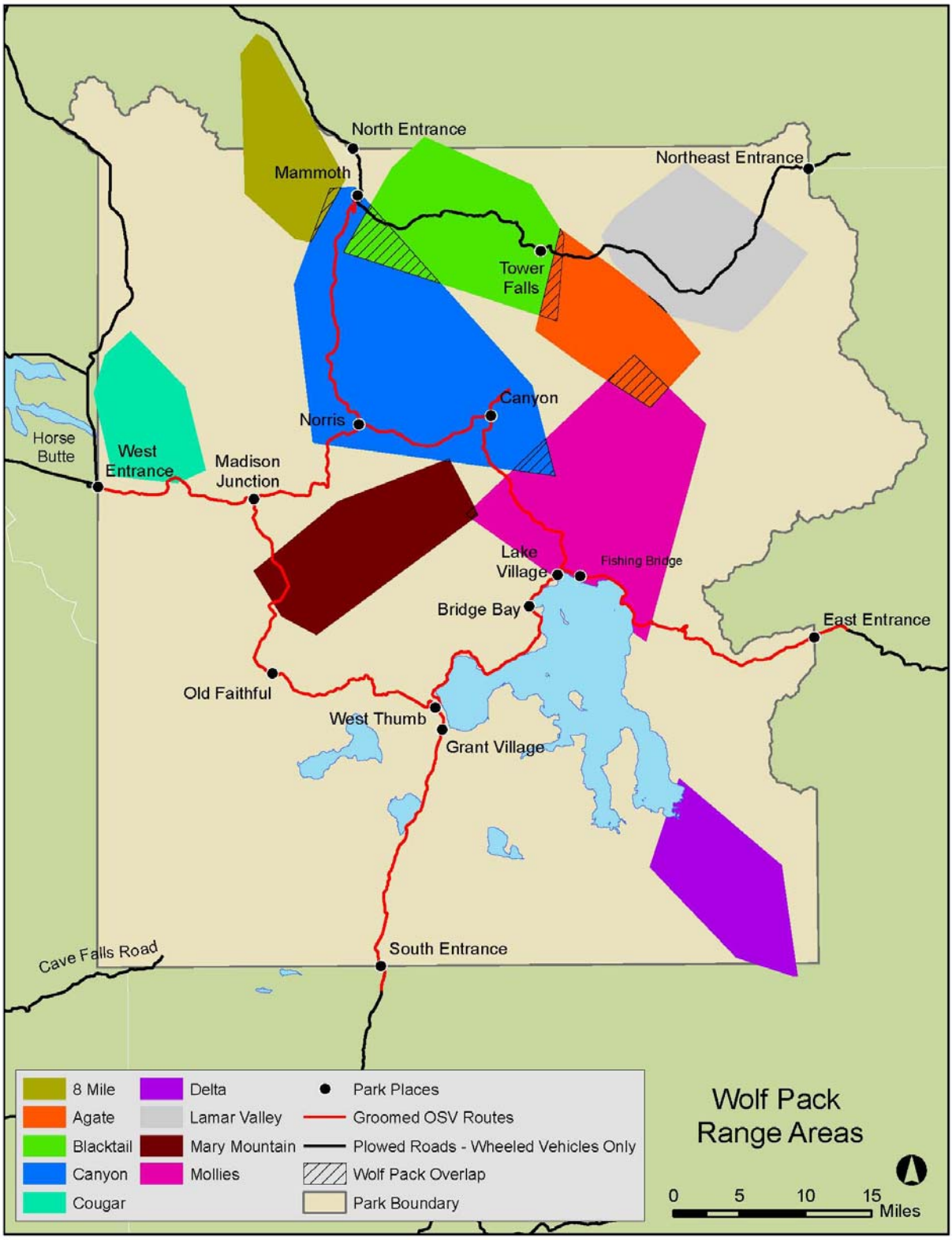


FIGURE 7: WOLF PACK RANGES IN YELLOWSTONE NATIONAL PARK

Winter researchers monitoring wildlife behavioral responses to OSVs have observed wolves only rarely in six years of monitoring, with a total of just 14 sightings as of 2009 that involved OSV-wolf interactions (less than 1 percent of total wildlife-OSV observations), with the majority of wolf responses consisting of look-resume or no visible response (McClure et al. 2009). Wolf tracks were frequently seen on the roads by winter wildlife monitoring crews, and wolves have been documented traveling and making nocturnal kills during winter in developed areas of the park. After reintroduction, wolves quickly became a showcase animal in the Lamar Valley, readily visible from the wheeled vehicle route, and attracting visitors just for the purpose of wolf watching. Wolf distribution does not appear to be affected by human recreation in the park (Smith, Stahler, and Guemsey 2005), but no studies have looked specifically at the population-level effects of winter use on distribution patterns, or at associated behavioral implications. Wolves den in April, after the winter use season has ended (Smith et al. 2010).

Creel et al. (2002), reporting on studies of wolves in Yellowstone, Voyagers, and Isle Royale national parks in 1999 and 2000, found that increased stress hormone levels, and therefore physiological stress, were correlated to OSV usage on short and annual scales. Several other researchers have found that prolonged GC elevation typically results in reduced survival and reproduction among both humans and captive animals (Munck, Guyre, and Holbrook 1984; Sapolsky 1994). Creel et al. (2002) state that despite higher stress hormone levels, they found "no evidence that current levels of snowmobile activity are affecting the population dynamics of [wolves] in these locations." However, their research did detect "a clear physiological stress response induced by the current level of snowmobile activity" in the population of elk and wolves they sampled during their research. It should be noted that OSV use has dropped by about two-thirds since these studies were completed (Sacklin pers. comm. 2010). Therefore, these results represent a higher level of OSV use than that occurring in recent years.

Avoidance of roads by wolves may adversely affect their hunting success. Data from one study of wolf hunting success in the Gallatin Range indicate that wolves are more likely to successfully bring down an elk in areas that are flat, open, and near roads (Creel and Winnie 2005). Such data suggest that avoidance of such areas by wolves during the day due to OSV use may limit their hunting success; however, this is a specific result from one study and results may vary depending on geographic location.

Habituation by wolves may occur if they are fed or exposed to human food or trash or human activity. Wolves in Yellowstone have an ample prey base for food supply, and wolves in and around Yellowstone rarely pose a threat to humans or demonstrate begging behaviors. Wolves frequenting areas of human use or development or wolves that are observed approaching people are hazed by the park staff, generally with bean-bag bullets (Smith et al. 2010).

Wolves in Yellowstone have an ample prey base for food supply, and wolves in and around Yellowstone rarely pose a threat to humans or demonstrate begging behaviors.

Hazing generally has good success in eliminating unwanted behaviors or in moving wolves out of an area. But if wolves demonstrate threatening behavior or begging behaviors that indicate they are conditioned to expect handouts from people, hazing may not be successful or park managers may decide the threat posed by the wolf (or wolves) is too high, and the wolf (or wolves) must be removed (Smith et al. 2010). Guiding requirements, education on proper storage of food and behavior around wildlife, and limits on the total number of visitors per day decrease the development of habituation in park wolves due to winter use. Humans who feed or encourage wolves to approach, or who leave food scraps in places accessible to wolves, may cause wolves to become habituated, but in recent years, OSV associated visitors have not been cited as a problem. Wolves may habituate regardless of human behavior, due to frequent exposure to non-threatening humans. It appears that wolves generally avoid encounters with OSV users, and may preferentially choose to travel on OSV roads during times of low human activity (Smith et al. 2008, 2009, 2010).

AIR QUALITY

Air quality is protected under several provisions of the Clean Air Act (CAA), including the Prevention of Significant Deterioration (PSD) program and the National Ambient Air Quality Standards (NAAQS). These regulatory requirements, as they relate to Yellowstone, are described in greater detail below.

PREVENTION OF SIGNIFICANT DETERIORATION

The CAA established the PSD program to protect air quality in relatively clean areas. One purpose of the PSD program is to protect public health and welfare, including natural resources, from adverse effects that might occur even though NAAQS are not violated. Another purpose is to preserve, protect, and enhance the air quality in national parks, national wilderness areas, national monuments, national seashores, and other areas of special national or regional natural, recreational, scenic, or historic value (42 USC 7401 et seq.). The PSD program applies to new major sources and major modifications to existing sources. A key component of the PSD program is the establishment of the maximum allowable increase in pollutant concentrations above a baseline level (or "increment") that a new or modified source can create without degrading air quality (EPS 2011). The baseline concentration is defined for each pollutant and, in general, is the ambient concentration existing at the time that the first complete PSD permit application affecting the area is submitted. Significant deterioration is said to occur when the amount of new pollution would exceed the applicable PSD increment (EPA 2009d). In Yellowstone, the baseline year for evaluating PSD increment consumption is 1979 (NPS 2000g).

CAA—Clean Air Act

PSD—Prevention of Significant Deterioration

NAAQS—National Ambient Air Quality Standards

AQRV—air quality related value

FLAG—Federal Land Managers' Air Quality Related Values Work Group

In addition to PSD increment limitations, the PSD program provides special protection for designated Class I areas. Yellowstone National Park is classified as a Class I area under the CAA PSD program, meaning that it is afforded the greatest degree of air quality protection. Even if the PSD increment is not exceeded, no PSD permit can be issued if the Class I area federal land manager (in this case the NPS) determines that the source of the emission will adversely affect the Class I area's air quality related values (AQRVs). The AQRVs of the park are those resources that are potentially sensitive to air pollution and include visibility, water quality, soils, vegetation, and wildlife (NPS 2007a). If the PSD increment is exceeded, but the federal land manager certifies that the source will not adversely affect the Class I area's AQRVs, a PSD permit can still be issued (NPS 2011a). The Federal Land Managers' Air Quality Related Values Work Group (FLAG) was formed to provide a consistent and objective approach to determining if a proposed emission source would have an adverse impact on AQRVs in a Class I area. The FLAG 2010 Phase I report describes the methodology and impact criteria for assessing AQRVs, including visibility (NPS 2010b).

NATIONAL AMBIENT AIR QUALITY STANDARDS

NAAQS requirements were established to protect human health and the environment and to serve as ceilings for acceptable maximum air quality concentrations (Hawkins and Ternes 2004). The NAAQS consist of numerical standards for air pollution, which are broken into "primary" and "secondary" standards for six major air pollutants described below. Primary standards protect public health (including sensitive populations such as asthmatics, children, and the elderly) and represent levels at which there are no known major effects on human health. 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 (EPA 2010j). These standards are detailed in table 16, along with the

averaging time period used to assess each standard and the statistical form of the standard used to determine compliance. Units of measure for the standards are parts per million (ppm – parts per 1,000,000) by volume, parts per billion (ppb – parts per 1,000,000,000) by volume, milligrams per cubic meter of air (mg/m^3), and micrograms per cubic meter of air ($\mu g/m^3$) (EPA 2010j).

- Carbon monoxide (CO)—Carbon monoxide is a colorless, odorless gas (EPA 2010a) produced by the incomplete burning of carbon in fuels (EPA 2009a). It is toxic to mammals because of its strong tendency to combine with hemoglobin to form carboxyhemoglobin, which reduces the oxygen-carrying capacity of the blood. Because the hemoglobin that has combined with CO is no longer available to carry oxygen, delivery of oxygen to the body's organs and tissues is inhibited, resulting in adverse health effects (Ayres and Kornreich 2004). 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 (EPA 2009b, 2010a).
- Nitrogen dioxide (NO_2)—Nitrogen dioxide has a strong, harsh odor and is a liquid below 70°F, becoming a reddish-brown gas at temperatures above 70°F (21.1°C). Nitrogen oxides (NO_x) are released into the air from the exhaust of motor vehicles; the burning of coal, oil, or natural gas; and during other industrial and manufacturing processes. In addition, NO_2 reacts with sunlight leading to the formation of ozone and smog conditions in the air (ATSDR 2002). Evidence suggests that short-term exposure to NO_2 may result in adverse respiratory effects including airway inflammation in healthy people and increased respiratory symptoms in people with asthma. Emissions control measures leading to reductions in NO_2 can generally be expected to reduce population exposures to all gaseous nitrogen oxides, which may have the co-benefit of reducing the formation of ozone and fine particles both of which pose significant health threats (EPA 2009c).
- Ozone (O_3)—Ozone is a colorless and odorless (in low concentrations) gas that is found in both the upper atmosphere (10 to 30 miles above the earth's surface) and at ground level. It is not usually emitted directly into the air, but at ground level is created by a chemical reaction between oxides of nitrogen (NO_x) and volatile organic compounds (VOCs) in the presence of sunlight (EPA 2010c). Inhaling ground-level ozone can result in a number of health effects: induction of respiratory symptoms including coughing, throat irritation, pain and discomfort in the chest, chest tightness, and shortness of breath; decreased lung function; and inflammation of airways. Exposure occurs when people inhale ambient air containing ozone, and people with the greatest exposure are those heavily exercising outdoors for long periods of time when ozone concentrations are high (EPA 2010c).
- Particulate matter (PM)—Particle pollution, or PM, is the term for a mixture of solid particles and liquid droplets found in the air (EPA 2010d). Particles that are less than 2.5 micrometers in diameter are known as "fine particles" ($PM_{2.5}$); those larger than 2.5 micrometers, but less than 10 micrometers, are known as "inhalable coarse particles" (PM_{10}) (EPA 2010d). Particulate pollution is made up of a number of components, including acids (such as nitrates and sulfates), organic chemicals, metals, and soil or dust particles (EPA 2010e) 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 (EPA 2010d). Health effects from PM emissions include reduced lung function, the development or aggravation of respiratory problems, irregular heartbeat, non-fatal heart attacks, and premature death in people with heart or lung disease (EPA 2010f).

- Sulfur dioxide (SO_2)—Sulfur dioxide is one of a group of highly reactive gases known as "oxides of sulfur" (EPA 2010g). Sulfur dioxide in the air results primarily from activities associated with the burning of fossil fuels such as at power plants (ATSDR 1998) and other industrial facilities (EPA 2010g). Current scientific evidence links short-term exposures to SO_2, ranging from 5 minutes to 24 hours, with a variety of adverse respiratory effects including bronchoconstriction (tightening of the airway muscles in the lungs) and increased asthma symptoms (EPA 2009a). Annual ambient SO_2 concentrations have decreased by more than 70 percent since 1980 (EPA 2010h).
- Lead—Lead is a naturally occurring, bluish-gray metal found in small amounts in the earth's crust, but it can also be found in all parts of the environment. Much of it comes from human activities including burning fossil fuels, mining, and manufacturing (ATSDR 2007). The largest source of lead in the atmosphere has been from leaded gasoline combustion, but with the phaseout of lead in gasoline, air lead levels have decreased considerably. Lead is a toxic element, causing a variety of effects at low dose levels. Brain damage, kidney damage, and gastrointestinal distress in humans are seen from acute (short-term) exposure to high levels of lead. Chronic (long-term) exposure to lead results in effects on blood, the central nervous system, blood pressure, kidneys, and vitamin D metabolism in humans (EPA 2010i).

Areas that have never been designated as nonattainment areas for a pollutant and that meet the NAAQS for that pollutant are considered attainment areas. Areas that do not meet the NAAQS for a pollutant are classified as nonattainment areas for that pollutant. Former nonattainment areas currently meeting the NAAQS are designated as maintenance areas.

Yellowstone is in five counties—Park and Teton counties, Wyoming; Fremont County, Idaho; and Gallatin and Park counties, Montana. All are currently in attainment of the NAAQS (EPA 2010k). However, air pollutant emissions within a 186-mile (300-kilometer) radius of Yellowstone have the potential to affect air quality sensitive resources in the park. There are several counties within a 186-mile (300-kilometer) radius of the park currently designated in non-attainment for PM_{10}, SO_2, and/or lead NAAQS established by the EPA (EPA 2010k; NPS 2004b):

- Lewis and Clark County, Montana, in non-attainment for SO_2 and lead
- Yellowstone County, Montana, in non-attainment for SO_2
- Missoula, Silver Bow, Yellowstone, and Rosebud counties, Montana; Power and Bannock counties, Idaho; and Sheridan County, Wyoming in non-attainment for PM_{10}.

Pursuant to the CAA provisions, Wyoming and Montana have adopted air quality standards that are more stringent for some pollutants than provided in the NAAQS (table 16). Idaho adopted NAAQS as the state standard. While it is clear that the CAA delegates jurisdiction for the 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 AQRVs (including visibility). The federal land manager, in this case the NPS, has the authority and jurisdiction to administer some provisions of the CAA, particularly the non-degradation standard for Class I air, and to manage activities within its jurisdiction that either affect, or have the potential to affect, air quality or associated values.

TABLE 16: NATIONAL AND STATE AMBIENT AIR QUALITY STANDARDS

Pollutant	Primary/ Secondary (for NAAQS)	Averaging Time	National and Idaho	Montana	Wyoming	Form (for NAAQS)
Carbon Monoxide	Primary	8-hour	9 ppm	Same as NAAQS	Same as NAAQS	Not to be exceeded more than once per year
		1-hour	35 ppm	23 ppm	Same as NAAQS	
Lead	Primary and Secondary	Rolling 3-month average	0.15 $\mu g/m^3$	—	0.15 $\mu g/m^3$	Not to be exceeded
	N/A	Quarterly	—	1.5 $\mu g/m^3$	—	Not to be exceeded
Nitrogen Dioxide	Primary	1-hour	100 ppb	300 ppb*	—	98th percentile, averaged over 3 years
	Primary and Secondary	Annual	53 ppb	50 ppb	50 ppb	Annual mean
PM_{10}	Primary and Secondary	24-hour	150 $\mu g/m^3$	Same as NAAQS	Same as NAAQS	Not to be exceeded more than once per year on average over 3 years
		Annual	—	50 $\mu g/m^3$	50 $\mu g/m^3$	Annual arithmetic mean
$PM_{2.5}$	Primary and Secondary	Annual	15.0 $\mu g/m^3$	—	Same as NAAQS	Annual mean, averaged over 3 years
		24-hour	35 $\mu g/m^3$	—	Same as NAAQS	98th percentile, averaged over 3 years
Ozone	Primary and Secondary	8-hour	0.075 ppm	—	0.08 ppm	Annual fourth-highest daily maximum 8-hour concentration, averaged over 3 years
	N/A	1-hour	—	0.10 ppm	—	Not to be exceeded more than once per year
Sulfur Dioxide	Primary	1-hour	75 ppb	500 ppb	—	99th percentile of 1-hour daily maximum concentrations, averaged over 3 years
	N/A	24-hour	—	0.1 ppm	0.1 ppm	Not to be exceeded more than once per year (state)
	N/A	Annual	—	0.02 ppm	0.02 ppm	Arithmetic average over any four consecutive quarters (state)
	Secondary	3-hour	0.5 ppm	—	0.5 ppm	Not to be exceeded more than once per year

*Form differs from NAAQS; not be exceeded more than once over 12 consecutive months.

Sources: EPA 2012b; MTDEQ 2011; Wyoming DEQ 2010.

AIR QUALITY AT YELLOWSTONE NATIONAL PARK

The climate in Yellowstone is characterized by cold winters and mild to warm summers. During the winter months, the average daytime temperature ranges from 0°F (17.8°C) to 20°F (-6.7°C). Subzero overnight temperatures are common during the winter. The prevailing winds during the winter months are

generally from the west and west–southwest (NPS 2009a; WRCC 2002). Annual snowfall averages near 150 inches; however, it is not uncommon for higher elevations to get twice that amount. In general, Yellowstone weather is unpredictable at all times of the year (ALL Trips n.d.; NPS 2010f). Air pollutant emissions can be transported long distances, eventually affecting air quality sensitive resources in parks hundreds of kilometers downwind of sources (NPS 2004b). The Wyoming Department of Environmental Quality is the governing authority for regulating air pollution from stationary sources in Wyoming. Because there is little industrial activity and a relatively low population in northwestern Wyoming, the overall air quality in the park is good (NPS 1998a). Regional sources of air pollutants that could affect Yellowstone include electric utility power plants, oil and gas processing, coal bed methane wells, industrial fossil-fuel combustion, and agriculture. Local sources of air pollution include automobiles, snowmobiles, and wildland fires (NPS 2007a). As previously described, several counties within a 186-mile radius of the park are designated in non-attainment for PM_{10}, SO_2, and/or lead NAAQS as a result of various local and regional sources of air pollutants.

AIR QUALITY RELATED VALUES

As previously described, the AQRVs of Yellowstone include visibility, water quality, soils, vegetation, and wildlife. Although visibility in the park is still superior to that in many parts of the country, visibility in the park is often affected by haze (light-scattering pollutants). The Environmental Protection Agency's (EPA's) regional haze regulations require states to establish goals for each Class I air quality area to improve visibility on the haziest days and ensure that no degradation occurs on the clearest days (NPS 2007a).

Secondary pollutants such as sulfates and nitrates, produced by industrial sources and automobile emissions, can result in the deterioration of visibility in park units and contribute to acid deposition, which leads to impacts in forests. Acid deposition, commonly referred to as acid rain, occurs when acidic materials are transferred from the atmosphere to the earth in either wet (rain, sleet, snow, fog) or dry (gases, particles) form. The main chemical precursors leading to acidic conditions are atmospheric concentrations of SO_2 and NO_x. When these two compounds react with water, oxygen, carbon dioxide, and sunlight in the atmosphere, the result is sulfuric acid (H_2SO_4) and nitric acid (HNO_3), the primary agents of acid deposition (Ecological Society of America 2000). Although there are currently no standards for levels of sulfates or nitrates in ambient air, these pollutants may present a concern for ecosystem health in park units.

Certain headwater lakes in the park are potentially sensitive to atmospheric deposition (deposited material) of sulfur and nitrogen compounds because of their low acid neutralizing capacity. Their snowmelt-dominated hydrology makes them vulnerable to episodic acidification in the spring, and possibly chronic acidification. In addition, high-elevation soils may be poorly buffered and sensitive to acidification (NPS 2006b, 2007a).

Soils and vegetation in the park may be sensitive to nutrient enrichment from nitrogen deposition as well. In some parts of the country, including other high-elevation ecosystems in the Rocky Mountains, nitrogen deposition has altered soil nutrient cycling and vegetation species composition. Native plants that have evolved under nitrogen-poor conditions have been replaced by invasive species that are able to take advantage of increased nitrogen levels (NPS 2007a).

Wildlife is considered an AQRV at Yellowstone; however, there is currently no information indicating that wildlife species in the park are being affected by air pollutants (NPS 2006b).

Effects of OSVs on Air Quality Related Values

Atmospheric and snowpack concentrations of OSV emitted pollutants have decreased in response to best available technology (BAT) implementation, and current emission levels from OSVs likely do not compromise ecosystem health in a measurable way. For a detailed review addressing the potential effects of OSV emissions on nitrate deposition, biota, soils, the snowpack, runoff and surface waterbodies, refer to the Scientific Assessment of Yellowstone National Park Winter Use (NPS 2011f).

AIR QUALITY CONDITIONS AND TRENDS

The NPS measures progress toward improving park air quality by examining trends for key air quality indicators, such as visibility, which affects how well and how far visitors can see; atmospheric deposition, which affects ecological health through acidification and fertilization of soil and surface waters; and ozone, which affects human health and native vegetation. The NPS monitors one or more of these indicators in 57 park units, including Yellowstone National Park, and there is sufficient data to assess conditions and trends in all of these parks. In addition, many state and local air quality monitoring stations are near enough to parks that the data they collect are considered reasonably representative of park air quality. Air quality trends provide one measure of performance and progress. In general, air quality that is improving, or showing no degrading trend, may be considered a sign of success. In accordance with the Government Performance and Results Act, the NPS has established performance goals based on air quality trends and reports annually on progress toward these goals (NPS 2009b). For fiscal year 2011, Yellowstone's goal was for air quality to remain stable or improve (NPS 2011d).

In addition to determining the trends in air quality, the NPS is interested in assessing the condition of the air resources in NPS units, including Yellowstone. To assess conditions, the NPS Air Resources Division (ARD) uses all available monitoring data collected from NPS, EPA, state, tribal, and local monitors over a five-year period to derive estimates of the air quality parameters at all national park system units in the continental United States. The NPS ARD uses these data to develop an index for each type of air quality data collected (visibility, ozone concentrations, and wet deposition) that assigns air quality to one of three condition categories (NPS 2011g): air quality is a significant concern, air quality is in moderate condition, or air quality is in good condition.

Based on this air quality rating guidance published by the NPS ARD (NPS 2011g), the year-round air quality condition at Yellowstone is rated as a "significant concern" for nitrogen wet deposition (deposited nitrogen to the earth's surface through precipitation). It is rated a "moderate condition" for ozone, visibility, and sulfur wet deposition (deposited sulfur through precipitation) (table 17). However, it should be noted that the "significant concern" condition for nitrogen wet deposition is due to regional sources and is not related to OSVs (refer to the Scientific Assessment of Yellowstone National Park Winter Use (NPS 2011f)). An NPS review of air quality trends from 1998 to 2008 shows no statistically significant change in nitrogen or sulfur wet deposition or visibility on hazy days. Visibility on clear days improved over this period (a statistically significant trend) and vegetation ozone exposure decreased (although not statistically significantly).

The stations where these trends are measured are not specifically related to winter OSV use; however, monitoring these key indicators provides a general overview of year-round air quality conditions and trends at the park, which is valuable when assessing air quality as it relates to winter use.

GENERAL AIR QUALITY TRENDS RELATED TO OSV USE

By the late 1990s, an average of 795 snowmobiles entered the park each day, resulting in high levels of pollution from CO, PM, and hydrocarbons. All snowmobiles at that time were two-stroke machines, which result in greater emissions of CO and PM than current four-stroke machines. The final 2000 Winter Use Plan/EIS proposed banning snowmobiles and only allowing snowcoaches (four-stroke snowmobiles were not available at the time). Subsequent winter use plans proposed addressing impacts on air quality (among other issues) using a combination of new technologies, limits on vehicle numbers, and mandatory use of guides (NPS 2010c). All plans proposed allowing a combination of snowmobiles and snowcoaches. Snowmobile numbers decreased from plan to plan and snowcoach numbers remained consistent.

TABLE 17: CONDITION OF AIR RESOURCES AT YELLOWSTONE NATIONAL PARK

Air Quality Resource	Condition Rating Criteria	Condition (2006-2010)[a]	1998-2008 Trend[b]
Visibility	Current Group 50 minus estimated Group 50 Natural (deciviews)[c] > 8 = Significant Concern 2-8 = Moderate < 2 = Good	Moderate (3.1 deciviews)	Improving on clear days (statistically significant ($p \leq 0.05$)), no significant trend on hazy days
Nitrogen Wet Deposition	Wet Deposition of N or S (kg/ha/yr)[d] > 1 = Significant Concern < 1 = Moderate	Significant Concern (1.9 kg/ha/yr)	No statistically significant trend
Sulfur Wet Deposition		Moderate (0.8 kg/ha/yr)	No statistically significant trend
Ozone	Vegetation ozone exposure (W126)[e] > 13 ppm-hrs Significant Concern 7-13 ppm-hrs Moderate < 7 ppm-hrs Good	Moderate (10.5 ppm-hrs)	Possibly improving, but no significant trend

[a] Based on NPS ARD 2006–2010 5-year average estimates (NPS ARD 2012a, 2012b, 2012c) Criteria provided in NPS ARD 2011.

[b] NPS ARD 2010.

[c] Group 50 is defined as the mean of the visibility observations falling within the range from the 40th through the 60th percentiles. The metric compares actual visibility with estimated natural visibility.

[d] The criteria shown are the more stringent criteria that NPS applies to parks in certain ecosystems in the west that are considered nitrogen or sulfur sensitive, including Yellowstone. A threshold for the "good" condition has not been determined for nitrogen and sulfur wet deposition in Yellowstone. Natural wet deposition in the west has been estimated at 0.13 kg/ha/yr (NPS 2011g).

[e] Some types of vegetation are more sensitive to ozone than humans are. The W126 measures cumulative ozone exposure over the growing season. The NPS has rating criteria for human health based 8-hour ozone standard and Yellowstone would be in the "moderate" category based on the human health ratings (65.9 ppm 4th highest 8-hour ozone concentration for 2006-2010).

The implementation of BAT requirements and the reduction in the number of OSVs entering the park during the managed use era dramatically reduced CO, PM, and hydrocarbon emissions. Maximum 8-hour CO concentrations at Old Faithful have declined from 1.2 ppm in 2002/2003 to 0.3 ppm in 2010/2011. Similar results were found the West Entrance, with the exception of an elevation to 1.7 ppm in 2009/2010, then went back down to 0.9 ppm in 2010/2011 (table 20). The 98th percentile $PM_{2.5}$ concentrations at Old Faithful have decreased from 21 $\mu g/m^3$ in 2002/2003 to 4.0 $\mu g/m^3$ in 2010/2011 (Ray 2008; Ray 2012a). In addition to BAT requirements and lower snowmobile numbers, improvements

in air quality have been assisted by guiding (guides help ensure the use of BAT and encourage users to keep idling to a minimum) and changes in entrance station procedures to lessen idling OSVs.

The substantial CO and PM emissions reductions from implementing BAT requirements have come with one important tradeoff—an increase in NO_x emissions. Snowmobiles that meet BAT requirements have higher NO_x emissions than snowmobiles that do not meet BAT requirements. Also, diesel snowcoaches have higher NO_x emissions than gasoline snowcoaches. Starting the winter season of 2009/2010, the park began measuring NO_x emissions in the form of NO_2. Results for the 2009/2010 season indicated that NO_2 concentrations at the West Entrance were slightly below 50 percent of the recently established 1-hour NO_2 standard of 100 ppb. During the 2010/2011 season, the NO_2 values peaked at near 40 percent of the NAAQS (Ray 2012a). For the 2010/2011 season, there were a total of four daily maximum NO_2 values above 30 ppb, and the average daily maximum 1-hour NO_2 values over the winter season for days on which data was available was 11.8 ppb (Ray 2012b). The available monitoring data supports the conclusion that the park is well below the NAAQS for NO_2. There is an insufficient record of NO_2 monitoring data to draw firm conclusions about NO_2 concentration trends in the park at this time. The NPS will continue NO_2 monitoring to better understand any trends in concentrations and the relationship between NO_2 concentrations and specific OSV types (BAT snowmobiles and snowcoaches).

AIR QUALITY MONITORING IN YELLOWSTONE NATIONAL PARK

Air quality monitoring has occurred at Yellowstone since 1980 when the park initiated wet deposition monitoring as part of the National Atmosphere Deposition Program/National Trends Network. The site for wet deposition monitoring is at Tower Ranger Station. Dry deposition has been estimated for Yellowstone since 1996 as part of the Clean Air Status and Trends Networks (NPS 2006c). Additional air quality monitoring at the park includes the following:

Wet Deposition—The process by which aerosol particles collect or deposit themselves on solid surfaces, decreasing the concentration of the particles in the air. Acid rain is one form of wet deposition.

- Air Atlas—Air Atlas is a geographical information system (GIS) database of air quality estimates for 270 parks that are part of the NPS Inventory and Monitoring Program. These estimates are often used when on-site monitoring data is not available (NPS 2006c).
- Night Skies—Air pollution and poor quality outdoor lighting degrade night skies. Optical monitoring to collect baseline data on night sky brightness at the park was conducted in 2005. Optical measurements can produce not only a measure of night sky brightness and identification of light pollution sources, but also a measure of the effect of the atmosphere on light scattering caused by fine particulates and other air pollutants, as well as moisture (NPS 2006b, 2006c).
- Mercury Monitoring—Mercury in rainfall is monitored in the park as part of the Mercury Deposition Network, which was initiated in 2002 at Yellowstone. The monitoring site is at Tower Ranger Station. Both distant industrial sources and local geothermal sources contribute to mercury deposition in the park (NPS 2006c, 2007a).
- Ozone Monitoring—Ozone has been monitored with a continuous analyzer in the park since 1987. Data indicate that ozone concentrations and doses are not currently at levels known to cause injury to natural resources like vegetation, although no systematic surveys to assess vegetation injury have been performed in the park (NPS 2007a).
- Visibility Monitoring—As part of the Interagency Monitoring of Protected Visual Environments Network, visual air quality in the park has been monitored since 1981 using a variety of methods, including an aerosol sampler, a transmissometer, a nephelometer, an automatic 35-mm camera, a digital camera, and a time-lapse video camera (NPS 2007a).

There are several air monitors within and in the immediate vicinity of Yellowstone. One network air quality station is near Yellowstone Lake maintenance facility on the north end of the lake, approximately 1/2 mile away from a moderately used OSV route (Site ID 560391011) (EPA 2009e; Ray 2008). The lake station measures meteorology as well as ozone, sulfate, nitrate, nitric acid, sulfur dioxide, and PM as part of the Clean Air Status and Trends Networks and Interagency Monitoring of Protected Visual Environments monitoring network. Another air quality station, near the Tower Ranger Station (near a wheeled vehicle road and 15 miles from the nearest OSV route), measures wet deposition for mercury, sulfates, nitrates, and ammonium as part of the National Atmosphere Deposition Program/National Trends Network national deposition monitoring network (Ray 2008). Results for ozone monitoring at the lake station are summarized in table 18, which presents a trend of general fluctuation in airborne concentrations of ozone that have remained below the current 8-hour NAAQS of 0.075 ppm and the Montana 1-hour standard of 0.1 ppm.

TABLE 18: RESULTS OF OZONE MONITORING AT YELLOWSTONE NATIONAL PARK, 1998–2011

Site ID	Location	County	Year	2nd Highest 1-hour Max (ppm)[a]	4th Highest 8-hour Max (ppm)[b]
560391011	Yellowstone National Park	Teton County, Wyoming	1998	0.070	0.066
			1999	0.078	0.071
			2000	0.073	0.065
			2001	0.076	0.066
			2002	0.073	0.066
			2003	0.071	0.065
			2004	0.065	0.060
			2005	0.068	0.060
			2006	0.074	0.069
			2007	0.073	0.065
			2008	0.070	0.065
			2009	N/A	0.063
			2010	0.070	0.066
			2011	0.070	0.066

Source: EPA 2012.

[a] The Montana air quality standard for 1-hour ozone concentrations is 0.1 ppm (not be exceeded more than once per year). With some limited exceptions, the 1-hour ozone NAAQS has been revoked.

[b] The NAAQS for ozone is 0.075 ppm and is based on the annual fourth-highest daily maximum 8-hour concentration, averaged over 3 years.

N/A = not applicable.

The EPA has data for $PM_{2.5}$ from 2003 to 2008 from one location in the park near the West Entrance (Site ID 300310013) and PM_{10} monitoring from 1998 to 2006 from one location in West Yellowstone, Montana (Site ID 300310012), outside the park boundary in the community of West Yellowstone. The monitoring site at the West Entrance was established in 1998 to measure CO, and continuous $PM_{2.5}$ monitoring was added in 2003. The West Entrance was moved about 0.25 mile farther into the park in spring 2008, and the air quality monitoring station was similarly relocated (MTDEQ n.d.). Results for $PM_{2.5}$ and PM_{10} monitoring for the two stations are summarized in table 19, which presents a trend of general decline since 1998 in PM_{10} that has remained well below the current 24-hour standard of

150 µg/m^3. Results for $PM_{2.5}$ monitoring at the West Entrance present a trend of considerable fluctuation since 2003; however, concentrations have remained well below the current 24-hour and annual standards of 35 µg/m^3 and 15 µg/m^3, respectively (EPA 2009e).

TABLE 19: RESULTS OF $PM_{2.5}$ AND PM_{10} MONITORING AT YELLOWSTONE NATIONAL PARK

Site ID	Location	Year	$PM_{2.5}$ (µg/m^3)		PM_{10} (µg/m^3)	
			Daily Value [a]	Annual Mean	Daily Value [a]	Annual Mean
300310012	Firehole, West Yellowstone [b]	1998	—	—	45	19
		1999	—	—	48	18
		2000	—	—	39	18
		2001	—	—	42	18
		2002	—	—	30	15
		2003	—	—	40	17
		2004	—	—	32	15
		2005	—	—	32	15
		2006	—	—	21	9
300310013	Yellowstone National Park, West Entrance [c]	2003	4.1	2.47	—	—
		2004	10.2	4.68	—	—
		2005	6.8	3.67	—	—
		2006	10.3	4.26	—	—
		2007	10.4	5.00	—	—
		2008	4.7	3.80	—	—

Source: EPA 2009e.

[a] Fourth highest 24-hour maximum.

[b] Outside the park boundary, in the town of West Yellowstone. Data after 2006 not available.

[c] Data after 2008 not available for monitor 300310013.

— Data not available.

Since 2003, ambient monitoring has been used in the winter to determine CO and $PM_{2.5}$ concentrations at two locations in the park, one at Old Faithful (Site ID 560391012) and another at the West Entrance (Site ID 300310013), as part of the adaptive management program on the use of OSVs. CO and $PM_{2.5}$ are also monitored outside the park in the town of West Yellowstone, Montana, in cooperation with the park (Ray 2010a). Results for CO and $PM_{2.5}$ monitoring at the three stations are summarized in tables 20 and 21.

As part of the adaptive management program on the use of OSVs. CO and $PM_{2.5}$ are also monitored outside the park in the town of West Yellowstone, Montana, in cooperation with the park (Ray 2010a).

TABLE 20: RESULTS OF WINTER CARBON MONOXIDE (PPM) MONITORING AT YELLOWSTONE NATIONAL PARK MONITORING STATIONS

Old Faithful									
Winter Carbon Monoxide	**2010/2011[a]**	**2009/2010**	**2008/2009**	**2007/2008**	**2006/2007[a]**	**2005/2006**	**2004/2005**	**2003/2004**	**2002/2003**
Max 1-hour	1.0	2.5	1.1	0.9	0.9	1.6	1.6	2.2	2.9
% of Standard	3%	7%	3%	2%	3%	4%	4%	6%	8%
Max 8-hour	0.3	0.8	0.4	0.4	0.4	0.5	0.8	0.9	1.2
% of Standard	3%	9%	4%	5%	4%	6%	7%	10%	13%
Average	0.19	0.19	0.14	0.19	0.27	0.18	0.12	0.26	0.24
90th percentile [b]	0.26	0.25	0.18	0.24	0.19	0.26	0.29	0.50	0.50
West Entrance									
Winter Carbon Monoxide	**2010/2011**	**2009/2010**	**2008/2009**	**2007/2008**	**2006/2007**	**2005/2006**	**2004/2005**	**2003/2004**	**2002/2003**
Max 1-hour	4.3	7.6	2.4	6.1	3.7	2.1	2.8	6.4	8.6
% of Standard	12%	22%	7%	17%	11%	6%	8%	18%	25%
Max 8-hour	0.9	1.7	0.6	1.6	0.8	0.9	1.0	1.3	3.3
% of Standard	10%	19%	6%	18%	9%	10%	11%	14%	37%
Average	0.18	0.21	0.22	0.23	0.19	0.23	0.24	0.26	0.57
90th percentile [b]	0.3	0.4	0.3	0.4	0.27	0.4	0.43	0.5	1.3
West Yellowstone, Montana [c]									
Winter Carbon Monoxide	**2010/2011**	**2009/2010**	**2008/2009**	**2007/2008**	**2006/2007**	**2005/2006**	**2004/2005**	**2003/2004**	**2002/2003**
Max 1-hour	4.5	3.6	7.9	6.7	5.0	—	—	—	—
% of Standard	13%	10%	23%	19%	14%	—	—	—	—
Max 8-hour	1.6	1.9	3.1	2.2	2.4	—	—	—	—
% of Standard	5%	5%	34%	25%	27%	—	—	—	—
Average	0.4	0.44	0.5	0.4	0.5	—	—	—	—
90th percentile [b]	0.7	0.8	0.9	0.7	0.9	—	—	—	—

Source: Ray 2010a.

[a] The visitor parking and the monitoring station moved due to construction at Old Faithful prior to the 2006/2007 season and 2010/2011 season. The monitoring station was moved again in the summer of 2011 from a location very near the entrance station to an alcove in the Old Faithful Visitor Education Center. The percent of standard (1 and 8 hour) increase in CO is believed to be a result of increased use of wood burning stoves to heat warming huts in the Old Faithful Developed Area.

[b] The 90th percentile is not used by the NAAQS. It is a useful measure to track higher concentrations without the points being dominated by possible statistical outliers.

[c] Outside the park boundary, in the town of West Yellowstone.

— Data not available from this source.

TABLE 21: RESULTS OF WINTER $PM_{2.5}$ (µG/M^3) MONITORING AT YELLOWSTONE NATIONAL PARK MONITORING STATIONS

Old Faithful									
Winter $PM_{2.5}$	2010/2011	2009/2010	2008/2009	2007/2008	2006/2007[a]	2005/2006	2004/2005	2003/2004	2002/2003
Max 1-hour	29	21	23	32	20	56	38	151	200
Max 24-hour	4	6	5.7	8.1	6.6	9	6	16	37
98th percentile [b]	4	6	5.2	5.8	6.4	9	9	9	21
% of Standard	23%	17%	15%	17%	18%	13%	14%	14%	33%
Average	2.6	3.2	3.1	3.2	3.3	3.5	4.0	4.9	6.9
West Entrance									
Winter $PM_{2.5}$	2010/2011	2009/2010	2008/2009	2007/2008	2006/2007	2005/2006	2004/2005	2003/2004	2002/2003
Max 1-hour	22	88	53	44	40	44	21	29	81
Max 24-hour	6	7	5.1	9.5	8.8	7	6	8	15
98th percentile [b]	6	5	4.8	7.8	8.7	6	6	7	17
% of Standard	20%	15%	14%	22%	25%	10%	9%	11%	26%
Average	0.7	1.0	1.5	2.6	2.1	1.9	2.9	4.0	8.2
West Yellowstone, Montana [c]									
Winter $PM_{2.5}$	2010/2011	2009/2010	2008/2009	2007/2008	2006/2007	2005/2006	2004/2005	2003/2004	2002/2003
Max 1-hour	184	154	145	167	119	—	—	—	—
Max 24-hour	33	38	27.5	24.7	32	—	—	—	—
98th percentile [b]	28	36	27	22	32	—	—	—	—
% of Standard	80%	103%	77%	63%	91%	—	—	—	—
Average	11.6	12.2	12.3	5.6	12.9	—	—	—	—

Source: Ray 2008, 2010a.

[a] The visitor parking and the monitoring station moved due to construction at Old Faithful.

[b] Statistic that best relates to the NAAQS standard at the time of the measurement (65 µg/m^3). Based on daily 24-hour average.

[c] Outside the park boundary, in the town of West Yellowstone.

— Data not available from this source.

As described in chapter 1, after the institution of BAT requirements for snowmobiles and limitations on the total number of OSVs permitted in the park, air quality improved quickly between the winters of 2002/2003 and 2003/2004 (Ray n.d.). CO concentrations decreased through the 2008/2009 winter season, with some fluctuation, since the 2002/2003 winter season. Measurements of the 8-hour CO levels improved from 1998/1999 to 2010/2011 by ten times except for in 2009/2010, where there was a slight elevation in CO, which dropped back down again in 2010/2011. These increased values are believed to be a result of the increased use of wood stoves to heat warming huts. Also in 2011/2012, the CO air quality monitoring station was temporary relocated to an alcove in the Old Faithful Visitor Education Center close to where most OSVs enter the Old Faithful Developed Area. The CO monitor was also very near the emergency generator. Part of the increased CO levels are believed to be a result of the close proximity to the generator which is run on regular intervals for testing purposes.

Maximum 1-hour concentrations of $PM_{2.5}$ have fallen at the Old Faithful monitoring location from 200 µg/m^3 during the 2002/2003 winter season to 23 µg/m^3 during the 2008/2009 winter season. Similarly, at the West Entrance monitoring location, maximum 1-hour concentrations have fallen from

81 µg/m^3 during the 2002/2003 winter season to 53 µg/m^3 during the 2008/2009 winter season, with a low (between 2002 and 2009) of 21 µg/m^3 reported for the 2004/2005 winter season.

Overall, from 2003 to 2011, air quality stabilized at the monitoring stations in the park, with the exception of the noted increased in 2010. These positive trends in air quality are primarily the result of BAT requirements for snowmobiles, fewer snowmobiles entering the park in recent years, and carbureted snowcoaches being replaced with modern fuel injected engines. Requiring the use of only BAT snowmobiles has improved emissions despite the increasing number of snowcoaches now entering the park. Although these changes present an overall positive trend toward lower emissions by OSVs, other local sources, such as uncontrolled wood stoves in warming huts and some facilities in the park, still contribute to winter CO and $PM_{2.5}$ concentrations.

More recent air quality monitoring in the park (Ray 2008, 2010a) revealed that although air quality at Yellowstone meets the national standards set by the EPA for CO and $PM_{2.5}$ to protect human health, CO, is present above regional background concentrations (between 0.1 and 0.2 ppm) in areas near vehicle routes during the winter (Ray 2012a).

On February 9, 2010, the EPA announced a revised NO_2 standard of 100 ppb as a 1-hour average (75 FR 6474).

On February 9, 2010, the EPA announced a revised NO_2 standard of 100 ppb as a 1-hour average (75 FR 6474). This standard was promulgated as a result of scientific evidence linking short-term NO_2 exposures with increases in asthma and other respiratory illness, and the new standard is a significant change from the previous 53 ppb annual average. Because hourly NO_2 data had not been collected at Yellowstone previously, a joint plan with the Montana Department of Environmental Quality was created to do exploratory winter NO_x monitoring at the West Entrance. Monitoring equipment was installed at the West Entrance just before the opening of the winter season in December 2009.

Two different NO_2 analyzers were used during the 2009/2010 study; the first analyzer barely passed audit and calibration checks, but the second analyzer was new and performed well and was also used for measurements in the 2010/2011 winter season. Although NO_2 concentrations of just under 50 percent of the NAAQS (100 ppb 1-hour average) were observed with the first analyzer, the more reliable values are from the replacement analyzer, which recorded NO_2 concentrations up to 18 percent of the standard (Ray 2010b). In 2010/2011, this reading peaked at near 40 percent of the NAAQS (Ray 2012a). For the 2010/2011 season, there were a total of four daily maximum NO_2 values above 30 ppb, and the average daily maximum 1-hour NO_2 values over the winter season for days on which data was available was 11.8 ppb (Ray 2012b). The available monitoring data supports the conclusion that the park is in compliance with the NAAQS for NO_2. There is an insufficient record of NO_2 monitoring data to draw firm conclusions about NO_2 concentration trends in the park at this time. The NPS will continue NO_2 monitoring to better understand trends in concentrations and the relationship between NO_2 concentrations and specific OSV types.

SOUNDSCAPES AND THE ACOUSTIC ENVIRONMENT

INTRODUCTION

Pursuant to NPS *Management Policies 2006* and Director's Order 47: Sound Preservation and Noise Management, an important component of the NPS mission is the preservation of natural soundscapes associated with national park units (NPS 2006a, 2000d). Natural soundscapes exist in the absence of human-caused sound (or what this document calls "noise," defined as unwanted, undesired, or unpleasant sound). The natural soundscape is the aggregate of all the natural sounds that occur in parks, together with the physical capacity for transmitting natural sounds. Natural sounds are intrinsic elements of the

environment and part of "the scenery and the natural and historic objects and the wild life" protected by the NPS Organic Act. They are vital to the visitor experience of many parks and provide valuable indicators of the health of various ecosystems. Noise is a concern because it can impede ecological function and diminish the ability of the NPS to accomplish its resource protection mission.

Natural sounds are necessary for ecological functioning and occur within and beyond the range of sounds that humans can perceive. Many mammals, insects, and birds decipher sounds to find desirable habitat and mates, avoid predators and protect young, establish territories, and meet other survival needs.

The natural soundscape is the aggregate of all the natural sounds that occur in parks, together with the physical capacity for transmitting natural sounds. Natural sounds are intrinsic elements of the environment and part of "the scenery and the natural and historic objects and the wild life" protected by the NPS Organic Act.

A majority of park visitors value and enjoy natural sounds, solitude, and quiet (Mace, Bell, and Loomis 2004). The opportunity to experience natural sounds is perceived by winter visitors to be important to both the value of Yellowstone and the visitors' experiences (Freimund et al. 2009). For many visitors, the ability to hear clearly the delicate and quieter intermittent sounds of nature, the ability to experience interludes of extreme quiet for their own sake, and the opportunity to do so for extended periods of time are important reasons for visiting national parks.

OVERVIEW OF YELLOWSTONE SOUNDSCAPES

Winter soundscapes in Yellowstone consist of both natural sounds and non-natural noises. Bird and animal calls, running water, wind, and thermal activity (e.g., geysers and hot springs) contribute natural sounds to Yellowstone. Non-natural noises have included those produced by snowmobiles, snowcoaches, snow groomers, aircraft, human voices, wheeled vehicles, and building operations (Burson 2011). The Dictionary of Acoustics refers to such unwanted or extraneous sound as noise. Yellowstone's soundscapes have varied greatly with location, time of day, and time of year. The audibility of OSVs in the park is influenced by environmental conditions including type of terrain, vegetation cover, wind speed and direction, presence of natural sounds (wind, bird calls, and geyser activity), snow cover, and other atmospheric conditions. In general, low frequency sounds travel farther from the source at lower temperatures and wind speeds, which often signal the presence of temperature inversions. Wind sounds often mask low-level motorized sound, limiting the audibility of motorized sounds at a site; the frequency of the sound and any movement of the other sound source also contribute to audibility.

Yellowstone's winter soundscapes, as experienced by most visitors, have included noise emanating from OSV use (Burson 2009), because most visitors either used OSVs to tour the park or stayed within two miles of motorized routes if engaging in non-motorized uses. Overall, the audibility of OSVs has been reduced since the 2002/2003 winter season by limiting the number of OSVs allowed in the park daily, requiring visitors to use BAT snowmobiles, limiting motorized access to a few park roads and travel corridors, and enforcing lower speed limits. Results of soundscape monitoring conducted from 2003 to 2011 show that although certain areas of the park had some of the lowest sound levels ever recorded (Burson 2004–2011), many travel corridors and developed areas, particularly those near motorized routes or with heavy use, experienced higher sound levels than natural ambient conditions.

Yellowstone's winter soundscapes, as experienced by most visitors, include sound from OSV use (Burson 2009), because most visitors either use OSVs to tour the park or stay within two miles of motorized routes if engaging in non-motorized uses.

SOUNDSCAPES TERMINOLOGY

This section introduces the key terms used to evaluate soundscapes, and discusses the factors that influence human perception of sounds.

Noise—Noise is defined in the Dictionary of Acoustics as "unwanted or extraneous sound." At Yellowstone, OSVs emit noise that is produced primarily by the engine and tracks and skis.

Percent Time Audible—Percent time audible is an important measure because it quantifies the fraction of the time in which visitor appreciation of the soundscape may be degraded by the perception of noise. It also provides a protective estimate of the duration of potential wildlife impacts, because humans are better able to detect low frequency sounds than almost any other vertebrate in North America. The threshold at which noise is perceived is determined by the sensitivity of human hearing during quiet conditions in Yellowstone, and by the background sound levels when they are elevated above the human threshold of hearing by flowing water, geyser activity, wind, or other sounds. At Yellowstone, a substantial proportion of the audible noise duration is at very low noise levels, so small changes in listener attention or background sound levels can cause notable changes in percent time audible. Percent time audible is a metric used to describe the amount of time during the analysis period (e.g., hour, day, or season) that OSVs are audible to a human with normal hearing. The audibility of OSVs is determined, in part, by the natural ambient sound levels. Lower natural ambient sound levels result in higher OSV percent time audible. The converse is also true: higher natural ambient sound levels result in lower OSV percent time audible. The percent time audible indicator does not provide information on how loud or quiet OSV noises are, only whether they are audible or not. Therefore, additional indicators of sound levels are also important to consider in conjunction with percent time audible.

Length of Time Audible for Discrete OSV Passby Events—Length of time audible is defined as the length of time that a discrete pass-by of either a single snowcoach (snowcoach transportation event) or single group of snowmobiles (average group size of 6.7) (snowmobile transportation event) is audible. The length of time OSV noise is audible can be ascertained from data collected at a number of sites throughout the park.

Sound Levels—The magnitude of noise is described by its sound pressure. Because the range of sound pressure varies greatly, the logarithmic scale decibel (dB) is used to relate sound pressure. Sound pressures described in dBs are often defined in terms of frequency-weighted scales. A sound level measurement is usually expressed as an A-weighted average energy value over a specified time interval. A-weighting provides a method of summing sound energy across the audible spectrum in a way that approximates human judgments of loudness; in other words, how loud people would perceive a sound to be. The standard way to express these measurements is $LA_{eq,T}$, where "T" refers to the time interval for the measurement, "A" refers to A-weighting, and "L_{eq}" refers to the energy averaging. This notation is a bit cumbersome, so this document will follow a widely used shorthand and refer to "dBA" for A-weighted decibel. Unless otherwise noted, the time interval for the energy averaging ("T") is 1 second in all NPS measurements and modeling. Several examples of sound pressure levels in dBA scale are listed in table 22. For comparison typical sounds found in Yellowstone in the winter include the interior noise level of the loudest snowcoach at cruising speed (84 dBA), the interior noise level of the quietest snowcoach at cruising speed (70 dBA), and a four-stroke snowmobile going 30 miles per hour, at 50 feet (65-70 dBA).

TABLE 22: DECIBEL LEVELS OF COMMON NOISE SOURCES

Noise	Noise Level (dB)	Effect
Boom Cars	145	
Jet Engines (near)	140	
Shotgun Firing Jet Takeoff (100-200 ft.)	130	
Rock Concerts (varies)	110–140	Threshold of pain begins around 125 dB
Oxygen Torch	121	
Discotheque/Boom Box Thunderclap (near)	120	Threshold of sensation begins around 120 dB
Stereos (over 100 watts)	110–125	
Symphony Orchestra Power Saw (chainsaw) Pneumatic Drill/Jackhammer	110	Regular exposure to noise over 100 dB of more than one minute risks permanent hearing loss.
Jet Flyover (1000 ft.)	103	
Electric Furnace Area Garbage Truck/Cement Mixer	100	No more than 15 minutes of unprotected exposure recommended for noises between 90–100 dB.
Farm Tractor	98	
Newspaper Press	97	
Subway, Motorcycle (25 ft.)	88	Very annoying
Lawnmower, Food Blender Recreational Vehicles, TV	85–90 70–90	85 dB is the level at which hearing damage (8 hrs.) begins
Diesel Truck (40 mph, 50 ft.)	84	
Average City Traffic Garbage Disposal	80	Annoying; interferes with conversation; constant exposure may cause damage
Washing Machine	78	
Dishwasher	75	
Vacuum Cleaner, Hair Dryer	70	Intrusive; interferes with telephone conversation
Normal Conversation	50–65	
Quiet Office	50–60	Comfortable hearing levels are under 60 dB
Refrigerator Humming	40	
Whisper	30	Very quiet
Broadcasting Studio	30	
Rustling Leaves	20	Just audible
Normal Breathing	10	

Table from the National Institute on Deafness and Other Communicative Disorders at http://www.nidcd.nih.gov/health/education/teachers/pages/common_sounds.aspx. Accessed on February 5, 2013.

Because sound is described in a logarithmic scale (i.e., dBA), sound levels cannot be added by ordinary arithmetic. An increase of 3 dBA represents a doubling of sound energy, so two helicopters flying side-by-side would be 3 dBA louder than one. A 6-dBA increase represents four times more energy and this increase generally allows for sounds to be heard from twice as far. Decibels are often related to perceived loudness, and in some frequency bands a 10-dBA increase can result in sounds that seem twice as loud, even though this would correspond to multiplying the number of sound sources by 10. Urban noise studies have shown that community annoyance tends to double with every 5 dBA increase in noise (ANSI Standard 12.9-2005/Part 4, table F.1).

Sound Level Metrics—Sound levels depend on the distance from the sound source, the presence of natural sounds, and non-sound source variables such as atmospheric conditions, wind speed and direction, topography, snow cover, and vegetation cover.

Metrics used to describe sound levels include L_{eq}, L_{min}, L_{max}, L_{50}, and L_{90}. L_{eq} can be understood as the energy average sound level or the constant sound level that conveys the same energy as the variable sound levels during the analysis period. For example, the 8-hour L_{eq} levels discussed in this section take into account the magnitude and duration of OSV sound over an 8:00 a.m. to 4:00 p.m. analysis period (including times when OSV sounds are not audible).

L_{min}—The lowest sound level measured in the analysis period.

L_{max}—The maximum sound level measured in the analysis period.

L_{50}—The sound level exceeded 50 percent of the measurement period. L_{50} is the same as the median; the middle value where half the sound levels are above and half below.

L_{90}—The sound level exceeded 90 percent of the time during the measurement period. L_{90} is a useful measure of the natural sounds because in park situations, away from developed areas and busy travel corridors, the lowest 10 percent of sound levels are less likely to be affected by non-natural sounds. This measure is recommended by the American National Standards Institute (ANSI) to represent the background or residual sound level.

Human Perception of Sounds—Percent time audible, length of time audible, and sound level metrics (L_{eq}, L_{min}, L_{max}, L_{50}, and L_{90}) are important indicators of the condition of natural soundscapes. Percent time audible and sound level metrics are the appropriate focus of NPS monitoring and management of natural soundscapes because they are measurable and objective. However, in interpreting these metrics it is important to also consider that human perception of sounds is complex and depends on the setting. Research conducted on sound perception demonstrates that a person's evaluation of a sound depends on the information contained in the sound and the context in which it is received (Carles, Lopez Barrio, and de Lucio 1999; Abe et al. 2006). Specifically, perceived sound levels and evaluation of the sound vary with place, sound frequency, expectation of hearing the sound, individual experience of the listener, perceived "appropriateness" of the sound to the setting, movement of the sound relative to the listener, and visual cues (Blauert 1986; Kuwano, Namba, and Miura 1989; Carles, Lopez Barrio, and de Lucio 1999; Ozawa et al. 2003; Schulte-Fortkamp, Genuit, and Fiebig 2007). For additional detailed information regarding the factors influencing human perceptions of sounds, refer to the Scientific Assessment of Yellowstone National Park Winter Use, Section 5.1.3, "Factors that Determine Visitors' Interpretation of Sound" (NPS 2011f).

SOUNDSCAPES MONITORING

NPS has conducted winter soundscapes monitoring in Yellowstone since the 2003/2004 season (Burson 2004–2011). The most recent soundscapes monitoring data available is the 2010/2011 winter season (Burson 2011). A total of 23 locations in the park have been monitored during at least one winter season. Two locations have been monitored every season since monitoring began: Madison Junction 2.3 (100 feet off the West Entrance Road, 2.3 miles west of Madison Junction) and the Old Faithful Weather Station. Figure 8 shows the locations of the monitoring sites and indicates which sites were monitored during each winter season.

Automated acoustic monitors were used to collect 1-second L_{eq} sound levels and digital recordings. Digital recordings of the soundscape were either sampled for 10 seconds every 4 minutes, or were collected continuously, 24 hours per day. For sites and times that digital recordings were not collected continuously, additional 20-second recordings were made during sound events that exceeded 70 dBA for 1 second or exceeded 60 dBA for 10 seconds. The recordings were analyzed to determine the source of each audible sound (e.g., snowmobile, animal, aircraft, wind, thermal activity), as well as the percentage of time each sound source was audible. Detailed technical information on the soundscapes monitoring and data analysis can be found in Burson 2004–2011.

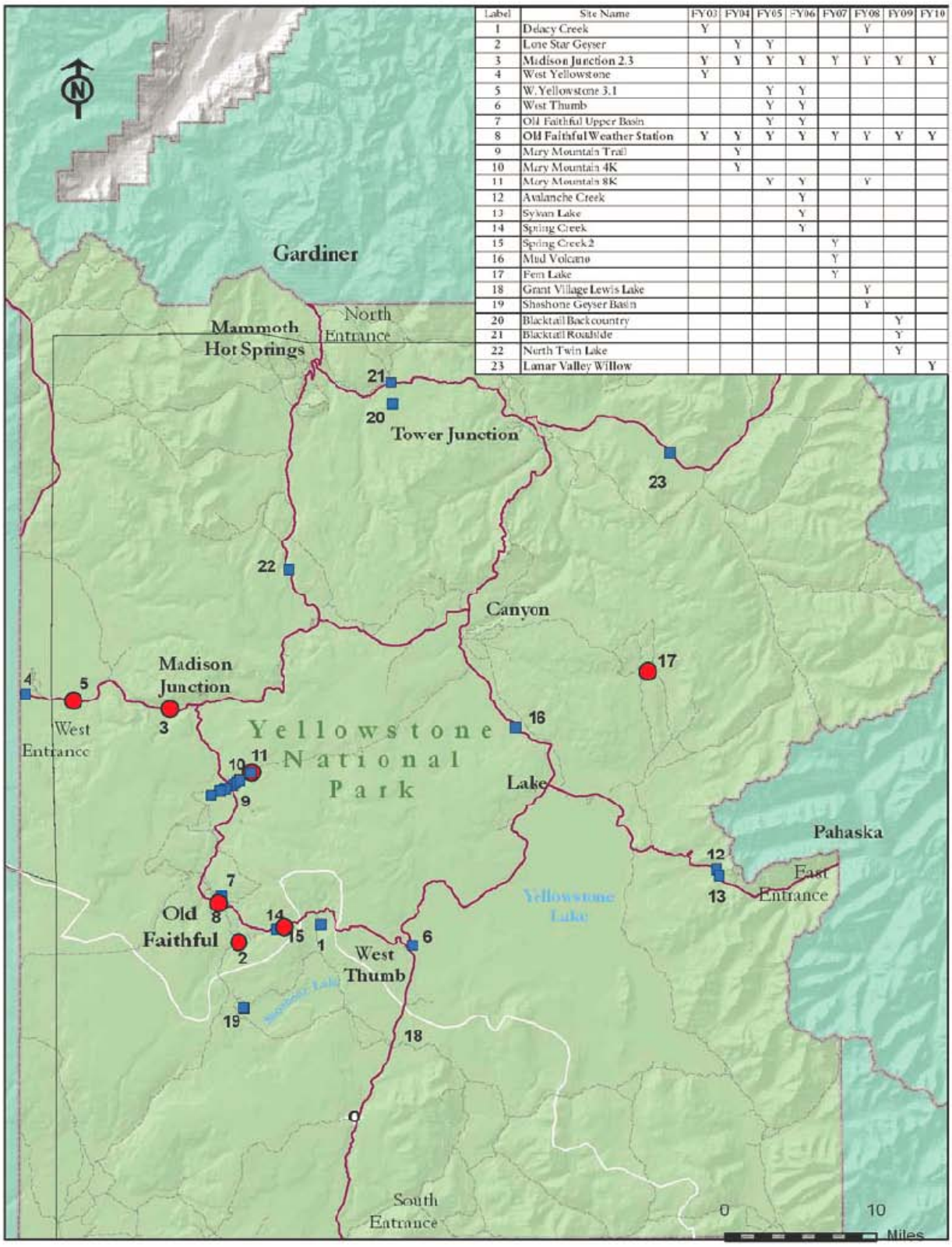
To distinguish between the various OSV user groups in the park (e.g., visitors, administrative), a separate observational study was conducted during seven winters, from 2005 to 2011. Data on the time audible and type of usage for each OSV were collected by observers at locations in developed areas and travel corridors (Burson 2011).

Percent Time Audible

Percent time audible metrics can vary considerably depending on the analysis period selected (e.g., hour, day). The 8:00 a.m. to 4:00 p.m. percent time audible provides a useful summary metric that reflects the time that most visitors are in the park. Table 23 summarizes the percent of the time between 8:00 a.m. and 4:00 p.m. that OSVs were audible at the Old Faithful Weather Station and Madison Junction 2.3. Table 24 summarizes the percent time audible information for other locations throughout the park that have been monitored only one or two years.

The monitoring results show that the highest percent time audible levels are in the most developed and heavily traveled portions of the park—Old Faithful and Madison Junction 2.3. Daily percent time audible is substantially lower (between 0 percent and 35 percent) in the transition and backcountry areas farther from road corridors. Based on all the available monitoring data, the average percent time audible was 59 percent for developed areas, 38 percent for travel corridors, 20 percent for transition zone, and 15 percent for backcountry areas (Burson 2011).

There is considerable variation in percent time audible among sites, even within the same management zone, due to factors such as regional topography and the number and type of OSVs on different road segments. Percent time audible does not always correlate with distance from roads. For example, the percent time audible at the Lone Star Geyser Basin site was 3 percent to 4 percent, compared to 18 percent at the Shoshone Geyser Basin site. The Shoshone Geyser Basin site is four miles farther from a road than the Lone Star Geyser Basin site. Topography and frequent, prolonged geyser activity were likely the reasons that OSVs were less audible at Lone Star Geyser than at Shoshone Geyser Basin (Burson 2010a).



Label	Site Name	FY03	FY04	FY05	FY06	FY07	FY08	FY09	FY10
1	Delacy Creek	Y					Y		
2	Lone Star Geyser		Y	Y					
3	Madison Junction 2.3	Y	Y	Y	Y	Y	Y	Y	Y
4	West Yellowstone	Y							
5	W. Yellowstone 3.1			Y	Y				
6	West Thumb			Y	Y				
7	Old Faithful Upper Basin			Y	Y				
8	Old Faithful Weather Station	Y	Y	Y	Y	Y	Y	Y	Y
9	Mary Mountain Trail		Y						
10	Mary Mountain 4K		Y						
11	Mary Mountain 8K			Y	Y		Y		
12	Avalanche Creek				Y				
13	Sylvan Lake				Y				
14	Spring Creek				Y				
15	Spring Creek 2					Y			
16	Mud Volcano					Y			
17	Fern Lake					Y			
18	Grant Village Lewis Lake						Y		
19	Shoshone Geyser Basin						Y		
20	Blacktail Backcountry							Y	
21	Blacktail Roadside							Y	
22	North Twin Lake							Y	
23	Lamar Valley Willow								Y

Note: Red circles indicate sites monitored in multiple seasons. Blue squares indicate sites monitored in winter only.

FIGURE 8: SOUND MONITORING LOCATIONS 2003–2011

TABLE 23: DAILY PERCENT TIME AUDIBLE (8:00 A.M. TO 4:00 P.M.) OF OVERSNOW VEHICLE NOISES AT OLD FAITHFUL AND MADISON JUNCTION 2.3

Management Zone	Site Name	Map ID	2010/ 2011	2009/ 2010	2008/ 2009	2007/ 2008	2006/ 2007	2005/ 2006	2004/ 2005	2003/ 2004
Developed	Old Faithful Weather Station	8	61%	55%	55%	68%	68%	67%	69%	61%
Travel Corridor	Madison Junction 2.3	3	51%	54%	47%	53%	59%	55%	61%*	25%*

*Indicates monitoring for only one or two days (may not represent typical or average acoustic conditions).

TABLE 24: DAILY PERCENT TIME AUDIBLE (8:00 A.M. TO 4:00 P.M.) OF OVERSNOW VEHICLE NOISES AT OTHER LOCATIONS

Management Zone (described in chapter 2)	Site Name	Map ID	Year(s) Monitored	Percent Time Audible
Developed	West Thumb Geyser Basin	6	2004/2005	47% [a]
			2005/2006	62% [a]
Travel Corridor	West Yellowstone 3.1	5	2004/2005	55%
	Spring Creek	14	2005/2006	34% [a]
	Spring Creek 2	15	2006/2007	44%
	Caldera Rim Picnic Area	25	2010/2011	44%
	Grant Village Lewis Lake	18	2007/2008	37%
	Mud Volcano	16	2006/2007	26%
	North Twin Lake	22	2008/2009	24% [a]
	Pumice Point Roadside	24	2010/2011	22%
Transition	Mary Mountain Trail	9	2003/2004	32%
	Old Faithful Upper Basin	7	2004/2005	29%
			2005/2006	35%
	Mary Mountain 4k	10	2003/2004	13% [b]
	Delacy Creek Trail	1	2007/2008	20% [a]
	Lone Star Geyser Basin	2	2003/2004	3%
			2004/2005	4%
Backcountry	Mary Mountain 8k	11	2004/2005	26%
			2007/2008	26% [a]
	Shoshone Geyser Basin	19	2007/2008	18% [a]
	Fern Lake Backcountry	17	2006/2007	0%

[a] Indicates monitoring for seven days or less (may not represent typical or average acoustic conditions).

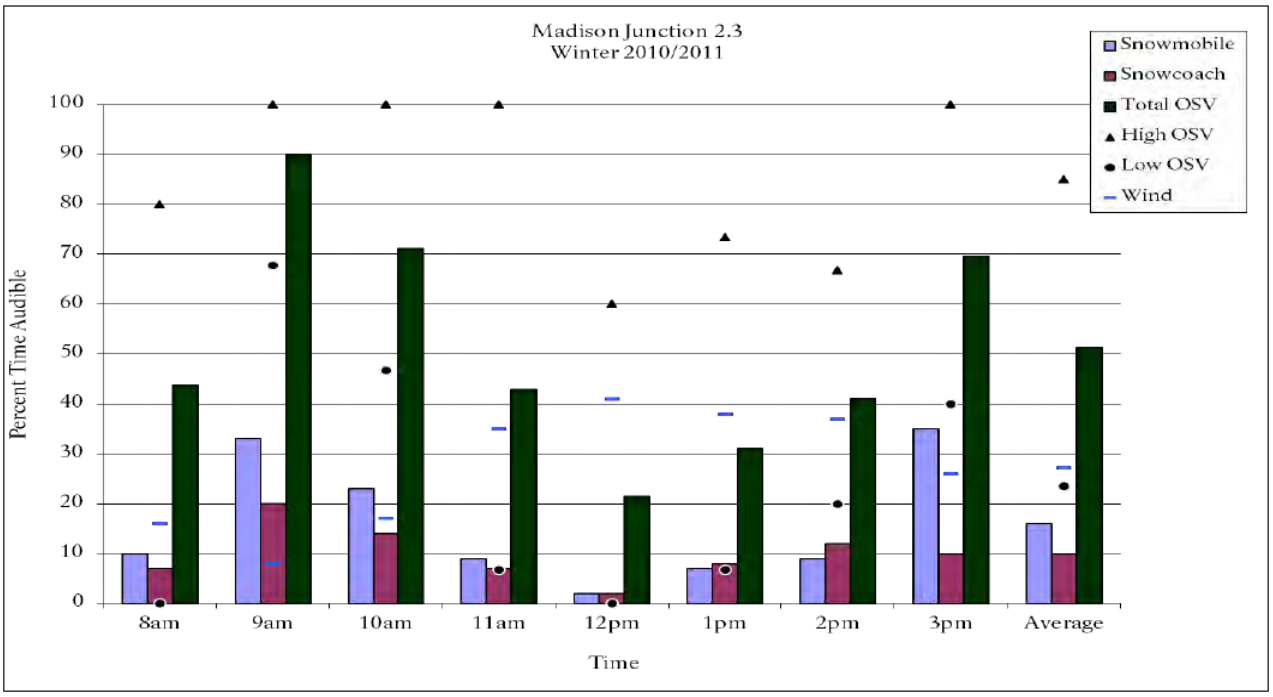
[b] Indicates monitoring for only one or two days (may not represent typical or average acoustic conditions).

Prior to the implementation of snowmobile guiding and BAT requirements during winter 2002/2003, the average percent time OSVs were audible at the Old Faithful Weather Station was close to 93 percent. The percent time audible was reduced to an average of 61 percent during winter 2003/2004.

One trend that emerges in the review of the continuous record of data at the Old Faithful weather station is the decrease in percent time audible in the 2008/2009 season compared to past years. The average percent time audible at the Old Faithful weather station was between 67 percent and 69 percent from winter 2004 to winter 2008. In the 2008/2009 and 2009/2010 winter seasons, the percent time audible at the Old Faithful weather station decreased to 55 percent as both snowmobile and snowcoach entries dropped. In the 2010/2011 winter season, the percent time audible at the Old Faithful weather station increased to 61 percent. However, this percentage is still lower than all of the winter seasons between 2004 and 2008.

The Madison Junction 2.3 site experienced a smaller decrease in percent time audible in 2008/2009 than the Old Faithful weather station. Unlike the Old Faithful weather station site, the Madison Junction 2.3 site experienced an increase in percent time audible from 47 percent in 2008/2009 to 54 percent in 2009/2010, and decreased in 2010/2011 to 51 percent. The increase in percent time audible in 2009/2010 is at least partially attributable to a decrease in the length of time wind was audible (wind can mask OSV noises). Wind was audible at Madison Junction 2.3 only 15 percent of the time in 2009/2010, compared to 27 percent of the time in 2008/2009 (Burson 2010a). Similarly, the slight decrease in percent time audible in 2010/2011 is partially attributable to an increase in the length of time wind was audible; wind was audible a little more than 25 percent of the time in 2010/2011 (Burson 2011).

Figure 9 provides an example of the variation in percent time audible by hour at Madison Junction 2.3 in the 2010/2011 winter season. Percent time audible exceeded 85 percent during the morning when many OSVs are entering the park, but dropped to less than 30 percent time audible midday. A peak number of OSVs leaving the park occurred in the afternoon; resulting in a percent time audible of over 60 percent between 3:00 p.m. and 4:00 p.m. OSVs were audible for an average of 51 percent of the time during the winter use season at Madison Junction 2.3.



Note: Graphic shows the average percent time audible by hour of snowmobiles and snowcoaches (between 8:00 a.m. and 4:00 p.m.) and high and low OSV percent time audible at 2.3 miles (3.7 kilometers) west of Madison Junction on the West Entrance Road, Yellowstone National Park, December 15, 2010–March 15, 2011.

FIGURE 9: AVERAGE OSV PERCENT TIME AUDIBLE BY HOUR

As shown in figure 8, three sites have been monitored on the plowed roads in the northern part of the park (Blacktail Backcountry, Blacktail Roadside, and Lamar Valley Willow). The percent time audible at these sites was not influenced by OSVs—only wheeled vehicles were audible. OSVs were not audible due to the distance between these monitoring sites and the nearest OSV routes (figure 8). The Lamar Valley Willow monitor was 142 feet from the road between Tower Junction and the Northeast Entrance. The percent time audible for wheeled vehicles in the 2009/2010 season was 66 percent between 8:00 a.m. and 4:00 p.m. Wheeled vehicles were audible an average of 12 percent of the time in the 2008/2009 winter season at the Blacktail Backcountry site 1.5 miles from the plowed road between Mammoth and Tower Junction. At 100 feet from the road, the Blacktail Roadside had an average wheeled vehicle percent time audible of 34 percent and wind was audible on most days.

As shown in figure 8, two new sound monitoring sites were included in the 2010/2011 winter season: Pumice Point Roadside between West Thumb and Lake adjacent to Yellowstone Lake, and Caldera Rim Picnic Area site on the new road alignment between Madison Junction and Norris. Both locations are 100 feet (30 meters) from a groomed road. At Pumice Point, OSVs were audible an average of 22 percent of the time between 8:00 a.m. and 4:00 p.m. during the 20 days analyzed. Strong wind off Yellowstone Lake was audible on many days, which masked the low sound levels of distant vehicle noise on some days. When the wind was not present, this site had very low ambient sound levels with OSVs being audible at long distances. At the Caldera Rim Picnic Area, OSVs were audible an average of 44 percent of the time between 8:00 a.m. and 4:00 p.m. during the 13 days analyzed in January and February. Wind was audible on many days, but at relatively low levels (Burson 2011).

Length of Time Audible for Discrete OSV Passby Events

The length of time audible for a discrete passby event of either an individual snowcoach or a group of snowmobiles traveling together (average group size of 6.6) can be estimated from data collected at 10 different locations throughout the park. Measurements were made by observers positioned near the road at 14 locations between 2005 and 2011. For these analyses, 10 of these sites were used to derive an average length of time audible. Four other sites were disregarded because they had fewer than 10 cases for one of the two transportation event types.

Observers recorded the start time when OSVs were first heard and stop time when they could no longer be heard. Nearly all measurements were for discrete guided snowcoach or snowmobile events. That is, only one OSV tour was audible during the measurement. For a few measurements, other OSVs may have overlapped slightly with the beginning or end of an event, yielding a shorter duration than would have been measured without overlap. These abbreviated measurements are unlikely to bias comparison of the durations of snowcoach and snowmobile noise events (S. Burson pers. comm. 2012). On average there were 6.7 snowmobiles per event and one snowcoach per event for the 2012 study.

Results for all locations are shown in table 25. A total of 1,127 events were recorded, however locations with fewer than 10 events recorded for a specific OSV transportation event type were excluded from analyses due to limited sample size. Therefore, 1,012 events were retained for analysis. Snowmobile transportation events were heard, on average, for 2 minutes and 36 seconds, whereas snowcoach transportation events were heard for an average of 2 minutes and 21 seconds. The overall difference in elapsed time between snowmobiles and snowcoaches averaged 15 seconds.

TABLE 25: AVERAGE ELAPSED TIME AUDIBLE PER OSV PASSBY (IN MINUTES: SECONDS) (2005–2011)

Location	Guided Snowmobiles	n	Guided Snowcoaches	n	Difference
West Yellowstone	1:22	56	1:00	24	0:22
Madison Junction	2:52	106	2:20	128	0:32
Mallard Lake	1:40	12	2:13	10	-0:33
Daisy	1:47	44	1:33	51	0:14
Mary Mountain Trailhead	2:30	44	2:20	30	0:10
Kepler Falls	2:00	41	1:52	15	0:08
Tuff Cliff	3:03	68	2:03	51	1:00
Spring Creek	3:09	79	3:38	60	-0:29
Lewis Lake	3:00	67	2:29	45	0:31
Cygnet Lake	4:44	50	4:05	31	0:39
Average	2:36		2:21		0:15
Total Sample Size		567		445	

Average time audible, sample size *n*, and difference in time audible for guided snowmobiles and guided snowcoaches in Yellowstone National Park. *Average time audible* and sample size *n* is for **groups** of guided snowmobiles and for **individual** guided snowcoaches.

Sound Levels

Table 26 summarizes sound level metrics for the 2009/2010 and 2010/2011 winter seasons at the Old Faithful Weather Station and Madison Junction 2.3 (monitoring location located 2.3 miles west of Madison Junction). Maximum sound levels at these relatively heavily traveled locations were close to or exceeded 75 dBA between 8:00 a.m. and 4:00 p.m. Snowcoaches contributed most of the loudest events at these locations, which were close enough to the roads to prevent substantial summation of noise from most groups of snowmobiles. The 8-hour L_{eq} sound level at Old Faithful Weather Station and Madison Junction 2.3 was slightly higher than 40 dBA.

TABLE 26: SOUND LEVEL METRICS (8:00 A.M. TO 4:00 P.M.)

	Old Faithful Weather Station (Developed)		Madison Junction 2.3 (Travel Corridor)	
	2009/2010	2010/2011	2009/2010	2010/2011
L_{min}	23.7	19.9	15.3	14.5
L_{90}*	30.0	29.3	22.0	23.6
L_{50}*	35.2	34.6	28.2	28.2
L_{eq}*	41.9	40.6	42.2	40.1
L_{max}	74.5	74.3	79.5	85.1

*Median from hourly calculations

The minimum sound levels at Old Faithful Weather Station and Madison Junction 2.3 were similar to the natural ambient sound level in the park (15 to 20 dBA). The L_{90} and L_{min} at Old Faithful Weather Station were influenced by sounds created by the exhaust and heating fans at the Snow Lodge and Ranger Station. At Madison Junction 2.3, the L_{90} and L_{min} are influenced by riffles from the nearby Madison River. The sound level meters used to collect these data artificially elevate the apparent sound levels when they approach or fall below 20 dBA, due to the internal electrical noise generated by the instrument.

Observational Study Results

The 2005–2011 observational study summarized in Burson (2011) found that in developed areas 78 percent of snowmobile traffic consisted of guided visitor snowmobiles and 18 percent consisted of administrative snowmobiles. The percentage of guided visitor snowmobiles was higher along travel corridors (92 percent) compared to the developed areas because administrative snowmobile use is more frequent in developed areas. A great majority of the loud noise events were found to be caused by snowcoaches, which are not yet BAT equipped (Burson 2009). The average visitor snowmobile group size was 7 (the parkwide average during this time was 6.7), whereas the average administrative snowmobile group size was just over one. Snowcoaches transporting visitors accounted for 85 percent of total snowcoach traffic in developed areas and 94 percent in travel corridors.

Visitor snowmobiles tend to travel in groups, whereas administrative snowmobile groups are typically single vehicles, and do not necessarily travel with the usual flow of visitor traffic in and out of the park. This is important in understanding the relationship between the percent time audible and OSV numbers.

Overall, motorized noises were audible 56 percent of the time during the observational study. Snowmobiles accounted for 56 percent of the duration of motorized noises, compared to 28 percent for snowcoaches and 7 percent for airplanes and helicopters. A total of 7,691 snowmobiles were tallied over the course of the study, compared to 1,033 snowcoaches. The time audible percentages were not in proportion to these numbers because the grouping of snowmobiles concentrates the usage time and, therefore, the time they are audible. As noted above, visitor snowmobiles tend to travel in groups, whereas administrative snowmobile groups are typically single vehicles and do not necessarily travel with the usual flow of visitor traffic in and out of the park. This is important in understanding the relationship between the percent time audible and OSV numbers. In developed areas, administrative snowmobiles are 63 percent of the snowmobile groups. Along road corridors, administrative groups are 33 percent of the snowmobilers.

VISITOR USE, EXPERIENCE, AND ACCESSIBILITY

VISITOR ACCESS AND CIRCULATION

Regional Access

Yellowstone has five entrances—one each on the north, east, west, and south boundaries and one in the northeast. Year-round wheeled vehicle road access into the park is provided from Gardiner, Montana, across the northern area of the park to Cooke City, Montana. At Cooke City, Highway 212 is closed to the east from October to May. All other park entrances are closed from early November to mid-December, re-open for the winter season, and close again in early to mid-March to allow for spring plowing.

In addition to the five main entrances to access the interior of the park, visitors may access the park on Cave Falls Road. Cave Falls Road is an approximately one-mile-long road that enters the park in the

southeast corner and dead-ends at Cave Falls. This route does not provide OSV access to other locations in the interior of the park.

Park Roadways, Trails, and Winter Facilities

About half of the park's winter visitors enter the park through the North Entrance. The West Entrance is the next busiest, with about 33 percent of winter visitors.

Certain roads within the park are maintained for numerous reasons, including tourism 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). The plowing of these roads totals approximately 78 miles, 20 of which are plowed by the state of Montana (NPS 2007c). These roads provide the only wheeled vehicle access through the park and are used by many visitors to view wildlife or access trailheads for cross-country skiing, snowshoeing, and/or hiking. In recent winters, the North Entrance has been the busiest in the winter – about half of the park's winter visitors enter the park through the North Entrance (both in OSVs and wheeled vehicles). The West Entrance was the next busiest, with about 33 percent of winter visitors (OSVs, only). The South Entrance accounted for 16 percent, with the East Entrance admitting 0.5 percent. During the winter, the Northeast Entrance has not been staffed.

OSV travel has been allowed on most primary interior park road segments (see figure 2 in chapter 2), with the exception of Dunraven Pass between Tower and Washburn Hot Springs overlook, which is closed due to avalanche danger. Where OSV travel has been allowed, the roads were groomed. Grooming begins when there is adequate snow cover, 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 nightly or every other night. Most other sections are usually groomed every two to three nights. The NPS grooms has 193 miles of OSV routes in the park in recent years.

About 35 miles of road are groomed for non-motorized uses in Yellowstone. These roads include the Blacktail Plateau Drive, Bunsen Peak Road, Upper Terrace Drive, North Canyon Rim Trail, Lone Star Geyser, and other trails in the Old Faithful area. The portion of the Dunraven Pass Road from Tower Junction past Tower Fall to the top of the Chittenden Road is groomed for skiing. In addition to the machine-groomed roads, parallel tracks are set on the sides of some of Yellowstone's snow roads, typically including the West Entrance to Madison (14 miles one way); Madison to Old Faithful (16 miles one way); and Madison to Norris (12 miles one way). These are established each time the road is groomed (every two or three days) and may be obliterated by snowcoach and snowmobile travel. In addition to these examples, a list of all non-motorized use trails in the park can be found on the park's website at http://www.nps.gov/yell/planyourvisit/skiyell.htm. Although some visitors access non-motorized use trails on foot, others use OSVs to access a point in the interior of the park, and then engage in non-motorized use once they have reached their interior destination. OSV routes within the park are shown in figure 2 (see chapter 2).

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 signs and may have restrooms and other facilities. The staging areas for snowmobile and snowcoach trips into the park are near Mammoth Hot Springs in the north, at Pahaska Tepee in the Shoshone National Forest three miles from the East Entrance, at Flagg Ranch two miles from the South Entrance, and in West Yellowstone adjacent to the West Entrance.

Oversnow Modes of Transportation

Snowcoaches have been used in Yellowstone since the mid-1950s, several years before snowmobiles first appeared in the early 1960s. Businesses in surrounding communities have run touring enterprises based exclusively on providing snowcoach tours (whereas some offer both snowcoach and snowmobile tours). The earliest snowcoaches were Bombardiers, purpose-built machines designed for oversnow travel. Approximately 25 Bombardiers are in operation today. In the 1970s, the conversion of wheeled vehicles to OSVs began. These are 7- to 33-passenger sport utility vehicles, vans, or mid-size buses whose wheels have been replaced with track and/or ski assemblages. Some conversion snowcoaches are accessible to the handicapped. Some coaches now have double-paned or vented windows that resist fogging in the cold winter air. Snowcoach operation and speed depend on a variety of conditions, especially weather and snow conditions. Under most winter conditions, however, they can maintain speeds of 15 to 25 mph. Repowered historical Bombardier snowcoaches average approximately 5 miles per gallon (mpg) whereas converted snowcoaches average approximately 1.7 to 2.7 mpg, depending on the coach and snow conditions.

In 2003, the NPS signed contracts with 14 businesses authorizing them to operate a specified number of snowcoaches for tours of the park for 10 years. A total of 78 snowcoaches have been authorized to operate every day in the park for the past 8 seasons. Snowcoaches can carry 8 to 33 passengers per day. On average, the maximum capacity of all of the coaches in the fleet is 12.7 passengers (13.7 persons, including the driver), which has resulted in a maximum visitor capacity of approximately 990 visitors per day (not including the drivers). Average ridership per snowcoach for the past three winter seasons (2009/2010 – 2011/2012) has been 8 people/coach (not including the drivers).

Snowmobiles were first used in Yellowstone in 1963, and by the 1980s thousands of visitors were entering the park using snowmobiles. Businesses in surrounding communities began running touring enterprises based exclusively on providing snowmobile tours and rentals (whereas others offer both snowcoach and snowmobile tours). In the early 2000s, manufacturers introduced four-stroke machines, which substantially reduced emissions and somewhat reduced the level of snowmobile noise emissions.

Since the winter of 2004/2005, all visitors using snowmobiles have been required to use commercial guides in the park and to use BAT machines. From 2004 to 2009, snowmobile use levels were capped at a maximum level of 720 per day. For the 2009/2010 to 2012/2013 winter seasons, the limit was 318 snowmobiles per day. Guided OSV service was available from a total of 23 different companies at the various park entrances. Of these companies, 8 operated both snowcoaches and snowmobiles, 3 operated only snowcoaches, and 12 operated only snowmobiles.

Since the winter of 2004/2005, all visitors using snowmobiles have been required to use commercial guides in the park and to use BAT machines.

Visitation and OSV Transportation Modes

Background

Information on visitation and OSV transportation modes are provided for the winter seasons 2004/2005 to 2011/2012 (the "managed use era"). "Winter seasons" in Yellowstone during this timeframe were from mid-December to mid-March. Analyses do not include data prior to December 2004 because this period preceded the implementation of limits on daily OSV numbers. Although several options for winter use in the park are being considered, there is no alternative for returning to unmanaged OSV use; therefore, these earlier years are not relevant for environmental impact assessment purposes or analysis of visitation trends.

Accurate OSV and visitation data broken down into key metrics will help in assessing potential changes to visitation resulting from new policies. To facilitate this assessment, superfluous statistics previously reported have been removed from analysis, including automobile, recreation vehicle, and bus statistics. The current Winter Use Plan / Supplemental Environmental Impact Statement (plan/SEIS) focuses solely on OSV transportation on interior park snow-packed and groomed roads, not the northern road between Gardiner and Cooke City, which is plowed to pavement during the winter. A breakdown of the gates through which OSV visitors are entering the park has been added to the analysis to illustrate which OSV routes are currently used by visitors and the relative proportions of OSV use.

Data Collection

Winter visitation and OSV use in Yellowstone National Park has traditionally been tracked using two different accounting methods. The statistics published on www.nature.nps.gov, are tracked and reported by the Visitor Services Office (VSO) under the Chief Ranger's Office. This office records the total number of OSVs and visitors coming through each entrance gate each day. Commercial tour operators "check in" with ranger staff at the entrance gate as they enter the park, submitting vouchers (at the west gate) or filling in a log book (at the south gate) with information about the number of people and machines in their group; these records are entered into a cash register and used to charge the operators for the number of vehicles entering the park.

The other winter visitation records are collected and compiled by the Yellowstone Concessions Management Office. Each month, operators provide the Concessions Management Office with a comprehensive list of all of tours that they ran during the month and the makeup of each tour event. The Concessions Management Office tracks additional levels of detail that the VSO does not. While VSO statistics are the most widely reported numbers and previous winter use environmental planning documents have relied upon these data, comparison of the VSO numbers with those from the Concessions Management Office indicated that Concessions Office data may more accurately represent the number of OSVs operating within the park at any given time. For example, VSO numbers do not include a portion of the traffic originating at Old Faithful but staying within the boundaries of the park; Old Faithful data is reported by the VSO only if OSVs leave and reenter the park, at which point they are counted at the gate. Concessions Office numbers do include Xanterra Parks and Resorts data and therefore numbers of OSVs based at Old Faithful and traveling exclusively within the park are reported. Concessions Office numbers tend to be somewhat higher than VSO numbers (about 5 percent per year for snowmobiles and 20 percent for snowcoaches) due to this inclusion.

Additionally, Xanterra Parks and Resorts, the park's largest concessioner, runs snowmobile and snowcoach tours from Mammoth Hot Springs and Old Faithful. Xanterra tracks and reports these numbers to the NPS Concessions Management Office, which incorporates these numbers into the compiled data from all of the operators, and to the VSO, which uses the number of tours that Xanterra runs out of Mammoth to inform their north gate snowmobile and snowcoach daily counts.

For maximum consistency and to enable comparison of the various data sources, the variables reported here are defined as follows and reported data has been adjusted to meet these definitions:

- Number of Snowmobiles—total number of snowmobiles, including guides
- Number of Persons by Snowmobile—total number of snowmobile riders, including guides
- Number of Snowcoaches—total number of snowcoaches
- Number of Persons by Snowcoach—total number of passengers in a snowcoach, including the drivers.

Annual OSV Numbers

Table 27 provides the total OSV numbers and commercial visitation for the previous eight winter seasons (the entire managed use era). The 2004/2005 season was the start of the managed use era, with the implementation of a 720 snowmobile-per-day limit. To enforce this limit, commercial operators were granted "allocations," or numbers of snowmobiles and/or snowcoaches they were allowed to operate in the park on a single day. In 2008/2009, park management planned a 540 snowmobile-per-day limit, but the plan was overturned in late 2008 and by court order the limit remained at 720 for that season; so, while the limit for that year was technically 720, usage rates were generally lower than in preceding years largely due to operators planning for the lower limit. In 2009/2010, the daily snowmobile limit was reduced to 318, where it has remained through the 2012/2013 season. The numbers presented in table 27 for snowmobiles and snowcoaches include the daily numbers of OSVs operated by commercial operators for tours in the park, based either out of one of the gateway communities or out of Old Faithful, summed for the entire winter season.

TABLE 27: NUMBER OF VISITORS BY TRANSPORTATION MODE, WINTER SEASONS 1999/2000 TO 2011/2012

Winter Season	Snowmobiles	Persons by Snowmobile	Snowmobile Groups	Snowcoaches	Persons by Snowcoach
2004/2005 [a]	18,987	27,898	2,847	2,263	16,119 [b]
2005/2006	22,547	30,104	3,563	2,620	19,245 [b]
2006/2007	23,720	34,768	3,488	2,978	24,708
2007/2008	24,509	36,380	3,617	3,051	25,857
2008/2009 [c]	18,142	27,239	2,811	2,950	23,146
2009/2010 [d]	16,852	25,312	2,521	3,075	25,818
2010/2011	17,598	24,497	2,684	3,403	26,853
2011/2012	15,514	21,180	2,305	3,156	24,293
Managed-Use Era Average	19,734	28,422	2,980	2,937	23,255
720 Snowmobile Era Average	21,581	31,278	3,265	2,772	21,815
318 Snowmobile Era Average	16,655	23,663	2,503	3,211	25,655

Source: NPS 2012.

[a] A daily limit of 720 snowmobiles was introduced during the 2004/2005 season.

[b] Snowcoach visitor numbers from 2004/2005 and 2005/2006 do not include Old Faithful numbers due to missing data.

[c] Although the daily limit during the 2008/2009 season was 720, guides and outfitters had planned for a 540 snowmobile limit, based on a winter plan that was vacated by the District Court for the District of Columbia in fall 2008.

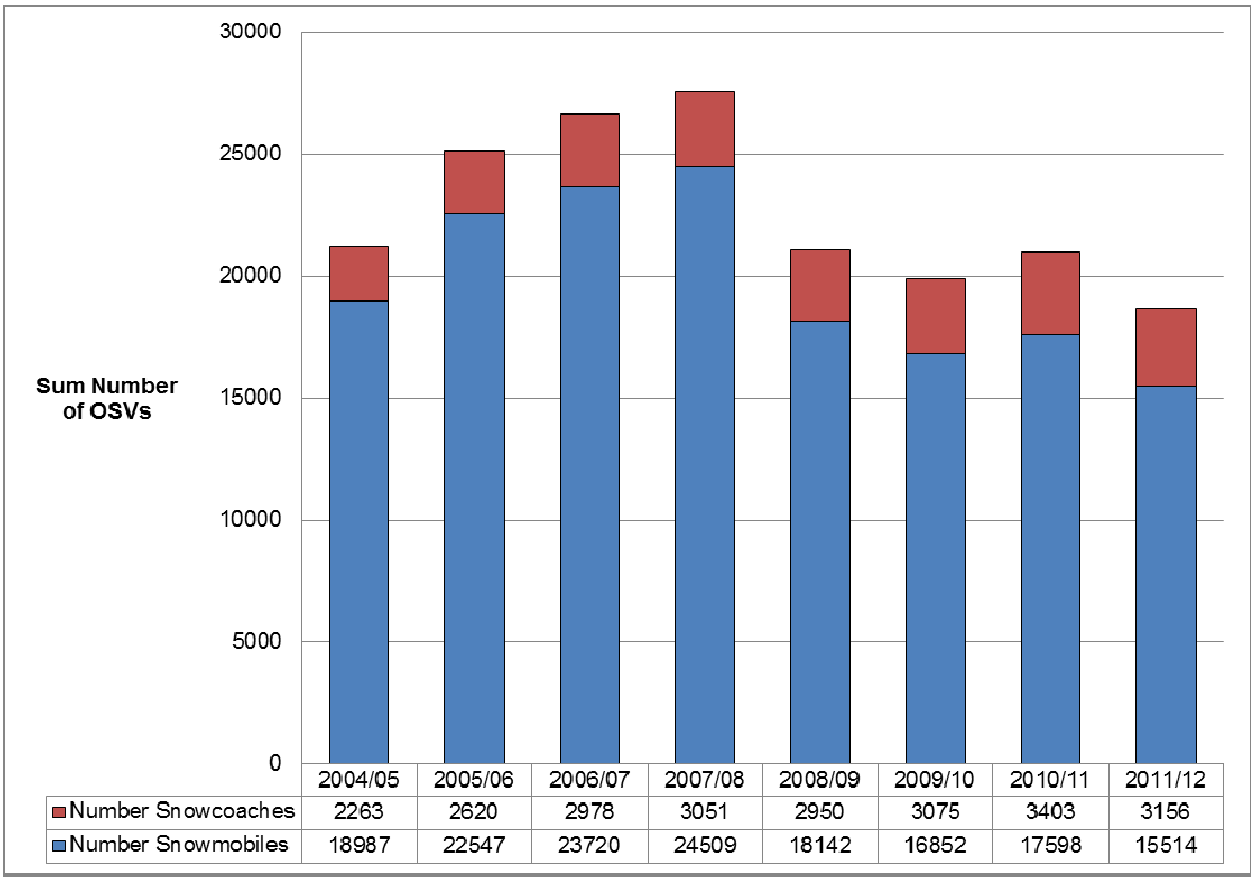
[d] The daily snowmobile limit was reduced to 318 starting during the 2009/2010 season.

From the 2004/2005 winter season through the 2011/2012 winter season, the total number of snowmobiles operating in the park decreased by 18.3 percent whereas the daily snowmobile allocation decreased by 55.8 percent (720 to 318 snowmobiles daily). During the 720 snowmobile-limit era (excluding 2008/2009 for reasons noted earlier), snowmobile numbers showed a gradual rise, from a total of 18,987 snowmobiles in 2004/2005 to 24,509 snowmobiles in 2007/2008. During the 318 snowmobile-

limit era, snowmobile use increased from 16,852 total snowmobiles in 2009/2010 to 17,598 in 2010/2011 but decreased to 15,514 snowmobiles in 2011/2012. A lack of snow in December 2011 caused a 16-day delay in opening the West and North Entrances for snowmobile use. The delay cut into the park's planned 91 day winter season which likely was the cause of the decline in snowmobile numbers during the 2011/2012 season.

The number of snowcoaches operating in the park increased by 39.5 percent from 2004/2005 to 2011/2012 (from 2,263 to 3,156). Similarly to snowmobiles, the annual sum number of snowcoaches operating in the park increased steadily from 2004/05 through 2007/2008 (a 34.8 percent increase, from 2,263 to 3,051), but has largely stabilized over the last 3 years.

Figure 10 graphically depicts the numbers cited in table 27. It shows the total number of OSVs used over the past eight seasons and is broken down by snowmobile and snowcoach to show overall trends as well as trends for each type of OSV.

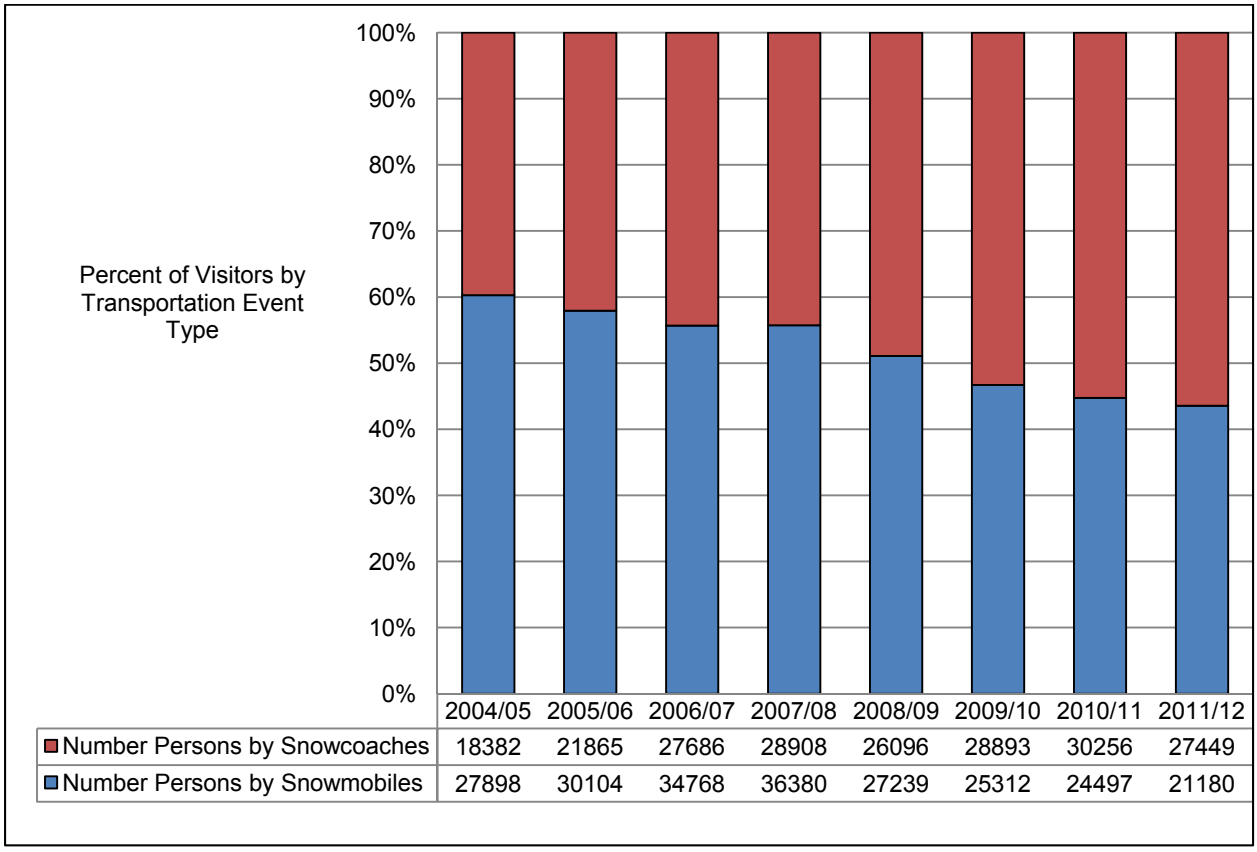


	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12
Number Snowcoaches	2263	2620	2978	3051	2950	3075	3403	3156
Number Snowmobiles	18987	22547	23720	24509	18142	16852	17598	15514

FIGURE 10: TOTAL NUMBER OF SNOWMOBILES AND SNOWCOACHES RUN DURING TOURS IN THE PARK FOR THE WINTER SEASONS OF 2004/2005 TO 2011/2012

Figure 11 shows the relative portions of visitors using the two OSV transportation types. This breakdown shows a shift from the majority of people using snowmobiles (60.2 percent during the 2004/2005 season) to the majority of persons using snowcoaches (56.4 percent during the 2011/2012 season) to access the park. However, it should be noted that during the period of time captured in Figure 11, authorized numbers of daily snowcoaches remained fixed at 78 snowcoaches per day while authorized snowmobile numbers dropped from 720 snowmobiles per day (2004/2005 through 2008/2009) to 318 snowmobiles

per day (2009/2010 through 2011/2012). Multiple days during the 2004/2005 through 2008/2009 seasons had overall snowmobile use numbers that eclipsed 318 snowmobiles per day (the maximum authorized use levels starting in December 2009). It is possible that snowmobile use was somewhat suppressed during the 2009/2010 through 2011/2012 seasons because of the absolute number was fixed at 318 which in turn would influence the data presented in figure 11.



	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12
Number Persons by Snowcoaches	18382	21865	27686	28908	26096	28893	30256	27449
Number Persons by Snowmobiles	27898	30104	34768	36380	27239	25312	24497	21180

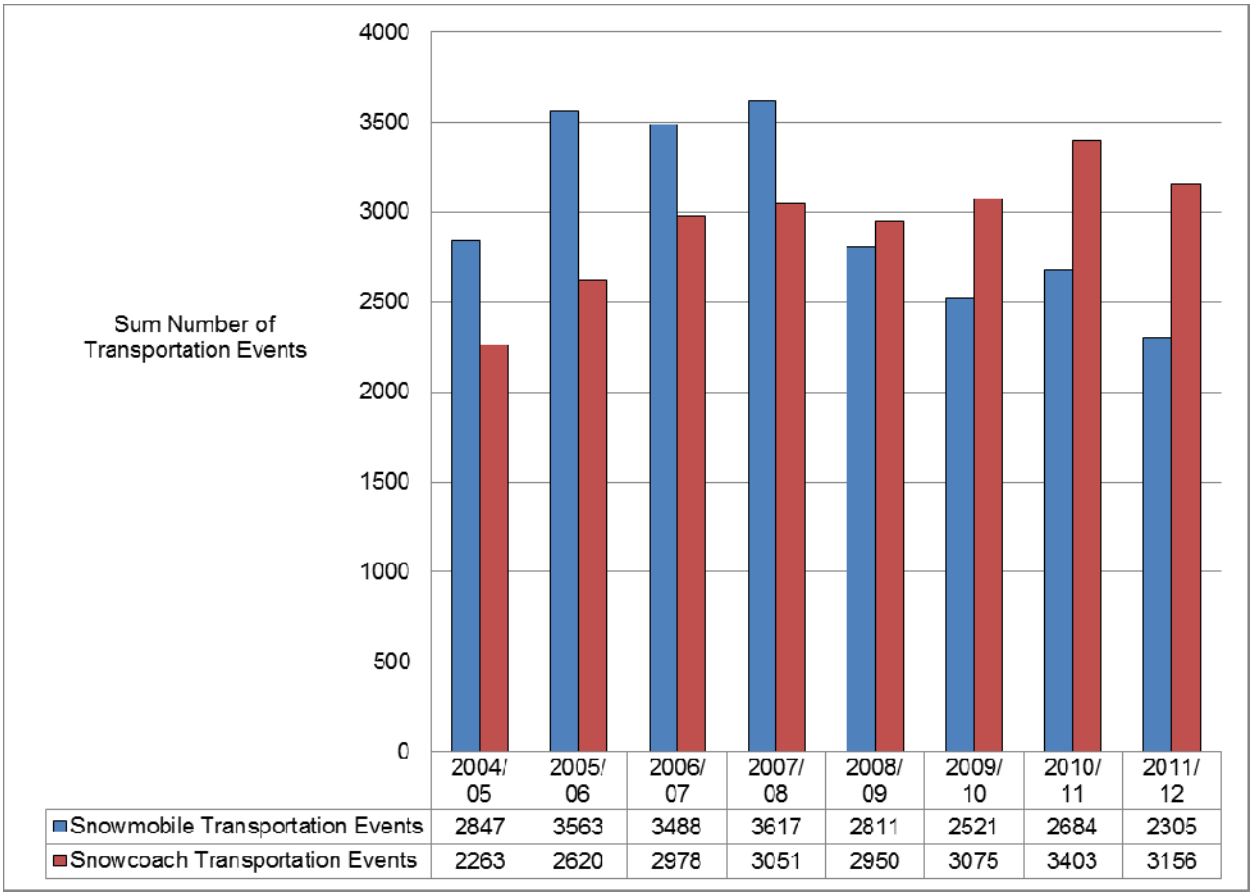
FIGURE 11: PERCENT OF PERSONS USING EACH OSV TRANSPORTATION TYPE

Transportation Events

A snowmobile tour typically consists of a group of multiple machines traveling together (average number of snowmobiles per group for the past three seasons (2009/2010 to 2011/2012) is 6.7) while a snowcoach tour most often consists of a single machine traveling by itself. Therefore, it is helpful to think of transportation events to understand the relative number of tours given using each type of OSV (see chapter 2 for definition). Total numbers of snowmobiles do not provide the specificity to understand how many groups entered the park or how many tours ran. Therefore, a transportation event is defined as either a group of snowmobiles traveling together as a discrete group or a single snowcoach traveling by itself. This framework allows the exploration of the relative popularity of each type of OSV transportation.

Figure 12 shows the total number of transportation events over the past eight seasons. A transportation event is defined as one snowcoach or a group of, on average, seven snowmobiles travelling together within the park. Year-to-year trends vary, but the overall range from 2004/2005 to 2011/2012 shows a general decrease in the number of snowmobile transportation events and a general increase in the number of snowcoach transportation events. The number of snowcoach transportation events first surpassed the

number of snowmobile transportation events in 2008/2009 and has continued to exceed snowmobile transportation events by an increasing number during each year since. The decline in the number of snowmobile transportation events could be due to lowered daily limits, but the increase in snowcoach transportation events is not due to limits on snowcoaches, which has been almost constant throughout the eight-year managed use era. The only change in snowcoach allocations occurred when a contract in South Entrance was terminated prior to the winter of 2011/2012, reducing allocations in South Entrance by 2 snowcoaches, from 13 to 11, and reducing the parkwide total from 78 to 76.

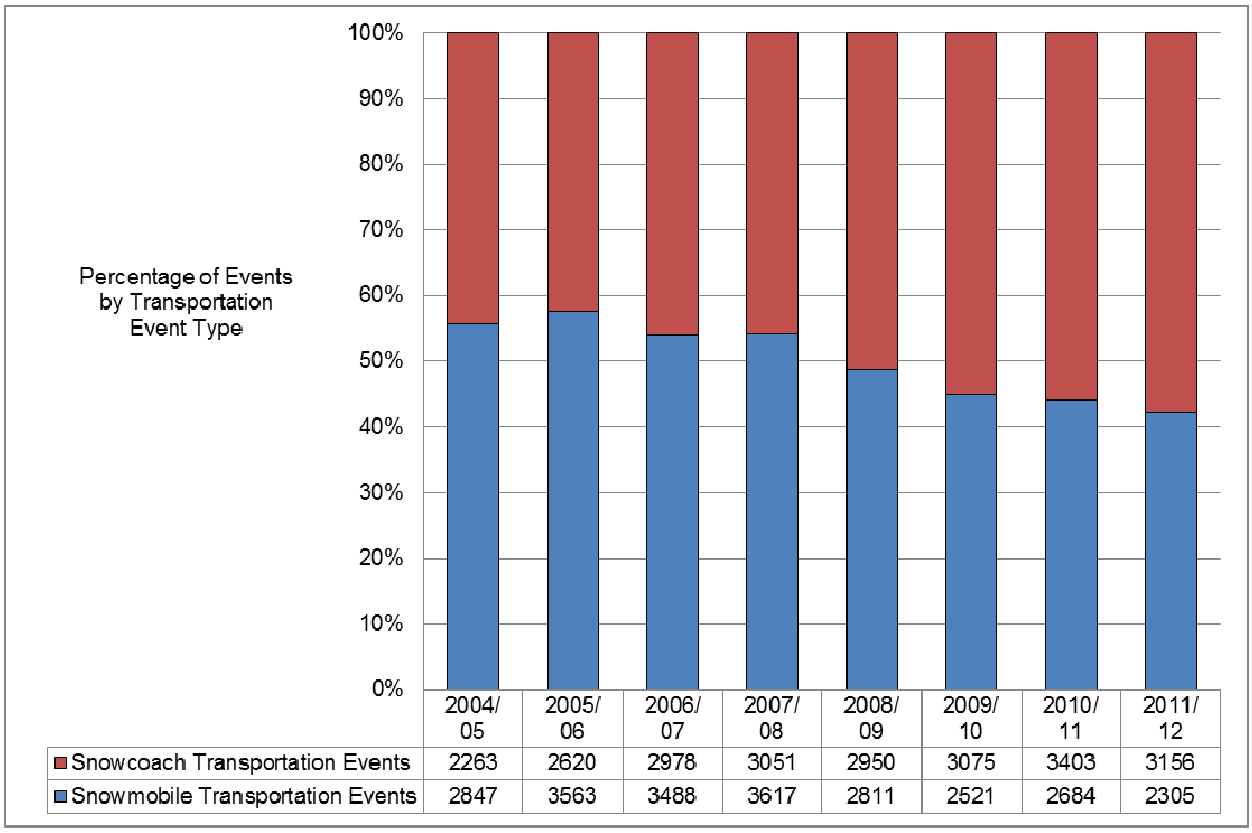


	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12
Snowmobile Transportation Events	2847	3563	3488	3617	2811	2521	2684	2305
Snowcoach Transportation Events	2263	2620	2978	3051	2950	3075	3403	3156

FIGURE 12: NUMBERS OF TRANSPORTATION EVENTS BY OSV TYPE PER WINTER SEASON THROUGHOUT MANAGED USE ERA

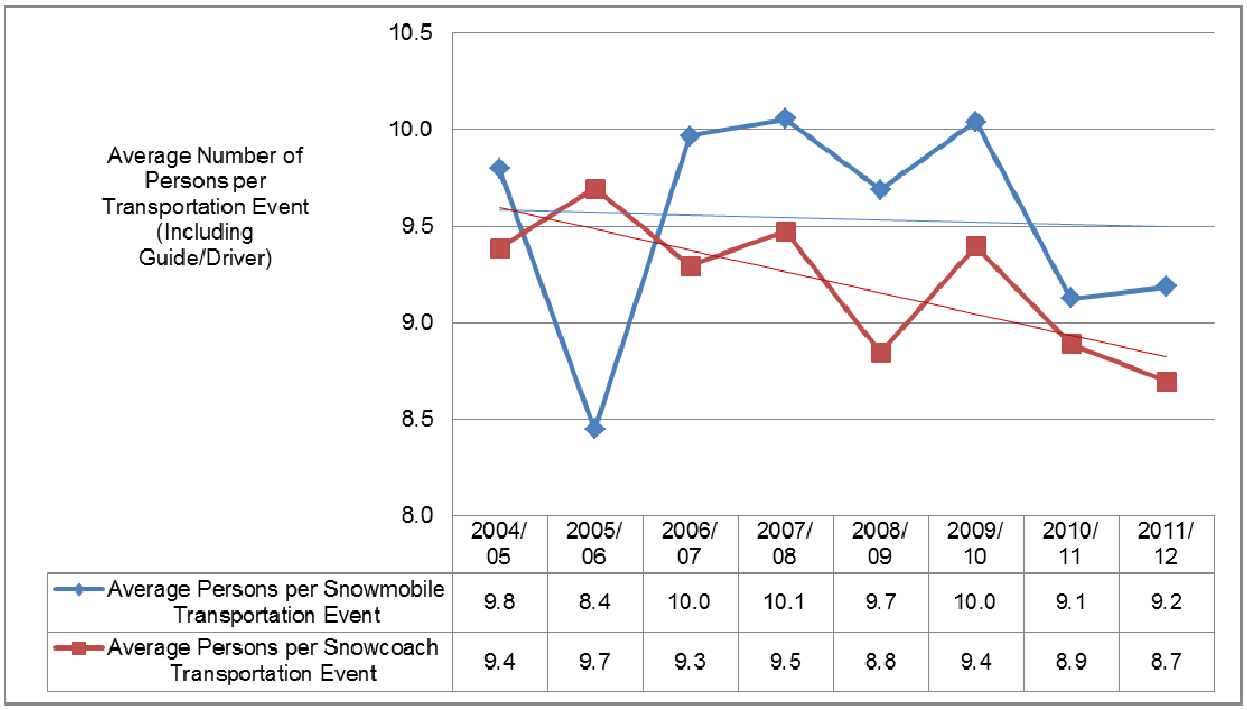
Figure 13 shows the breakdown of transportation events by percentages. In 2004/2005, 55.7 percent of OSV transportation events were snowmobile groups, but by 2011/2012, 42.2 percent of transportation events were snowmobile groups.

The characteristics of an average transportation event have changed slightly over the past eight seasons. On average over the past eight winter seasons, individual commercial snowmobile transportation events have consisted of 6.6 snowmobiles and 9.5 persons per group (including the guide), with an average of 1.4 riders per snowmobile. During the 318 snowmobile-limit era, on average 29 snowmobile transportation events occurred daily, whereas during the 720 era the average number of daily snowmobile groups was 40. For the past eight seasons, snowcoach transportation events averaged 9.2 persons per snowcoach (including the driver), but during the 318 snowmobile-limit era this average dropped to 9.0 person per snowcoach (8.0 visitors per snowcoach). Figure 14 demonstrates these trends.



	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12
Snowcoach Transportation Events	2263	2620	2978	3051	2950	3075	3403	3156
Snowmobile Transportation Events	2847	3563	3488	3617	2811	2521	2684	2305

FIGURE 13: PERCENTAGE OF TRANSPORTATION EVENTS BY OSV TYPE



	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12
Average Persons per Snowmobile Transportation Event	9.8	8.4	10.0	10.1	9.7	10.0	9.1	9.2
Average Persons per Snowcoach Transportation Event	9.4	9.7	9.3	9.5	8.8	9.4	8.9	8.7

FIGURE 14: AVERAGE NUMBER OF PERSONS PER TRANSPORTATION EVENT BY TRANSPORTATION EVENT TYPE

Average and Peak Day Use

To understand how snowmobiles and snowcoaches are currently used in the park, it is helpful to understand average daily use, which gives an indication of what a typical day during a season might look like, and peak daily use, which is a snapshot of OSV use on the peak day of the season. The peak use day for a winter season, during which the most OSVs are operating, generally falls near one of three holiday periods during the winter: Christmas/New Year (around December 23 to January 5), Martin Luther King, Jr., Day, and President's Day. During these time periods, operators usually have more clients and use more of their OSV allocations than they do during the rest of the year. Illustrating these trends graphically helps to show the peak possible demand, given the current OSV limits, which can be used to assess visitor numbers and preferences for one transportation type over another.

Both average daily use figures and peak daily use figures can be used to determine average and peak day utilization rates. Utilization rates are calculated by dividing the actual number of OSVs in use for a given day (to determine peak day utilization rate) or season (to determine average utilization rate) by the absolute number of OSVs permitted. Utilization rates under different OSV limits and how these utilization rates change within multiple seasons at a set limit can indicate how appropriate the existing limits are and how operators adjust to these limits.

Table 28 provides the average daily number of snowmobiles and snowcoaches in the park during the previous eight seasons (through 2011/2012) as well as each season's peak numbers of OSVs. The daily limit column shows the maximum number of OSVs permitted daily in the park during that winter season. During the winters of 2004/2004 through 2008/2009, the maximum number of snowmobiles permitted in the park was 720. The daily average during this period ranged from 213 snowmobiles to 303, meaning that average daily utilization rate ranged from 30 percent to 42 percent. Peak use during this period ranged from 429 to 560 snowmobiles (peak utilization rate of 59 percent to 77 percent). During the most recent three seasons (20, 2009/2010 to 2011/2012, the daily limit for snowmobiles was 318 and the daily average ranged from 187 to 197 snowmobiles (59 percent to 62 percent average utilization rate). Peak use of snowmobiles during these years ranged from 258 to 294 (peak utilization rates of 81 percent to 92 percent).

Snowcoach daily limits remained at 78 throughout the managed use era, until the 2011/2012 winter season when they dropped to 76 due to termination of a snowcoach contract with 2 snowcoach allocations at the South Entrance. Daily parkwide averages ranged from 26 to 39 (33 percent to 50 percent average daily utilization rate) during these seasons. Overall, the average daily number of snowcoaches increased by 34.6 percent, from an average of 26 coaches per day in 2004/2005 to an average of 35 coaches per day in 2011/2012. Peak daily snowcoach utilization rates ranged from 56 to 63, with peak daily utilization rates between 72 percent and 81 percent.

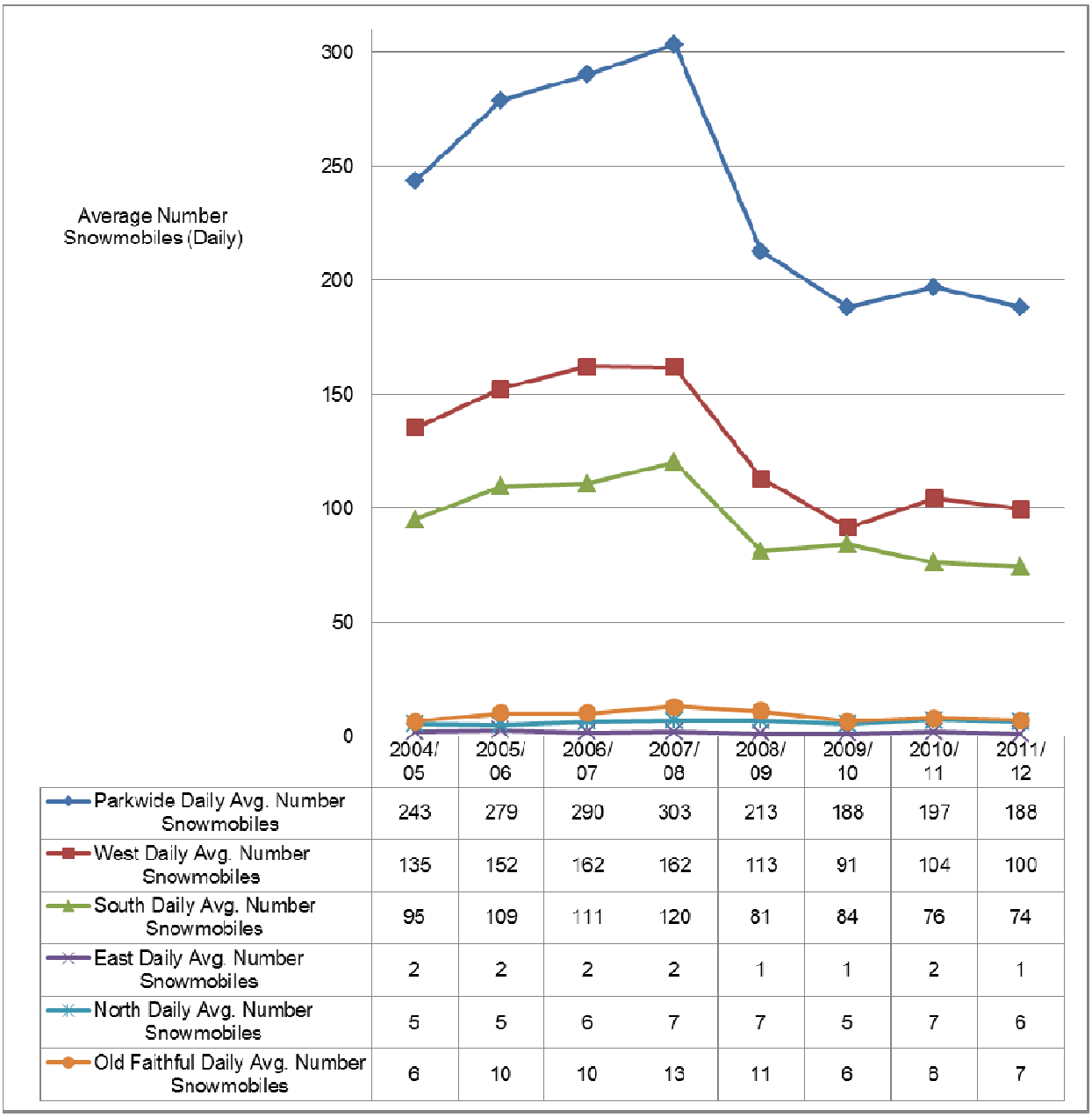
Figure 15 shows the average daily number of snowmobiles operating in the park, both parkwide and by location of origin. Daily averages increased yearly during the 720 snowmobile-limit era until 2008/2009. During the 318 snowmobile-limit era, daily averages stayed fairly constant.

TABLE 28: AVERAGE DAILY NUMBER OF OSVS, WINTER SEASONS 2004/2005 TO 2011/2012

Winter Season	Snowmobiles					Snowcoaches				
	Daily Limit	Daily Average	Daily Average Utilization Rate	Peak	Peak Utilization Rate	Daily Limit	Daily Average	Daily Average Utilization Rate	Peak	Peak Utilization Rate
2004/2005	720	243	34%	430	60%	78	26	33%	58	74%
2005/2006	720	279	39%	494	69%	78	33	42%	60	77%
2006/2007	720	290	40%	552	77%	78	37	47%	58	74%
2007/2008	720	303	42%	560	78%	78	38	49%	63	81%
2008/2009	720 (540)*	213	30% (39%)	429	60% (79%)	78	33	43%	55	71%
2009/2010	318	188	59%	294	92%	78	35	44%	59	76%
2010/2011	318	197	62%	281	88%	78	39	49%	59	76%
2011/2012	318	188	59%	261	82%	76	35	46%	56	74%
Managed-Use Era Average	569	238	46% (47%)	413	76% (78%)	78	34	44%	58	75%
720- Snowmobile Era Average	720	266	37% (39%)	493	68% (73%)	78	33	43%	59	75%
318-Snowmobile Era Average	318	191	60%	279	88%	77	36	47%	58	75%

Source: MN Spreadsheet (concessions data except for peak numbers, which are VSO).

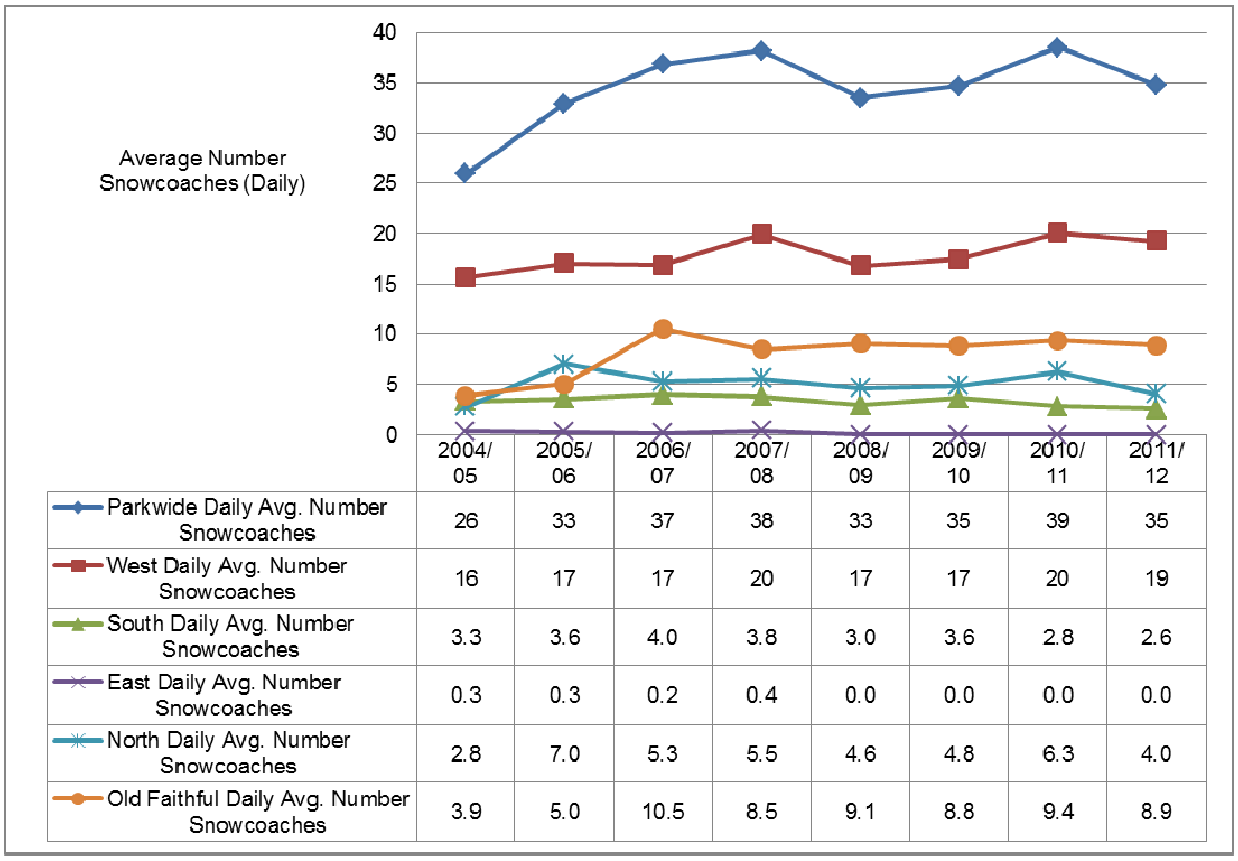
*Although the daily limit was 720, guides and outfitters had planned for a 540 snowmobile limit, based on a winter plan that was overturned in late 2008.



	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12
Parkwide Daily Avg. Number Snowmobiles	243	279	290	303	213	188	197	188
West Daily Avg. Number Snowmobiles	135	152	162	162	113	91	104	100
South Daily Avg. Number Snowmobiles	95	109	111	120	81	84	76	74
East Daily Avg. Number Snowmobiles	2	2	2	2	1	1	2	1
North Daily Avg. Number Snowmobiles	5	5	6	7	7	5	7	6
Old Faithful Daily Avg. Number Snowmobiles	6	10	10	13	11	6	8	7

FIGURE 15: DAILY SNOWMOBILE AVERAGES FROM WINTER SEASONS 2004/2005 TO 2011/2012 (PARKWIDE AND BY GATE)

Figure 16 shows the average daily number of snowcoaches in operation in the park over the past eight seasons. Daily averages increased 46.2 percent from 26 in 2004/2005 to 38 in 2007/2008. During 2008/2009 to 2011/2012, averages ranged from 33 to 39 snowcoaches. The 2008/2009 average of 33 snowcoaches is a decrease from the 2007/2008 daily average of 38 snowmobiles. While this is only slightly more than the fluctuations seen in later years, this drop in 2008/2009 does correspond to the significant drop in snowmobile numbers in this same season, which is likely due to the anticipated snowmobile-limit decrease of that year.

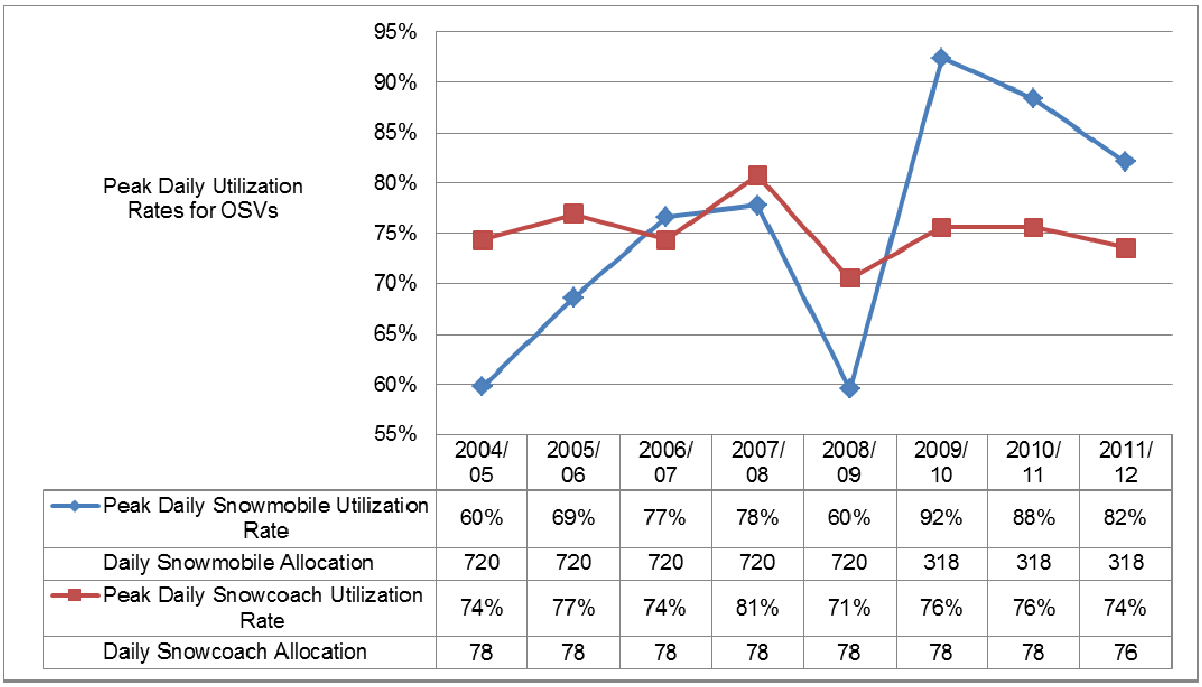


	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12
Parkwide Daily Avg. Number Snowcoaches	26	33	37	38	33	35	39	35
West Daily Avg. Number Snowcoaches	16	17	17	20	17	17	20	19
South Daily Avg. Number Snowcoaches	3.3	3.6	4.0	3.8	3.0	3.6	2.8	2.6
East Daily Avg. Number Snowcoaches	0.3	0.3	0.2	0.4	0.0	0.0	0.0	0.0
North Daily Avg. Number Snowcoaches	2.8	7.0	5.3	5.5	4.6	4.8	6.3	4.0
Old Faithful Daily Avg. Number Snowcoaches	3.9	5.0	10.5	8.5	9.1	8.8	9.4	8.9

FIGURE 16: DAILY SNOWCOACH AVERAGES FROM WINTER SEASONS 2004/2005 TO 2011/2012 (PARKWIDE AND BY GATE)

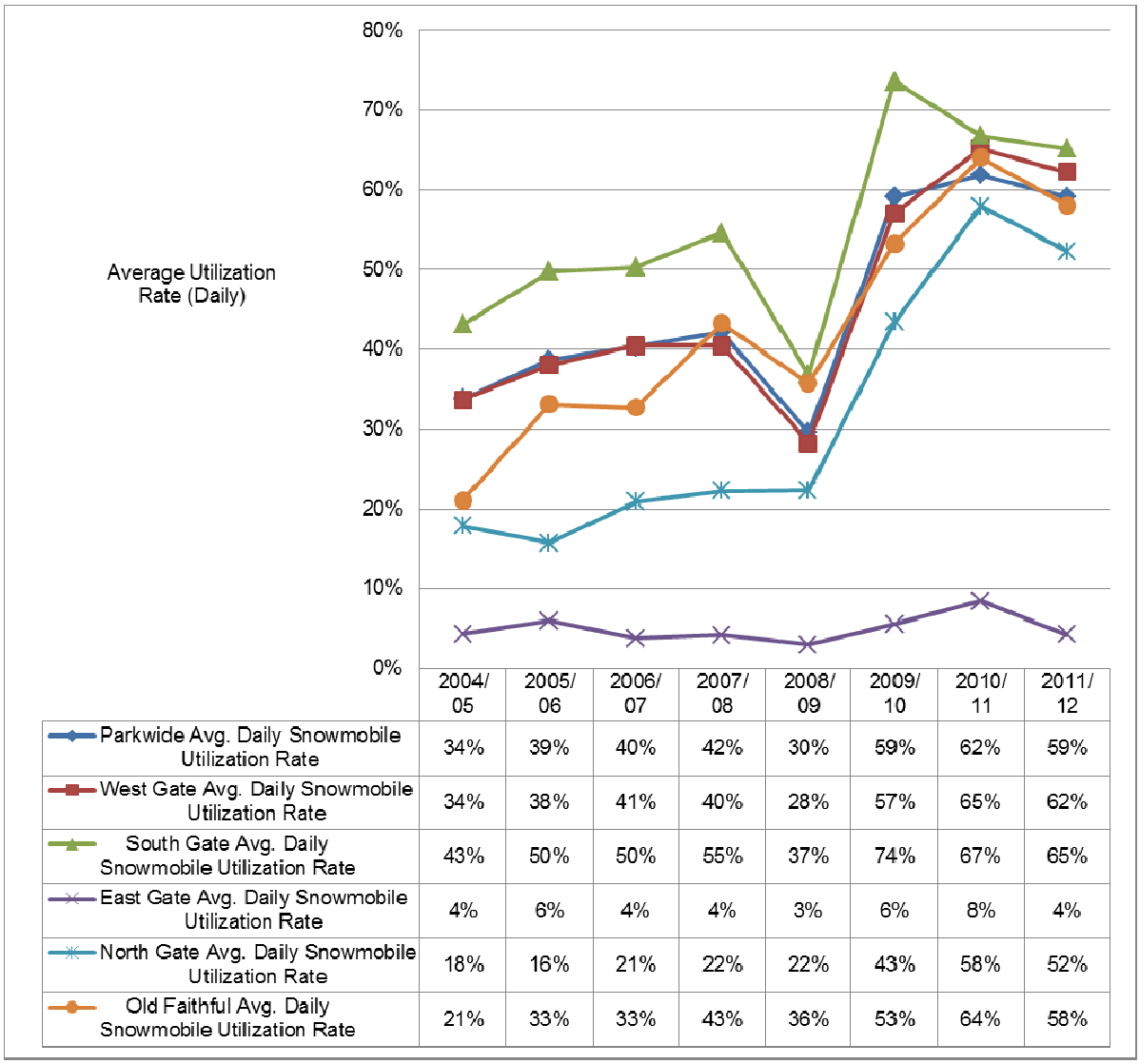
Snowcoach peak daily utilization rates have stayed within a fairly narrow range for the past eight seasons: 74 percent in 2004/2005 (58 coaches) and 74 percent in 2011/2012 (56 coaches), but ranging as high as 81 percent in 2007/2008. Snowmobiles had a peak daily utilization rate of 60 percent in 2004/2005 (430 snowmobiles out of the 720 allowed) and a peak daily utilization rate of 82 percent in 2011/2012 (261 snowmobiles out of the 318 allowed). Peak utilization rates for snowmobiles increased most dramatically between winter seasons 2008/2009 and 2009/2010, going from 60 percent to 92 percent (figure 17).

The average daily utilization rate for snowmobiles has increased over the past eight seasons at almost all gates, as depicted in figure 18. The average daily utilization rate increased steadily throughout most of the 720 snowmobile-limit era (from 2004/2005 to 2007/2008), from 34 percent to 42 percent parkwide except for a drop of 30 percent during 2008/2009 when the snowmobile limit was unexpectedly increased at the last minute. When the 318 snowmobile limit was implemented in 2009/2010, the utilization rates went up drastically, to 59 percent parkwide, and then stayed around that level (or a little higher) during the remaining two 318 snowmobile-limit years. In general, these trends were the same for the individual gates.



	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12
Peak Daily Snowmobile Utilization Rate	60%	69%	77%	78%	60%	92%	88%	82%
Daily Snowmobile Allocation	720	720	720	720	720	318	318	318
Peak Daily Snowcoach Utilization Rate	74%	77%	74%	81%	71%	76%	76%	74%
Daily Snowcoach Allocation	78	78	78	78	78	78	78	76

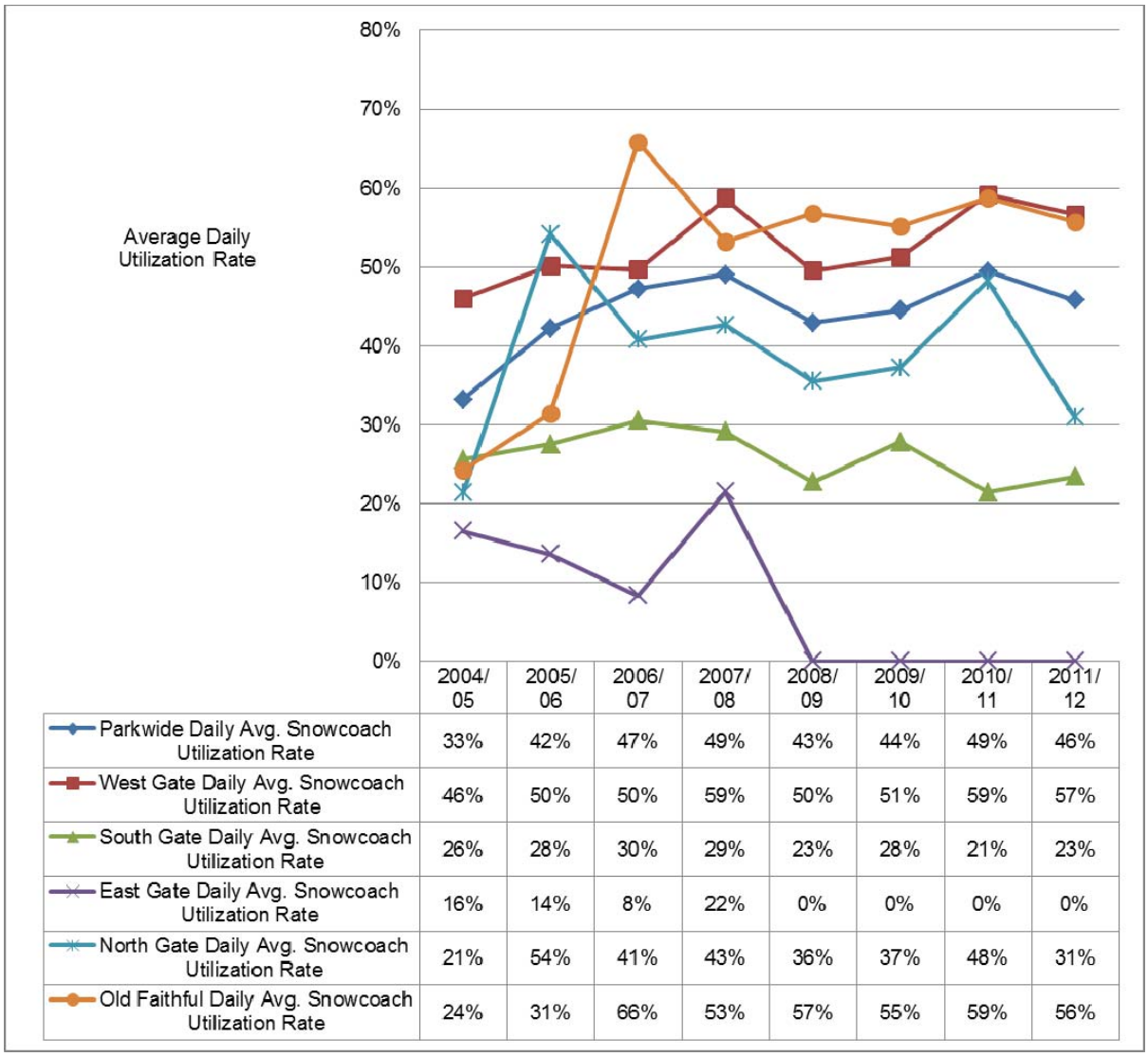
FIGURE 17: PEAK DAILY UTILIZATION RATES OF SNOWMOBILE AND SNOWCOACHES DURING MANAGED USE ERA



	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12
Parkwide Avg. Daily Snowmobile Utilization Rate	34%	39%	40%	42%	30%	59%	62%	59%
West Gate Avg. Daily Snowmobile Utilization Rate	34%	38%	41%	40%	28%	57%	65%	62%
South Gate Avg. Daily Snowmobile Utilization Rate	43%	50%	50%	55%	37%	74%	67%	65%
East Gate Avg. Daily Snowmobile Utilization Rate	4%	6%	4%	4%	3%	6%	8%	4%
North Gate Avg. Daily Snowmobile Utilization Rate	18%	16%	21%	22%	22%	43%	58%	52%
Old Faithful Avg. Daily Snowmobile Utilization Rate	21%	33%	33%	43%	36%	53%	64%	58%

FIGURE 18: AVERAGE DAILY SNOWMOBILE USE RATES THROUGHOUT MANAGED USE ERA

Overall, the average daily snowcoach utilization rates have increased more gradually than snowmobiles, going from 33 percent parkwide in 2004/2005 to 46 percent parkwide in 2011/2012, as shown in figure 19. There was a gradual increase in snowcoach use at most of the gates with the exception of the East Entrance, where operators chose to stop running coaches in 2008/2009 despite the two-snowcoach allotment, and the South Entrance, which stayed between 20 and 30 percent throughout the managed-use era. There was a fairly steep drop in snowcoach utilization rate at the North Entrance in the 2011/2012 season (figure 19).



	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12
Parkwide Daily Avg. Snowcoach Utilization Rate	33%	42%	47%	49%	43%	44%	49%	46%
West Gate Daily Avg. Snowcoach Utilization Rate	46%	50%	50%	59%	50%	51%	59%	57%
South Gate Daily Avg. Snowcoach Utilization Rate	26%	28%	30%	29%	23%	28%	21%	23%
East Gate Daily Avg. Snowcoach Utilization Rate	16%	14%	8%	22%	0%	0%	0%	0%
North Gate Daily Avg. Snowcoach Utilization Rate	21%	54%	41%	43%	36%	37%	48%	31%
Old Faithful Daily Avg. Snowcoach Utilization Rate	24%	31%	66%	53%	57%	55%	59%	56%

FIGURE 19: AVERAGE DAILY SNOWCOACH UTILIZATION RATES THROUGHOUT MANAGED USE ERA

Visitation from Afar

Visitors can also visit the park from afar. Section 1.4.3 of NPS *Management Policies 2006* states, "The fundamental purpose of all parks also includes providing for the enjoyment of park resources and values by the people of the United States. The enjoyment that is contemplated by the statute is broad; it is the enjoyment of all the people of the United States and includes enjoyment both by people who visit parks and by those who appreciate them from afar. It also includes deriving benefit (including scientific knowledge) and inspiration from parks, as well as other forms of enjoyment and inspiration."

The park offers seven webcams for visitors to remotely view the park. These webcams include two at Old Faithful; one each at the Upper Geyser Basin, Mammoth Hot Springs, and the terraces at Mammoth Hot Springs; and two at Mount Washburn. Visitors can view these webcams at any time during the year (NPS 2010l).

VISITOR ACTIVITIES

Activities such as snowmobiling, cross-country skiing, and riding snowcoaches are primary winter uses in Yellowstone. These activities allow visitors to view wildlife, take photographs in various areas throughout the park, and enjoy the sounds of the natural environment. Other popular uses include camping, hiking/snowshoeing, and participating in interpretive programs. These visitor activities are generally available throughout the winter season, but the park superintendent may restrict the use of any area or trail to protect visitors and park resources. Weather conditions may also warrant closing an area.

The ability of visitors to experience Yellowstone by OSV is determined, in part, by the amount of snowpack on designated routes. The variability of snowpack over numerous years helps identify realistic opening and closing dates for OSVs in the park. Rubber-tracked coaches can operate in low snow conditions. Snowmobiles and steel-tracked coaches are not allowed to operate when snow is too thin. Actual opening dates for non-rubber-tracked vehicles is often later than the scheduled dates shown in table 29. For example, snowpack at Madison Junction helps dictate when the road can be opened from Old Faithful to West Yellowstone. Approximately 15 to 18 inches of cumulative snowfall is necessary to open the west-side roads to OSV use. Spring closings closely mirror changes in the snowpack, specifically when the snowpack becomes the same temperature throughout the snowpack, marking the beginning of spring melt. Mid-winter melt can also be a problem for maintaining snow on roads; therefore mid-winter melt affects visitor use (Farnes and Hansen 2005).

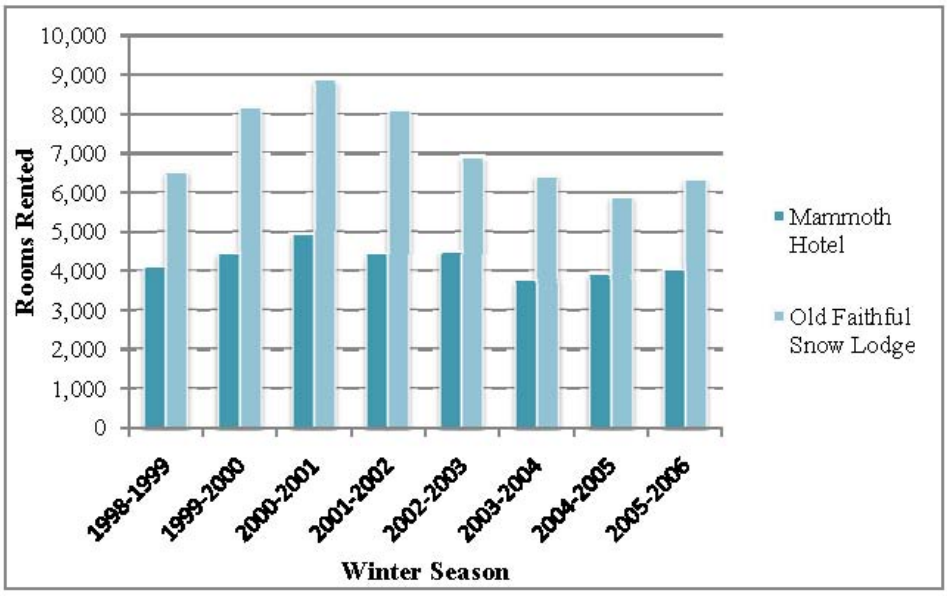
TABLE 29: TARGET OPENING DATES

Entrance	Date of Opening
South Entrance	December 15
East Entrance	December 22
West Entrance	December 15

In addition to parking facilities dispersed throughout the park, there are warming huts at various locations. Warming huts are found at Mammoth, Canyon Village, Indian Creek, Fishing Bridge, Madison, and West Thumb. Small snack bars or vending machines are available at the warming huts at Mammoth, Madison, and Fishing Bridge. NPS interpreters or volunteers staff some of the huts to answer questions and provide information and assistance to visitors. Winter fueling facilities are available at Old Faithful, Fishing Bridge, Mammoth, and Canyon Village (NPS 2007c).

Winter lodging facilities in the park include the Mammoth Hotel and the Old Faithful Snow Lodge. Together, these hotels have 228 rooms with 448 beds (NPS 2007c). In addition to these facilities, Yellowstone Expeditions operates six yurts plus a dining/community yurt and kitchen yurt near Canyon Village. The park also issues winter backcountry camping permits. Overnight stays at the hotels were at their highest during the 1999/2000 to 2001/2002 winter seasons (figure 20). The change in hotel stays closely parallels fluctuations in overall Yellowstone winter visitation. Snowmobile use and recreational visitor numbers were at their highest during these years.

Snow Lodge



Source: NPS 2007c.

FIGURE 20: HOTEL ROOMS RENTED IN YELLOWSTONE NATIONAL PARK, VARIOUS WINTER SEASONS

There are a number of museums in the area that offer a variety of different opportunities to learn about the history and heritage of the park and region. The Heritage and Research Center in Gardiner, Montana, houses the Yellowstone National Park museum collection, archives, research library, historian's office, archeology lab, and herbarium. Other nearby education resources include the Buffalo Bill Historical Center, the Carbon County Historical Society & Museum, the Eagle Rock Art Museum, the Gallatin County Historical Society and Pioneer Museum, the Museum of the Mountain Man, and the Museum of the Yellowstone, among others.

Visitor Accessibility

Yellowstone offers a wide variety of experiences in the park that can be experienced by a range of visitors. Visitors that could have difficulty accessing the park during the winter months include the very young, the elderly, and those who are mobility impaired. Within Yellowstone, visitors with access challenges can drive through the North Entrance of the park and through Lamar Valley and Mammoth in their own vehicles. Additionally, tour companies offer accessibility through the North Entrance of the park through wildlife viewing tours in Americans with Disabilities Act (ADA) accessible vehicles (Xanterra pers. comm. 2010). Visitors can enjoy viewing wildlife and the natural surroundings from a wheeled vehicle. Depending on individual mobility challenges, for some, snowmobiles can provide a way for visitors to enjoy the park in the winter. For others, ADA-accessible snowcoaches are the preferred mode of travel. Companies work with visitors to provide the type of transportation that best meets their needs and desires. Commercial vendors at Yellowstone offer ADA-accessible snowcoaches for those with accessibility issues. According to one company, disabled visitors use the power-lift snowcoaches on average twice a month (Johnson pers. comm. 2010).

Tour companies offer accessibility through the North Entrance of the park through wildlife viewing tours in ADA accessible vehicles (Xanterra pers. comm. 2010). Visitors can enjoy viewing wildlife and their natural surroundings from a wheeled vehicle.

The Old Faithful Visitor Education Center and the Albright (Mammoth) visitor center are wheelchair accessible. Visitors with accessibility needs may require assistance to enter the Madison warming hut (NPS 2010i). Wheelchair accessible rooms are available at the Old Faithful Snow Lodge, which also offers a handicapped-accessible cabin for visitors. Trails, paths, and roads in the park are snow covered in the winter. Routes between the Snow Lodge, the Old Faithful Visitor Education Center, and the geyser basin boardwalks are kept open, but soft or fresh snow may preclude easy access among them. At Canyon, the South Rim Drive at Artist Point offers a view of the Lower Falls (NPS 2010j). At the Mammoth Hotel, two handicapped-accessible rooms are available (NPS 2010k).

VISITOR SURVEYS

Numerous studies have examined visitor use in national parks, including some specific to Yellowstone, in an attempt to understand features and elements of particular importance to different user groups. Managing OSV use can affect visitor experiences in the park directly and indirectly. The NPS directly controls several elements of OSV travel, including limits on the number of OSVs in the park each day, the size of snowmobile tour groups, the relative proportion of snowmobiles and snowcoaches allowed, the grooming of roads, and requirements for visitors to employ licensed guides and use OSVs equipped with BAT. Through these actions, the NPS also manages other aspects of OSV use that can affect the experiences of winter visitors. Much of the research that has been done addresses how noise can impact the visitor experience, however, studies on the role wildlife viewing plays in the visitor experience and the potential for visitor conflicts are also relevant to winter use in the park.

Soundscapes are a key element of the environment and natural ecology of national parks (Borrie, Freimund, and Davenport 2002; Bowles 1995). However, equally important are the ways in which visitors experience a natural soundscape (McCusker and Cahill 2010). Much of the social science research on soundscapes addresses the effects of noticeable natural and anthropogenic (human-caused) sounds on visitor experiences in national parks and other natural areas. This has been an important area of investigation during the last two decades. In general, social science research has found that the majority of visitors to national parks value and enjoy natural sounds, solitude, and quiet (Mace, Bell, and Loomis 2004). At Yellowstone, a 2008 study found that those interviewed believed the natural sounds they heard were part of what made Yellowstone special. Eighty-one percent of respondents indicated that natural sounds had a positive effect on their experience (Saxen 2008).

The visitor survey report summarized below is the most recent available report of its kind. Data below were collected during the 2007/2008 winter season. The report, entitled *Winter Experiences of Old Faithful Visitors in Yellowstone National Park*, was prepared by The University of Montana, Department of Society and Conservation and released in August 2009 (Freimund et al. 2009). The methodology employed for this study was designed to address the following objectives related to noise and the visitor experience: to better understand the dynamics of visitor experiences of natural sounds and to better understand visitor perceptions of the practical need for mechanical noise presence during a park visit. Additionally, the study examined the relationship between visitor experience and wildlife and guiding.

The soundscapes sub-study sought to describe the dynamics of winter visitors' experiences of the soundscape environment in Yellowstone and document how visitors feel natural soundscapes should be protected by park management. Interviews conducted for the survey revealed that the natural soundscape assists in providing a deep connection to nature that is restorative and even spiritual for some visitors. Natural sounds influenced respondents' motivation to visit Yellowstone and were an important part of the experience for more than a third of the visitors interviewed. Specifically, experiencing natural sounds during a visit was rated as "extremely" or "very" important by 85 percent of cross-country skiers, 81 percent of snowshoers, and 75 percent of snowcoach tourists, but only 55 percent of snowmobilers.

Slightly less than half of respondents said the park was particularly attractive as a place free from motorized noise. Overall, snowmobilers and snowcoach riders generally felt strongly or somewhat agreed that Yellowstone is a place for natural quiet. Because they are able to travel in different locations than motorized vehicles, survey respondents participating in non-motorized winter activities, such as cross-country skiing and snowshoeing, had a higher percentage of respondents indicating they believe the park is a place free of motorized noise (even though they all had to use OSVs to access Old Faithful). Overall, Freimund et al. (2009) report that 71 percent of respondents to the soundscape survey said they found the level of natural sound they were looking for half or more of the time they desired it, but only 15 percent of visitors were able to find these experiences all of the time they were in the park. Still, very few respondents (8 percent to 13 percent) in all groups supported closing the roads at Yellowstone to all OSVs. Somewhat greater support existed for closing roads to snowmobiles while allowing snowcoach tours to continue; but fewer than half of all groups strongly or somewhat supported this measure, and only 11 percent of snowmobilers supported it.

The majority of respondents supported requiring BAT vehicles, continuing guide requirements, limiting the total number of OSVs in the park per day, and limiting group size to 11 per guide. The closing of roads to all OSVs or to snowmobiles only was opposed or strongly opposed by the majority of respondents. Plowing the roads for automobile access was also strongly opposed by approximately 71 percent of respondents.

In addition to these most recent studies, the effect of noise on the visitor experience has been examined at the park since the late 1990s. In a study before managed winter use, Davenport et al. (2000) found that most visitors "treasured" their winter experience in the park, with peace and quiet being part of that experience, with a high level of visitor satisfaction. Littlejohn (1996) also conducted a study in the "pre-managed era" and found that in response to an open-ended question about what they liked least about their visits, 134 respondents replied that trails and roads needed grooming, but only 79 respondents replied that noise from snowmobiles was what they liked least. Borrie et al. (1997) also explored the impact of noise on the quality of the winter experience at the park during the pre-managed era. In this study, visitors tended to describe the noise impact as neutral (neither important nor not important). More recent studies (Freimund et al. 2009; Saxen 2008) of visitor satisfaction during the "managed era" at the park reported similar findings, as detailed above and in the Scientific Assessment of Yellowstone National Park Winter Use (NPS 2011f).

Wildlife Viewing and the Visitor Experience

Many studies have noted the importance of wildlife viewing as part of the visitor experience in the park (Freimund et al. 2009), with bison being the most visible animals in the park. A second sub-study of the 2007/2008 survey looked at the visitor experience and bison. This study was conducted to explore snowcoach, snowmobile, and cross-country skiing winter use visitors' opinions of the human/bison interactions witnessed during park visits and to analyze situational and visitor characteristics that might influence those opinions. Surveys were given to 411 park visitors. From these surveys, Freimund et al. (2009) found that 71 percent of winter visitors to the park believed their opportunity to view bison was "very" or "extremely" important to their visit. When comparing cross-country skiers, snowshoers, snowmobilers, and snowcoach users, 70 percent or more of all groups rated the importance of the opportunity to view bison as very important or extremely important.

The majority of respondents indicated that the bison they encountered did not seem to notice the presence of humans or OSVs or, if they did, they quickly resumed their activities. Less than 20 percent of respondents had interactions with bison where they witnessed a defensive charge or felt bison were hurried or put to flight. Specifically, when asked to describe the most significant or "intense" encounter with bison that they witnessed, 43 percent of visitors described responses no more intense than bison

noticing the presence of humans and resuming their activity. Another 36 percent witnessed interactions in which bison appeared to be vigilant, to move away in an unhurried manner, or to have their desired movement blocked. The remaining 21 percent of visitors indicated seeing interactions where bison were hurried, were put to flight, seemed defensive toward humans, or appeared to fight each other as a result of human presence.

The survey found that snowmobilers were more likely to say bison were calm, as compared to cross-country skiers and snowshoers, who indicated that the bison appeared somewhat agitated and somewhat dangerous. Respondents traveling through the park via snowcoach were more likely to report that the bison appeared calm, as compared to reports from respondents using non-motorized transportation modes.

The majority of respondents still believe that bison lead a largely free, unrestricted life and remain an authentic symbol of western culture and heritage. Respondents indicated that they believe the bison appear healthy and they gave a positive endorsement in the case of appropriateness, quality of management, and acceptability of the bison.

Guiding

In addition to visitors, Freimund et al. (2009) also conducted interviews with 22 guides at the park. The study was designed to identify the perceptions snowmobile and snowcoach winter guides in Yellowstone have on the effectiveness of recent policy changes in achieving environmental protection while promoting satisfactory visitor experiences. At the time the study was conducted (2008), the daily limit on the number of snowmobiles in Yellowstone was 720, and it was the fourth winter that guides and BAT requirements had been in place. The number of snowcoaches and their requirements had remained unchanged since 2004.

Overall, guides thought that implementing policies requiring cleaner and quieter technology vehicles was beneficial to the ecology, improved the soundscape, and enhanced visitor experience. The majority of guides felt that the visitor experience was enhanced because the presence of guides resulted in a more interpretive experience while also enforcing regulations and ensuring safety. The change in visitor characteristics observed by guides suggests that people come to Yellowstone to experience the natural environment as opposed to using it as a place to ride OSVs. Few felt that the guide requirement inhibited the visitors' and local residents' ability to enjoy the park in the way they choose.

Guides did not believe that smaller groups had an effect on wildlife, because there are numerous groups in the same area at the same time, negating the purpose of limiting the size of groups. Additionally, they felt that sufficient lands surrounding Yellowstone exist to accommodate unguided snowmobiling, and the park should be a place to be educated and to enjoy nature. The majority of guides felt that the 720 snowmobile-per-day limit was working well. Some snowmobile guides were concerned about road conditions and the 1/3 mile rule, which states that snowmobiles must stay a third of a mile behind the guide, and some snowcoach guides felt that snowmobiles should be removed from Yellowstone all together.

Conflict and the Visitor Experience

Conflicts caused by OSV use in Yellowstone could be due to several impacts: engine or track noise interrupting inspirational visitor experiences, vehicle congestion at popular locations and rest areas, incompatible styles of use, perceived differences between user groups in social status, values, or identity, and conflicts arising from perceived differences in support of or opposition to NPS management actions. In some cases, this conflict could be "symmetrical" (i.e., recognized and experienced by all groups that are involved in the conflict). In other cases, the conflict may be "asymmetrical" in that it is perceived only

by the impacted group, but not by the group or groups causing the impact (Adelman, Heberlein, and Bonnicksen 1982). A well-established definition of behavioral conflict in the recreation social science literature is "goal interference attributed to the behavior of another" (Ruddell and Gramann 1994). Two types of visitor conflicts, noise-based conflicts and those that identify potential conflicts between user groups, have been studied at Yellowstone.

As suggested by previous noise research, the probability of conflicts arising from visitors' annoyance with motorized noises in Yellowstone may be highest in areas where the noises are perceived as incongruent with the setting, such as in backcountry locations accessible only by ski or snowshoe. Expectations for experiencing tranquility, solitude, and low or zero human-produced noises are common to backcountry users, forming an integral part of their anticipated experience and one of their primary reasons for visiting such locations (Manning et al. 2004). Based on noise modeling conducted for past winter use plans, mechanized noise is generally audible within a relatively narrow corridor around the road segments. These corridors are typically between 3.5 and 5 miles wide, but when 100 percent audibility is reached the contour forms a plateau extending about 0.5 to 1.5 miles on either side of the road and then sharply drops to no audibility over a short distance (Hastings, Fleming, and Lee 2006). This means that some non-motorized visitors to the park could encounter OSV noises during their visit, but that impacts are limited to an area around the road corridor. Cross-country skiers or snowshoers, who may travel by OSV to areas inaccessible to wheeled vehicles and then proceed on foot, would be most likely to notice such noise and experience conflict with OSV use (NPS 2008a), especially if they are seeking natural sounds and quiet once they reach their desired destination for skiing or snowshoeing. Active visitors might travel beyond the range of mechanized noise, but most users stay within two miles of travel corridors (NPS 2008a), putting them within the possible audible range of OSVs for a portion of their experience.

According to Jacob and Schreyer (1980), four major factors contribute to conflict between individuals or groups in outdoor recreation: (1) differences in the level of significance attached to using a specific recreation resource; (2) differences in personal meanings assigned to an activity; (3) differences in expectations of the natural environment; and (4) differences in lifestyles. Information on whether winter user groups in Yellowstone believe they are in conflict with other identified groups in the park has not been systematically collected, however, information from other studies such as Freimund et al. (2009) can be used to inform this issue. During this study, similarities between OSV and non-OSV users were found; for example, all user groups believed natural sounds to be important to their experience and there was overall support for the use of snowmobiles and snowcoaches in the park. Similarities continued among user groups for the interpretation of bison-human interactions at the park (Freimund et al. 2009), indicating that conflict did not exist between these groups. Other studies look at visitors based on their primary motivation for visiting the park in winter rather than their mode of transportation. Borrie et al. (1999) found the primary motivations at Yellowstone included "personal growth," "quiet activity," "nature study," and "accidental." The "accidental" category addressed those visitors who did not rank any single motivation highly. The study found differences between these groups in terms of the park entrance they preferred, acceptability of encounters with other OSV users, and tolerance of difference scenarios of OSV use. However, snowmobilers made up a large segment of each group, suggesting a simple "mode of transport" segmentation may not reveal the most meaningful differences between visitors and their experiences at the park.

OTHER SURVEYS

West Yellowstone Snowcoach Study, Visitor Profile of Snowcoach Passengers in West Yellowstone, Montana (Nickerson, Dvorak, and Wilton 2006)

This study by the Institute for Tourism and Recreation Research at the University of Montana profiled West Yellowstone snowcoach passengers in Yellowstone during a two-year study conducted from January to March in 2005 and 2006. Snowcoach passengers from five West Yellowstone companies were given a two-page questionnaire to complete during the last five minutes of their trip back to West Yellowstone. The survey was conducted over a two-year period, resulting in 266 usable questionnaires.

Overall, travel groups were relatively large, with a mean group size of 4.4. Non-resident groups stayed an average of 5.67 nights away from home, while Montana groups stayed 3.23 nights. Those who stayed at least one night in West Yellowstone averaged 4.14 nights in the area. Non-residents' reasons for being in the area were to visit Yellowstone in the winter (50 percent) and to ski at Big Sky (41 percent) compared to Montanans, 69 percent of whom said they came to visit the park and only 8 percent of whom indicated they came to ski at Big Sky. Of those who spent a night in West Yellowstone, 24 percent said snowmobiling was a reason for visiting the area. Primary reasons visitors wanted to visit the park in the winter included viewing wildlife in the winter, seeing winter wonderland scenery, and seeing geothermal activity in the winter. Respondents reported that the snowcoach tour provided them with an appreciation of nature, an educational experience, and a sense of wonderment.

Study of Preferences and Values on the Bridger-Teton National Forest (Clement and Chang 2009)

Bridger-Teton National Forest conducted a survey of preferences and values in relation to the forest. The forest is adjacent to the park and allows for a variety of winter uses. The Study of Preferences and Values on the Bridger-Teton National Forest report was designed to

- Conduct a random sample survey of local residents to explore their values and preferences in relation to the Bridger-Teton National Forest
- Better understand respondents' values associated with geographic aspects of the forest
- Conduct a Q-study, used as a research method to study people's "subjectivity" or their viewpoint, to explore the main values discourses that prevail regarding the Bridger-Teton National Forest with members of local communities who participated in the survey.

Participants in the survey included members of the general public who filled out the survey online, a group of cooperating counties, and soil conservation districts. Mailings were sent to 1,500 random households in the five counties surrounding the forest, with a 32 percent response rate.

Recreational activities in the Bridger-Teton National Forest enjoyed by the greatest percentage of participants include driving, wildlife viewing, fishing, hunting, and nature enjoyment. Participants were allowed to identify all recreational activities in which they participated within the forest. Approximately 87 percent of respondents prefer to experience the forest through non-motorized recreational activities, whereas 44 percent enjoy all-terrain vehicle use, 33 percent like the four-wheel driving experience, and 56 percent like OSVs.

Approximately 42 percent of respondents indicated that they felt that the current level of motorized activity was appropriate, whereas approximately 37 percent felt there was a need to create more motorized road access either by opening roads that were closed or through the construction of new roads.

Approximately 15 percent of respondents indicated that they believed the level of motorized road access should be reduced or eliminated. Additionally, 65 percent of respondents indicated that the current level of outfitter guide use (i.e., fishing, hunting, hiking, and snowmobiling) should be maintained. Approximately 48 percent of respondents indicated that no other areas should be designated as wilderness area.

Shoshone National Forest Study (An Economic Profile of the Shoshone National Forest, Taylor, Foulke, and Coupal 2008)

Shoshone National Forest conducted a survey of public values and preferences for the counties bordering the forest in 2006 (Taylor, Foulke, and Coupal 2008). The forest is adjacent to the park and offers a variety of visitor activities. The survey inquired about the following:

- Familiarity with the Shoshone National Forest
- Forest use preferences
- Attitudes to important topics on the Shoshone National Forest
- What values respondents attach to the Shoshone National Forest, the intensity with which those values are held, and, using a map, places on the Shoshone National Forest that represent those values
- Demographic information.

A four-phase mailing was sent to 1,300 random households in Fremont, Hot Springs, Teton, and Park counties. The surveys sent were split evenly between the counties according to zip codes. The mailing resulted in a response rate of 3 percent; of those responses, 69 percent included mapping data regarding valued places in the Shoshone National Forest. The survey results provided

- The forest values that residents around the Shoshone National Forest have in relation to the forest
- The preferences and attitudes associated with uses and issues in relation to the Shoshone National Forest
- The places in the Shoshone National Forest associated with these resident preferences, attitudes, and values.

Responses were weighted according to the relative county population numbers. First, county populations were divided by the number of respondents from that county and that number was used to weight results. Recreational activities in the Shoshone National Forest enjoyed by the greatest percentage of participants include driving, nature enjoyment, wildlife viewing, fishing, hiking/backpacking, and hunting. Participants were allowed to identify all recreational activities in which they participated in the forest. Approximately 37 percent of respondents prefer to experience the forest through non-motorized recreational activities, whereas 40 percent enjoy all-terrain vehicle use, 37 percent like the four-wheel driving experience, and 28 percent like OSVs.

Approximately 39 percent of respondents believed the level of existing road access was appropriate (recognizing that roads may be relocated or rehabilitated to protect resources), whereas 19 percent believed there was a need for more motorized road access and 8 percent commented that the level of motorized open roads should be reduced. Of all respondents, 34 percent of respondents replied as being "very satisfied" with winter recreation experiences in the forest. Additionally, 72 percent of respondents indicated that the current level of outfitter guide use (i.e., fishing, hunting, and snowmobiling) should be maintained.

PREVIOUS STUDIES

Other studies have been conducted related to visitor use and experience in the winter at Yellowstone. However, most of these occurred prior to the managed use era and have limited applicability for impact analysis. These studies are further described in the Scientific Assessment of Yellowstone National Park Winter Use (NPS 2011f).

HEALTH AND SAFETY

Three primary health and safety issues regarding winter visitor use were identified and are addressed in this plan: the effect of motorized vehicular emissions and noise on employees and visitors, avalanche hazards, and safety problems where different modes of winter transport are used in the same place or in close proximity.

In the last 15 years, the NPS (both nationally and in Yellowstone) has become increasingly concerned about providing safe work environments for all employees. In part, the agency's concern was heightened after the Occupational Safety and Health Administration (OSHA) found more than 600 safety violations in Yellowstone in 1997. Yellowstone's injury rate was two to three times as high as 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.

PERSONNEL AND OCCUPATIONAL EXPOSURE TO CONTAMINANTS

Air Quality

Although managed use of OSVs has reduced health and safety issues related to OSV accidents over the years, health and safety issues related to the noise and air emissions from OSV use remain. Historically (pre-four-stroke engine technology), snowmobiles in national parks have been a major source of air pollution, including CO, which is emitted as a byproduct of incomplete combustion of carbonaceous fuels (e.g., gasoline, diesel) (Flachsbart 1998). After inhalation into the body, a CO molecule binds with hemoglobin (Hb) in the blood to form carboxyhemoglobin (COHb), which can cause headaches, nausea, and irritation when exposure is over the NIOSH peak level (Flachsbart 1998; NPS 2005c). In a summer 2005 study at Yellowstone, peak CO levels were associated with older, un-tuned vehicles and/or motorcycles that were idling for several minutes at the entrance station window (NPS 2005c). Formaldehyde, another contaminant associated with snowmobiles and snowcoaches, is classified as a proven carcinogen (group 1) by the International Agency for Research on Cancer. NIOSH has a recommended exposure limit (REL) of 0.016 ppm (8-hour time-weighted average (TWA)) but also recommends that exposure to carcinogens be as low as technologically feasible (USDOI 2009).

Numerous occupational air quality studies have been conducted at Yellowstone, focusing on the West Entrance, the busiest winter access point to the park for OSV access. The major objective of these studies was to evaluate NPS employee exposure to PM, other 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 park, for example the Martin Luther King three-day weekend and the Presidents' Day three-day weekend.

Some of these studies, conducted when unlimited two-stroke machines were allowed, indicated concerns regarding employee safety and health, particularly on days with atmospheric inversions. Because snowmobiles entering the West Entrance are now BAT with reduced numbers, exposure levels to a variety of chemicals have dropped appreciably, as shown in tables 30 and 31. In 1997, personnel exposure measurements for CO were conducted at the West Entrance (Radtke 1997). The 8-hour TWA for CO was between 2 and 4 ppm. The OSHA permissible exposure limit (PEL) is 50 ppm and the threshold limit value (TLV) is 25 ppm. The more restrictive 8-hour NAAQS is 9 ppm. The study concluded that CO did not appear to be an important hazard for employees at the West Entrance.

TABLE 30: AVERAGE PERSONNEL EXPOSURE TO NOISE LEVELS

Sample Description	Kiosk A	Kiosk B	Kiosk C	Rider Average
Radtke 1997 – no snowmobile count taken, mostly two-stroke snowmobiles through West Entrance	70.9 dBA	Not sampled in 1997	Not sampled in 1997	Not sampled in 1997
OSHA 2000 – 976 two-stroke snowmobiles through West Entrance	72.1 dBA	75.2 dBA	88.3 dBA	93.1 dBA riding two stroke snowmobile
IHI Environmental 2004 – average of 220 snowmobiles, 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 snowmobiles, 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 snowmobiles, 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 dBA; exchange rate = 5 dBA Criterion Level = 90 dBA; Time Constant = slow).

TABLE 31: MAXIMUM EXPOSURE TO NOISE LEVELS

Sample Description	Kiosk A	Kiosk B	Snowmobile Riders
IHI Environmental 2004 – average of 220 snowmobiles, 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 snowmobiles, primarily 4 strokes through West Entrance (P) Denotes personnel 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)	

In 2000, OSHA conducted personnel and area sampling for benzene, gasoline, formaldehyde, and CO. They concluded that exposures were below PELs and TLVs, except for exposure to benzene, formaldehyde, and CO which exceeded the NIOSH REL for one employee at the West Entrance express lane.

A 2001 study included personnel exposure monitoring for respirable PM, CO, formaldehyde, acetaldehyde, and benzene. The study recorded an average benzene level of 0.035 ppm and an average overexposure of 0.029 ppm to benzene (Kado, Kuzmicky, and Okamoto 2001). Measured levels of benzene were below OSHA PEL and NIOSH REL levels. For formaldehyde and acetaldehyde, concentrations of 0.072 ppm and 0.024 (respectively) for a 170-minute sampling period were measured, which is also below OSHA PEL and NIOSH REL levels. Average particulate levels were measured at 0.1 mg/m^3, also below OSHA PEL and NIOSH REL levels. In 2004, after the managed OSV program was in place, occupational exposures to aldehydes, VOCs, respirable PM, CO, and noise were evaluated. This study concluded that concentrations of all airborne contaminants were well below current standards and RELs (IHI Environmental 2004).

A 2005 study evaluated exposures at the West Entrance for aldehydes, VOCs, total hydrocarbons, elemental and organic carbon, oxides of nitrogen, CO, and respirable PM. All employee exposures to the above air contaminants and noise were below OSHA PELs and other RELs. 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, Hart, and Stephenson 2006). Although there were some minor variances, the 2006 report confirmed employee exposures below all current standards set by regulatory agencies except for 2 of 13 benzene samples (mean concentration of 0.0032 ppm). The minimal risk level for chronic-duration inhalation exposure (365 days/year) is 0.003 ppm for benzene; the intermediate-duration inhalation exposure is 0.006 ppm and the PEL is 1.0 ppm. Although the two benzene samples averaged slightly higher than the minimal risk level, 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 fewer than 250 snowmobile entries on the days with higher benzene exposures. However, recent benzene exposure levels are an order of magnitude lower than they were when two-stroke machines were allowed in the park—a decrease possibly attributable to lower numbers of snowmobiles. Overall, emissions are well below federal safety levels; monitoring and adaptive management activities will continue.

In 2009, air monitoring for snowmobile and snowcoach exhaust was conducted at the West Entrance station over President's Day weekend. Monitoring showed CO slightly elevated from 2008 readings, but still below occupational exposure limits. On one sample day, snowcoaches and snowmobiles were separated. The exposure results showed that CO was slightly higher over the sampling period for snowmobiles; however, the peak reading for CO was higher for the snowcoaches (the sample period included 19 snowcoaches and 221 snowmobiles). The elevated levels of CO were likely due to the absence of ventilation in the booths (USDOI 2009). Otherwise, exposure levels to other pollutants measured were similar. An exposure assessment of the entrance station employees was also conducted in 2008. Results of VOC testing showed most levels were below detection limits, with the relative highest

exposure being to benzene, which was approximately 2 percent of the OSHA PEL. Three of the nine aldehyde samples had detectable levels of formaldehyde. These measurements were only approximately 2 percent to 3 percent of the OSHA PEL. Maintaining adequate positive pressure ventilation and minimizing time outside of the kiosk when snowmobiles and snowcoaches are idling will keep these exposures low (USDOI 2008).

Noise Exposure

Noise associated with OSV use can also have adverse effects on both park staff and visitors. Noise has a range of effects on performance, and the effects are dependent on the type of noise and the demands made by the task. Exposure to noise has other effects, such as the potential to contribute to cardiovascular disease. Noise can disrupt sleep and the functions that sleep provides in modulating cardiovascular function. Studies have also shown that noise exposure can result in changes in heart rate, blood pressure, vasoconstriction, stress hormones, and electrocardiogram (ECG) readings. Animal studies of long-term exposure to high noise levels shows permanent changes in heart muscle. Epidemiological studies of noise exposure have found an increased risk for hypertension and myocardial infarction in environments dominated by road traffic or aircraft noise (Babisch 2011; Jarup et al. 2008). In contrast to the airport and road noise studies, railroad noise has not been shown to increase cardiovascular disease risk (Bluhm and Eriksson 2011). As a result of the road and airport studies, the World Health Organization (WHO) Night Noise Guidelines for Europe established an interim target nighttime noise level (as measured outside) of 55 dBA and a night noise guideline of 40 dBA (WHO 2009). The interim target noise level is intended for situations where the 40 dBA night noise guideline is not practicable. The evidence of noise-related cardiovascular effects is limited because of the relatively small number of studies, inconsistencies between studies, and difficulties in accurately measuring indoor noise exposure (Stansfeld and Crombie 2011). Further studies are needed to fully understand the underlying causal relationship observed in the epidemiological data and to establish a dose-response relationship to allow the prediction of cardiovascular health impacts from noise exposure (Ndrepepa and Twardella 2011). No studies specific to snowmobile or snowcoach noise and health impacts have been conducted.

Noise exposure was measured for both snowmobile riders and employees working at the West Entrance in studies conducted between the years 1997 and 2005. The exposure measured included noise from all sources, including snowmobiles and other equipment. One way to measure employee exposure to noise, as below, is to compute the 8-hour TWA (time-weighted average, or the average exposure to noise that workers may experience without adverse effects over a specific period, such as over an 8-hour day or 40-hour week), with hearing protection required when the TWA is above 85 dBA.

In 1997, personnel exposure measurements for noise were conducted at the West Entrance. The 8-hour TWA for the noise samples ranged from 70.9 dBA to 82.0 dBA. These levels are below the action level of 85 dBA and the OSHA PEL 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 personnel and area sampling for noise. The study concluded that exposures were below PELs and TLVs, but the express lane employee was overexposed to the American Conference of Governmental Industrial Hygienists (ACGIH) action level and NIOSH standard for noise of 85 dBA. The only noise overexposures to West Entrance employees occurred when two-stroke snowmobiles were allowed.

In 2004, after BAT limits and commercial guiding were in place, 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 percent and 5.5 percent of the allowable noise exposure, respectively. Peak 8-hour TWAs for those two winters were 75 and 80 dBA, or 12.5 percent and 26.0 percent of the allowable exposure, respectively (Jensen and Meyer 2006). Clearly, although 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 snowmobiles operated for more than four hours. As noted earlier, 98 percent of loud OSV noises are from coaches, which tend to be louder at closer range, than snowmobiles, which tend to be louder at longer ranges. Even new coaches can have high interior and exterior noise levels. A 2010 Glaval coach was tested in March 2010. At cruising speed (21 mph), it measured 73 dBA on the outside and 83 to 84 dBA on the inside. At top speed, 28 mph, the Glaval measured 77 dBA on the outside and 86 dBA on the inside (Burson pers. comm. 2010b). Noise exposure while riding on or in OSVs can be controlled with standard ear plugs, which are provided by snowmobile and snowcoach operators to users entering the park. All commercially available NIOSH-rated foam plugs provide enough attenuation to protect employee hearing. An estimated exposure of 77 dBA for 8 hours when wearing earplugs falls within acceptable exposure limits set forth by OSHA, NIOSH, and ACGIH.

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 noises that generate sound levels greater than 140 dBA. No noise sampling in the park has indicated a maximum exposure above 115 dBA.

Additional noise studies were conducted during the winter 2011/2012 to assess the noise levels experienced by OSV users in the park. OSV noise levels were measured to assess their impact on visitor experience, including communication between guides and clients, as well as for the health and safety considerations of those traveling by OSV in the park. Noise exposure was measured in the interior of snowcoaches and near the ears of operators during snowmobile travel.

For snowcoaches, interior noise levels were measured in five different vehicles operating at typical cruising speeds of approximately 20 to 25 mph on snow-covered groomed roads in the interior of Yellowstone National Park (table 32). These five vehicles ranged from a repowered and retrofitted Bombardier with skis and long tracks to a 32-passenger bus. These vehicles were selected because they represent a cross-section of relatively late-model snowcoaches currently in operation in the park. Noise levels inside snowcoach cabins were measured using a calibrated Larson Davis Type 1 sound level meter and microphone. Measurements were taken in the front seat and the back seat of each snowcoach at approximate ear level as the snowcoach traveled at typical cruising speed on a snow-covered road. Average dBA was calculated as the logarithmic mean of the front and back seat measurements. Measurements were taken over a three-day period during the week of March 5, 2012.

TABLE 32: AVERAGE INTERIOR SNOWCOACH NOISE MEASURED IN DBA AT INDICATED CRUISING SPEEDS

Snowcoach	Average dBA	Cruising Speed (mph)
2011 Ford F-F550 32 Passenger, Grip Tracks	70	22
2011 Ford Vanterra, Mattracks	74	24
2008 Chevy Express Van, Mattracks	77	24
2011 Ford F-450 Glaval, Mattracks	81	27
1956 Bombardier B-12, V8 Motor, Skis & Tracks	84	26

On February 20, 2006, noise levels were measured on a 2006 Arctic Cat T660 four-stroke machine on packed (groomed) snow at the West Entrance of Yellowstone. On February 27, 2006, additional noise level measurements were conducted on a 2004 Arctic Cat T660 on unpacked snow at Mammoth, Montana. The average overall sound pressure level was measured near the operator's ear while the machine was idling and at up to six traveling speeds. These measurements were performed with a Quest Sound Pro DXL Type 1 real-time analyzer and a Quest Model 2700 Type 2 sound level meter fitted with a Quest Model OB-50 octave filter (NPS 2006d).

In relation to visitor use, noise can obscure the human voice by *masking* the sound of the voice, covering the voice and making it difficult to hear (Truax 1999a). When noise masks human speech, *speech interference* is occurring (Truax 1999b). Speech interference causes a listener to miss some proportion of what is being said in conversation. In response to speech interference, speakers raise the volume of their voices.

People with average voice strengths discussing unfamiliar material face-to-face raise their voices when background noise reaches 50 dBA (Truax 1999b, Figure 1). In telephone conversations with the phone against the ear, speech interference begins at background noise levels of 60 dBA.

Snowcoach noise measurements appear in table 32.[1] Results for snowmobiles appear in table 33. These noise levels were measured at the operator's ear and do not account for wind, wearing a helmet, or other similar factors. The actual level of noise the rider is exposed to is likely significantly less given the rider wears a helmet and other coverings and may wear ear plugs.

TABLE 33: SOUND LEVEL MEASUREMENTS IN DBA MEASURED AT OPERATOR'S EAR

Speed (mph)	dBA 2006 Arctic Cat T660 packed snow	dBA 2004 Arctic Cat T660 unpacked snow
0 (Idle)	69	67
15	87	84
20	—	85
25	91	89
30	—	97
35	92	92
40	—	91
45	97	92

Findings indicate that speech interference for snowcoach passengers is highly likely while the vehicle is at typical cruising speed. Without amplification, operators and passengers may be able to successfully communicate only when the OSV is traveling slower than typical cruising speed. Interior snowcoach noise in tested snowcoaches would interfere with spoken communication inside the snowcoach. The average snowcoach interior noise of the quietest snowcoach was 70 dBA, similar to being in the same room with a running vacuum cleaner. Two of five were louder than average city traffic. The noise inside the 2008 Chevy Express Van snowcoach (77 dBA average) was louder than the comparison sounds found

[1] Average dBA combines measurements taken in the front and rear of each vehicle.

in table 22 such as for a typical conversation (50-65 dBA), the inside of a Ford F-150 pickup truck traveling at 55 mph (63 dBA), and a vacuum cleaner (70 dBA); but quieter than average city traffic (80 dBA). Figure 21 graphically presents the loudness of one snowcoach and several comparison sources. The bar chart in figure 21 shows dBA measurements for reference sounds (quiet office, vacuum cleaner, Ford truck at 55 mph) and the measured interior noise of five measured snowcoaches.

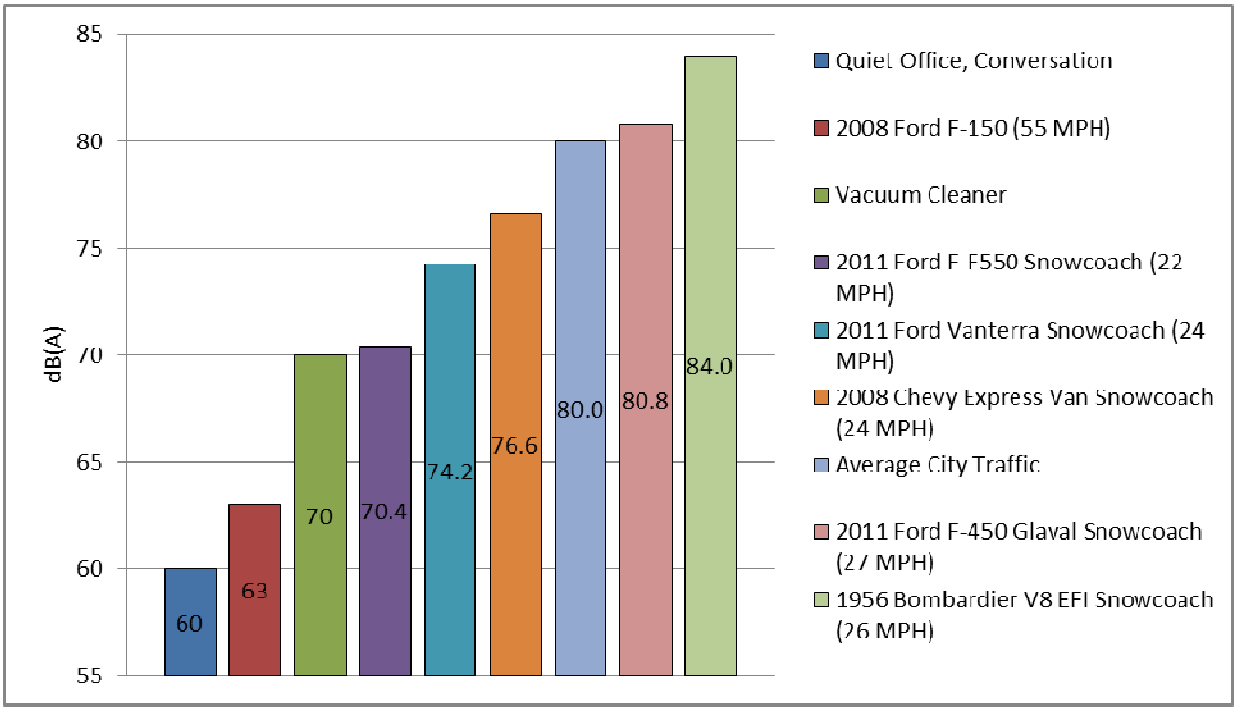


FIGURE 21: COMPARISON OF SNOWCOACH NOISE RELATIVE TO OTHER SOURCES

The OSV noise of all tested OSVs would interfere with spoken communication (table 32). In the snowcoach with the quietest measured sound level (70 dBA), passengers and guide would have to raise their voices or voices would need to be amplified in order to be heard. Communication with raised voices would remain difficult between guide and passengers because passengers would not be able to see the guide's face, limiting the possibility of reading lips to assist communication. Interior noise may reach levels where communication between snowcoach passengers is impossible while the vehicle is at cruising speeds. Many current snowcoaches have amplification systems from the guide to the passengers, but not from passengers to the guide or among passengers. Conditions for spoken communication in the louder snowcoaches would be worse. These elevated sound levels may contribute to increased fatigue and reduced visitor comfort.

Because of the higher operator noise exposure levels for snowmobile operators (table 33), verbal communication between two riders on one snowmobile or between two snowmobiles would be more difficult than within a snowcoach. Snowmobile operators and passengers wear helmets, further reducing hearing ability.

Speech interference occurs with all measured OSVs. In addition to raising voices, approaches to improving communication might include amplification equipment, noise mitigation efforts including sound dampening materials, and quieter OSV equipment. In their absence, communication at cruising speeds on all types of OSVs is difficult.

Further information on the impact of noise and its impacts on motor abilities is provided in the Scientific Assessment of Yellowstone National Park Winter Use (NPS 2011f). Average and maximum exposure levels at the West Entrance are summarized in tables 30 and 31.

AVALANCHE HAZARDS

NPS staff conducts avalanche control operations in the park 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 plan/SEIS. This discussion focuses on operations at Sylvan Pass, but also discusses parkwide operations and the Talus Slope area on the South Entrance Road.

Avalanche control at Sylvan Pass has long represented a safety concern to the NPS. Sylvan Pass is an approximately 1-mile-long portion of the East Entrance Road that splits the Absaroka Mountain Range near the eastern edge of the park. The pass connects the park's East Entrance with Lake Village and goes between Top Peak on the south and Hoyt and Avalanche peaks to the north. Sylvan Pass is situated at an elevation of 8,530 feet and receives a great deal of snow in the fall, winter, and spring. It is extremely windy and its nearly 45-foot slopes are prone to avalanches (Comey 2007). 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.

Since 1973, avalanche hazard mitigation work has been conducted on Sylvan Pass to accommodate snowmobile and snowcoach traffic (Yochim pers. comm. 2005). Historically, Sylvan Pass has been closed multiple times during a season for several hours to a full day during the winter to allow avalanche management to occur. That is, the pass has almost never been open for the entire season. Most reasonable avalanche mitigation techniques would result in the pass being closed for at least some days in the winter to conduct avalanche mitigation. Past winter planning documents concluded that the health and safety risks of operating an avalanche control program in Yellowstone at Sylvan Pass are considerable. These risks have become better known in recent years, with at least two agencies (OSHA 2001; State of Montana, Department of Military Affairs 2004) examining and explaining some of the risks the NPS incurs in its avalanche control program. Use levels have always been relatively low at Yellowstone's East Entrance. Even during the highest winter use years in the 1990s, total use for the season rarely exceeded 5,000 people, less than 5 percent of Yellowstone's total winter visitation.

These concerns led the NPS, in its 2007 winter planning decision, to close Sylvan Pass. However, in that decision, the NPS agreed to work with the City of Cody; Park County, Wyoming; and the state of Wyoming to determine the future of OSV travel over Sylvan Pass. These three entities and the NPS formed the Sylvan Pass Study Group and met a number of times in 2008. The meetings resulted in the Sylvan Pass Agreement in June 2008.

The Sylvan Pass Study Group recommended to the Intermountain Regional Director of the NPS that Sylvan Pass be kept open in future winter use seasons to motorized and non-motorized oversnow travel between December 22 and March 1. The group recommended continued use of a combination of avalanche mitigation techniques, including forecasting and helicopter and howitzer dispensed explosives.

This recommendation to operate within a defined core season would reduce risk, improve safety, and maximize visitor access. The Sylvan Pass Study Group reached agreement based on the following guiding principles:

- That the safety of visitors, guides, and NPS employees is the first priority in any avalanche mitigation operation on Sylvan Pass.
- That snowmobile and snowcoach motorized oversnow winter use access should be as regular and predictable as possible given weather constraints.
- That regular communications between the park, the City of Cody, Park County, the state of Wyoming, and the Cody community is a key ingredient of any future winter operations on Sylvan Pass.

The City of Cody, Park County, and the state of Wyoming agreed, in good faith, to work cooperatively to explore funding of safety and access improvements. The members of the Sylvan Pass Study Group agreed to establish consistent ongoing communications regarding Sylvan Pass winter use operations. The NPS agreed to make funding for safety and access improvements on Sylvan Pass a priority.

The agreement guided the management of Sylvan Pass during the 2009 to 2013 interim regulations. Under the agreement, the park may use a combination of techniques that have been used in the past (howitzer and helicopter), as well as techniques that may be available in the future. Area staff may use whichever tool is the safest and most appropriate for a given situation, with the full understanding that safety of employees and visitors comes first. Park staff members the operational determination when safety criteria have been met and operations can be conducted with acceptable levels of risk. The NPS will not take unacceptable risks (figure 22). When safety criteria have been met, the pass will be open; when they have not been met, the pass will remain closed. Extended closure of the pass may occur.

Sylvan Pass Avalanche Forecasting and Hazard Mitigation Program

For avalanche mitigation activities at the park, an operational profile exists that defines standards for communication, safe travel, and all operations at Sylvan Pass. The pass (and the East Entrance) is closed from 9:00 p.m. until 8:00 a.m. or until the determination is made about whether the pass is open or closed. This closure applies to park staff (except those conducting avalanche mitigation activities) as well as visitors. Avalanche mitigation measures include the use of a howitzer (cannon) to deliver explosives that trigger snow release or the use of a helicopter to deliver the explosives.

Prior to and since the Sylvan Pass Agreement, the NPS has adopted several mitigation measures to reduce the dangers of avalanches and avalanche mitigation activities to its employees and visitors:

- Installing a radio repeater on Top Notch Peak to improve communications in the pass area
- Providing additional, extensive, ongoing avalanche and howitzer training so that skilled staff perform control missions
- Conducting additional avalanche forecasting on site
- Constructing a berm above the howitzer platform to catch rock and cornice fall from the cliff behind it
- Realigning the East Entrance Road to reduce avalanche danger from some of the paths
- Modifying access to the gun mount, where the howitzer is located, to be farther from avalanche paths

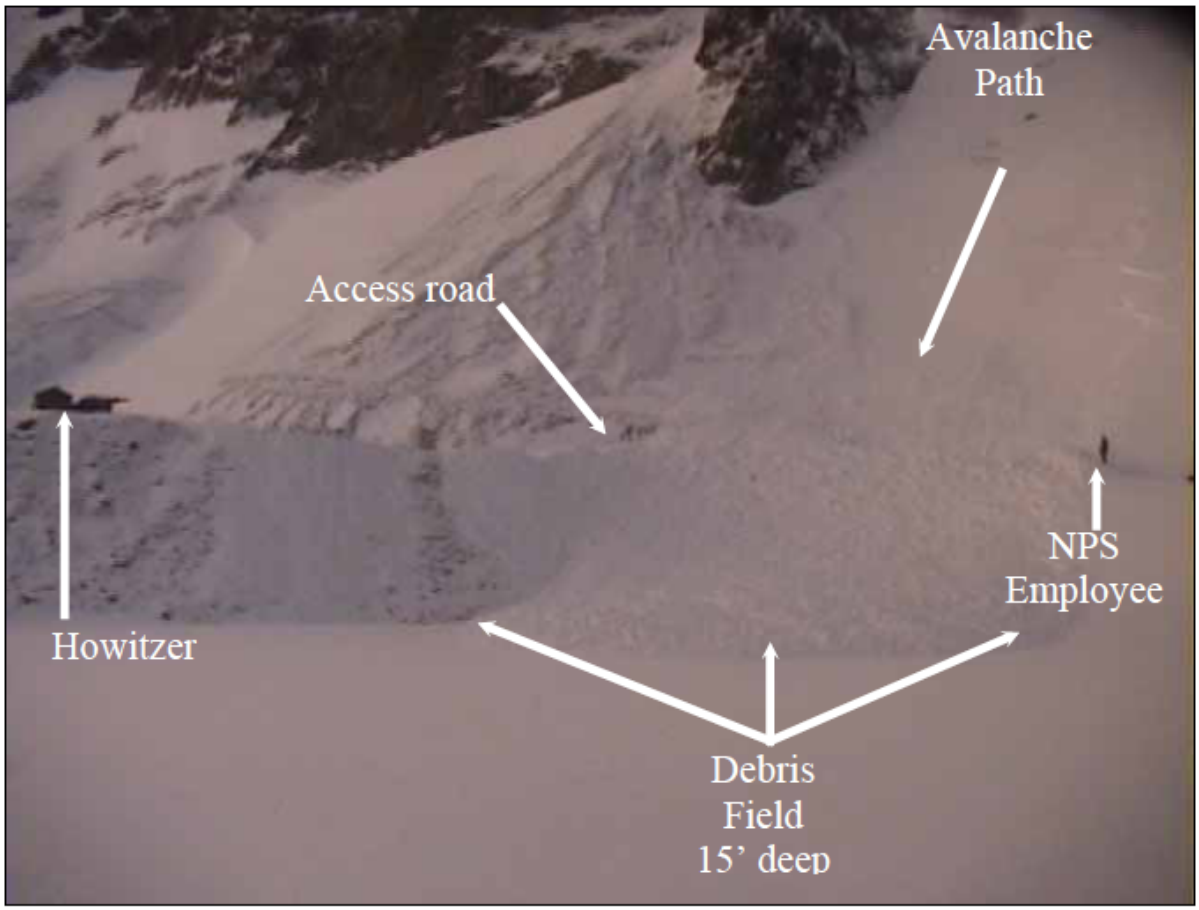


FIGURE 22: AVALANCHE THAT CROSSED THE ACCESS ROAD TO THE HOWITZER PLATFORM

- Acquiring a second howitzer (with the help of Wyoming)
- Having an enclosed vehicle available on site to support avalanche operations (again through assistance from Wyoming)
- Adding staff
- Adding additional weather equipment to improve forecasting (NPS 2010n).

The following is a discussion of the avalanche mitigation procedures summarized from the recent Operational Risk Management Assessment (ORMA) report (NPS 2010n).

Communication and Documentation

Road conditions are reported daily to the Yellowstone Communications Center. Changes in road status are sent via email and forecasters brief the Sylvan Pass staff on potential changes in weather. Following daily avalanche briefings, the weather forecast is updated. Discussions are posted for review by all staff working at Sylvan Pass. Forecasters complete documentation of avalanche hazard mitigation missions, natural avalanche occurrences, and snow observations. Regional Avalanche Forecast Centers provide the park with general condition reports and advisories. Forecasters for Sylvan Pass contribute site specific observations to regional centers.

Weather Forecasting

The Sylvan Pass Avalanche Forecasting and Hazard Mitigation Program begins and ends with weather forecasting. Each day a weather forecaster and an assistant check the weather for wind speeds, 24-hour snowfall, and air temperature. They also check for snowpack instability, visibility for driving, road conditions, weather factors, and any changes from the last observation. Weather factors include recent strong winds, recent heavy snow or rain, water content exceeding one inch from last observation, sudden warming (+12°F to 15°F (+6.7 to 8.3) over 12 hours), recent wind loaded slopes, and localized areas of convexity, especially with thin snowpack and rocks underneath. The team practices open communication, teamwork, and safe travel practices. Forecasters use remote automated weather stations and SNOTEL (SNOwpack TELemetry) sites that provide hourly updated information to track weather influences on avalanche formation. The most useful stations are placed near a potential avalanche location.

Loaded slopes can occur when rain or snow has fallen in the past 48 hours or when one inch of snow per hour for the past 6 hours has fallen on or near the pass. Both terrain features and high winds can contribute to a higher chance of an avalanche. If the team decides to close the pass, the road will remain closed until the avalanche hazard has decreased or been mitigated, signs indicate increased stability, and visibility improves. After avalanche mitigation is complete, a road groomer smooths the road surface to allow for OSV travel. At this point the forecaster will make the determination whether to re-open based on current and predicted conditions.

The Process of Avalanche Mitigation

When a decision is made to conduct an avalanche mission, avalanche mitigation begins with ensuring that current, trained staff members are available. If it is a howitzer mission, artillery training, hazardous material training, and proper experience of all team members is required. A crew is assembled from Lake and the East Entrance, and other districts, and the avalanche hazard is assessed by an avalanche forecaster. This assessment is used to determine the potential effectiveness of using the howitzer and the ability of personnel to safely access the gun mount. The Go/No Go decision may be based on the potential for avalanches to reach or cross the road along the west side of the avalanche zone. The decision to proceed is determined by the forecaster with the consensus of the howitzer crew. The method of accessing the gun mount will vary based on the evaluation of the avalanche hazard, conducted by the avalanche forecaster.

Prior to the howitzer mission, a briefing is conducted outside the avalanche zone, and the access route and other operational considerations are reviewed with the howitzer team. During the howitzer mission, approximately 20 rounds are fired into the starting zones of the avalanche paths, depending on snow conditions and observed results. At the conclusion of a mission, if conditions are safe, a groomer rebuilds the snow road to make it passable for OSVs. The groomer operator also has basic avalanche safety training, and the forecasters and other staff maintain a close watch during the grooming to watch for unexpected releases of snow. A single avalanche control mission requires a 10-hour work day for five to seven specially trained employees.

The park works closely with other regional avalanche forecasters to compare Sylvan conditions with those being observed in the vicinity of the park. The park is also a member of the Avalanche Artillery Users of North America Committee, has adopted their M101-A1 Howitzer Avalanche Control Firing Manual, and attends the annual Avalanche Artillery Users of North America Committee meeting to stay current on nationwide avalanche management.

The howitzer is on loan from the U.S. military, and the Wyoming National Guard assists with annual maintenance and training.

A contract helicopter may be used instead of a howitzer, especially when access to the howitzer is unsafe. NPS employees are not aboard the helicopter and do not drop the explosive charges. That is the role of the contractor. NPS employees brief the pilot and crew, and the pilot and crew make the decisions about where to drop the charges. As with howitzer missions, an NPS groomer rebuilds the road, and the East Entrance Road may be re-opened for public and administrative travel. Figure 23 shows avalanche paths at Sylvan Pass.

Unexploded Ordnance

Unexploded ordnance (ammunition that remain unexploded, whether by malfunction, design, or any other cause) at Sylvan Pass presents concerns, both for public safety and regarding homeland security. Over the years, unexploded ordnance has accumulated, primarily from past use of a 75-mm recoilless rifle for control work. The total number of unlocated unexploded ordnance is estimated at 300. Six unexploded ordnance 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 is highly toxic to humans and the environment. Both exploded and unexploded ordinance have the potential to release toxic materials (State of Montana, Department of Military Affairs 2004). The fate of the partially unexploded and unexploded ordnance and its toxic filler is unknown but of concern in the Sylvan Pass area. Visitors may come into contact the unexploded ordnance; 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. Unexploded shells have also fallen onto the road (Comey 2007). When one did so in 2006, the road 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 unexploded ordnance.

OSV Use in Sylvan Pass

Commercial OSV operators receive an orientation on safe travel practices through Sylvan Pass. Visitors can access the park website to check the status of open or closed roads, check for daily winter weather reports (including minimum and maximum temperatures, new snow accumulation, snow depth, weather, and an avalanche danger rating), and learn more about avalanche forecasting and hazards. A closure of Sylvan Pass occurs from 9:00 p.m. each night until 8:00 a.m. the next morning, when staff can make the operational determination for opening the pass.

Talus Slope

The “Talus Slope” area on the South Entrance Road also contains some avalanche zones. In contrast to those at Sylvan Pass, there are only seven avalanche zones, averaging less than a 200-foot vertical drop within a 1,700-foot section of the road. The South Entrance Road does not cross the avalanche paths, but rather the run-out zones attributed to the avalanches. If a vehicle were pushed off the road by a slide, it would drop about five to ten feet. In 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 coming close to covering it (Johnson pers. comm. 1999; NPS 2007b; Mossman pers. comm. 2003).

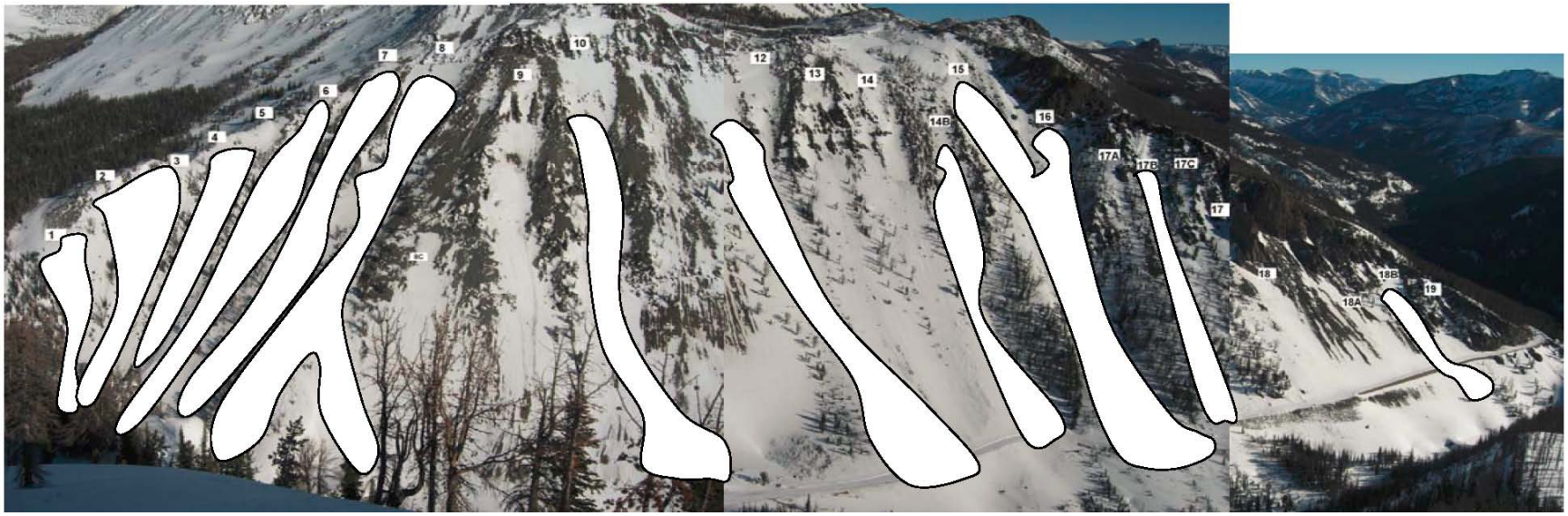


FIGURE 23: MAP OF SYLVAN PASS (AVALANCHE PATHS INDICATED BY NUMBER)

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 the use of an avalauncher (rather than the hand-charges that had historically been employed) (NPS 2002b). After two to three seasons of avalauncher use (which included considering its use at Sylvan), further reviews of the avalanche situation at Talus occurred (NPS 2002c). Those extensive reviews, which included input from avalanche experts outside the NPS, concluded that the risk of substantial avalanche activity at Talus Slope was low under normal conditions (Mossman pers. comm. 2003; Johnson pers. comm. 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 pers. comm. 2004). The review also concluded that the avalanche risk there would be best managed through careful observation of snow and weather conditions, signs for the visiting public prohibiting stopping in the avalanche zone, possible structural designs, and the use of helicopter-dropped explosives (Johnson pers. comm. 1999; NPS 2003a). 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 pers. comm. 2004; NPS 2007b). Even so, Yellowstone park staff members 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 roads until conditions improve or until such avalanches could be discharged. The same policy applies to the numerous other roadside slopes in the park that are prone to slides given the right snow and wind conditions. Park policy is uniform for all locations: monitor (using both regional and site-specific information), close the road if conditions are unsafe, control for avalanches (currently with howitzer- or helicopter-dispensed explosives), and reopen when safe (NPS 2003a). No management changes are proposed for the Talus Slope, Dunraven Pass, other road segments, or for park backcountry areas with avalanche hazards.

SAFETY CONCERNS AMONG DIFFERENT MODES OF WINTER TRANSPORTATION

Winter use in Yellowstone occurs mainly on groomed park roads for cross-country skiers, snowshoers, snowmobilers, and snowcoaches. Past planning efforts have raised safety concerns regarding conflict between non-motorized use and motorized use, including the concern that the use of a snowcoach or snowmobile on the same road as a cross-country skier or snowshoer could pose a threat to health and safety. There are several established trails that are groomed specifically for non-motorized uses and are not accessible to motorized users, which could reduce this perceived conflict. Safety concerns are addressed in part, by the requirement for OSV use to be guided within the park.

Since the winter of 2004/2005, all snowmobilers have been led by guides. Some visitors to Yellowstone have never ridden a snowmobile, and guides help teach them how to safely travel through the park. Guides are experts at snowmobile and/or snowcoach driving in Yellowstone and know the conditions that may be encountered with such travel. All guides are trained in basic first aid and cardiopulmonary resuscitation. 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. Guides use a “follow-the-leader” approach, stopping often to talk with their 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 indicate when to turn the snowmobile on or off.

As shown in figure 24, the introduction of guided snowmobile tours has reduced the number of law enforcement incidents since 2003/2004. Based on these raw numbers, OSV related incidents are down 90 percent from 2002/2003(282 incidents) to 2009/2010 (27 incidents). Although the number of violations related to OSV travel has been reduced, violations still occur, mostly unrelated to winter visitor recreation use. In 2009, four snowmobilers were apprehended when park rangers caught them riding in Yellowstone's backcountry. The offenders were operating rented machines off trail, more than a mile inside the park boundary near West Yellowstone. The use of OSVs in the backcountry, on trails, and off-road has always been prohibited. Despite this prohibition, rangers have observed off-road snowmobile tracks up to 2.5 miles inside Yellowstone's backcountry. Rangers regularly patrol the boundary and have the option to ticket, arrest, and confiscate the snowmobiles of the violators, who can expect to face aggressive prosecution (NPS 2009c).

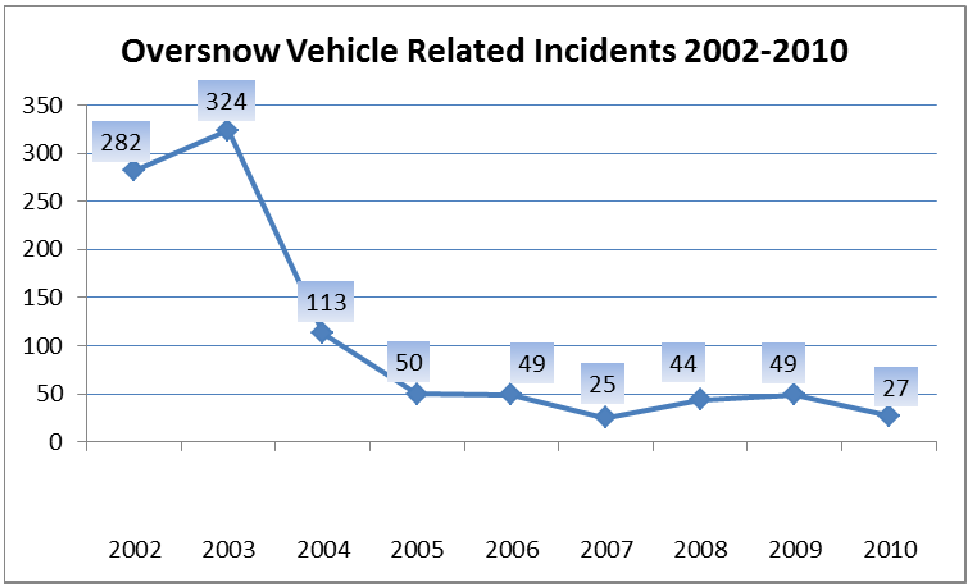


FIGURE 24: WINTER LAW ENFORCEMENT STATISTICS, 2002–2010

Severe Weather Conditions

According to industry standards established by the ACGIH, all non-essential work should stop at a temperature of -25°F (-31.7°C) if there is a 20 mph wind. With no noticeable wind, the temperature at which non-essential work should cease is -45°F (-42.8°C). Travel by snowmobile may produce wind-chill factors of -40 °F (-40°C).

Current Yellowstone employee procedures state that snowmobile travel is not advised for non-essential work at temperatures below -20°F (-28.9°C). 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; and research fieldwork. Temporary park closures may be enacted as necessary to provide for the safety of the public and employees during severe weather.

SOCIOECONOMIC VALUES

EXISTING AND HISTORIC SOCIOECONOMIC CONDITIONS

Economy of the Greater Yellowstone Area

The affected environment for socioeconomics of the greater Yellowstone area is described at three different levels: the state level (Idaho, Montana, and Wyoming), the county level (Fremont County in Idaho, Gallatin and Park counties in Montana, and Park and Teton counties in Wyoming), and the community level (Cody and Jackson, Wyoming, and West Yellowstone, Montana) where data is available. These three levels provide context for the magnitude of the impacts (both absolutely and relatively) at multiple geographic levels. These were also the levels used in analysis in the previous EIS (NPS 2000b), SEIS (NPS 2003c), EA (NPS 2004a), and EIS (NPS 2007c) for winter planning. The three communities at the local scale (Cody, Jackson, and West Yellowstone) provide 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 Northeast Entrances. Dubois, Wyoming, is a gateway community to both Yellowstone and Grand Teton. Island Park and other Idaho communities are gateways to Yellowstone. Other areas, within the counties or states but outside the communities can also be affected by the winter use alternatives. The effects on these smaller areas may be apparent, even when looking at a smaller area, such as within a zip code. Where these effects cannot be see within a zip code, qualitative measures were used.

Table 34 presents the relative sizes of the economies of the five counties in the affected region. The range of total economic output among these areas ranges from $534 million annually in Fremont County to $8.7 billion in Gallatin County. This range suggests that a change in visitor activity that is generally small in the context of the five-county area has the potential to be substantial in the context of the smaller economy of a community like Fremont County. However, 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). In a 2009 study, the NPS looked at the economic benefits to local communities from national park visitation. Using the Money Generation Model version 2 (MGM2) this study found that the nearly 3.3 million visitors in 2009 spent around $297 million year-round in the local communities year-round (NPS 2009d).

TABLE 34: ECONOMIC OUTPUT AND EMPLOYMENT LEVELS FOR THE GREATER YELLOWSTONE AREA, 2008

County	Total 2008 Output in $(2012)	Total 2008 Employment
Gallatin County, MT	8,697,185,428	67,737
West Yellowstone, MT	195,295,238	1,740
Park County, MT	1,049,197,379	8,730
Fremont County, ID	534,172,959	4,418
Park County, WY	2,689,466,448	19,448
Cody, WY	1,598,036,298	11,876
Teton County, WY	4,504,893,629	30,458
Jackson, WY	3,405,209,913	22,562
Five-County Area Total	17,474,915,469	130,791
Three-State Area Total	307,639,982,309	1,942,947

Source: IMPLAN Database and Model 2008.

Note: All numbers are exported from IMPLAN for each study area. The output for each of the five counties does not sum to the output for the 5-county study area in IMPLAN.

Table 35 illustrates the breakdown of employment by industry for the five-county affected region. The four largest industries are government and government enterprises, accommodation and food services, construction, and retail trade (BEA 2012).

Looking specifically at the travel industry, Taylor, Foulke, and Coupal (2008) presented information for the three Wyoming counties that contain most of the Shoshone National Forest (table 36). Park County had the highest earnings between 1997 and 2006. Taylor, Foulke, and Coupal also present information in their report on the counties surrounding Bridger-Teton National Forest. After adjusting for inflation, total visitor spending in Fremont, Lincoln, Sublette, and Teton counties in Wyoming (the counties surrounding Bridger-Teton National Forest) increased from $467.4 million in 1997 to $605.4 million in 2005 (+29.5 percent) (Taylor, Foulke, and Coupal 2008).

TABLE 35: EMPLOYMENT BY MAJOR INDUSTRY AND GEOGRAPHIC REGION, 2009

Industry	Five-county Area (Employees)	% of total Employees
Government and government enterprises	17,786	14.1%
Accommodation and food services	15,547	12.3%
Retail trade	13,755	10.9%
Construction	12,302	9.7%
Real estate and rental and leasing	9,459	7.5%
Professional, scientific, and technical services	9,069	7.2%
Health care and social assistance	8,350	6.6%
Other services, except public administration	6,808	5.4%
Finance and insurance	5,691	4.5%
Arts, entertainment, and recreation	4,952	3.9%
Manufacturing	4,019	3.2%
Administrative and waste services	3,914	3.1%
Farm employment	3,457	2.8%
Transportation and warehousing	2,482	2.0%
Wholesale trade	2,065	1.6%
Mining	1,668	1.3%
Information	1,603	1.3%
Educational services	1,728	1.4%
Forestry, fishing, and related activities	1,140	0.9%
Utilities	230	0.2%
Management of companies and enterprises	191	0.2%
Total	126,234	100%

Source: BEA 2012.

Note: Totals by industry may be low to avoid disclosure of confidential information. As a result, the total employment may not be equal to the sum of employment by industry.

TABLE 36: TRAVEL INDUSTRY EARNINGS FOR SHOSHONE NATIONAL FOREST AREA (FREMONT, HOT SPRINGS, AND PARK COUNTIES), 1997–2006

Year	Deflated Fremont	Deflated Hot Springs	Deflated Park	Deflated Three-county Area
1997	$22,009,349	$4,506,676	$44,018,697	$70,534,722
2001	$24,316,644	$4,882,860	$49,023,916	$78,223,420
2002	$24,475,222	$4,703,082	$51,062,033	$80,240,337
2003	$24,905,079	$4,793,053	$52,441,638	$82,139,769
2004	$26,867,472	$4,752,070	$52,638,313	$84,257,855
2005	$27,433,628	$5,221,239	$53,274,336	$85,929,204
2006	$28,481,474	$6,262,493	$49,928,367	$84,672,334
Total Change 1997 to 2006	29.4%	39.0%	13.4%	20.0%
Annual Change 1997 to 2006	2.9%	3.7%	1.4%	2.0%

Source: Taylor, Foulke, and Coupal 2008.

RECENT TRENDS IN PARK VISITATION

Previous estimates of changes in greater Yellowstone area visitation in response to changes in winter use policies relied primarily on visitor surveys to predict future policy impacts (Duffield and Neher 2000; RTI 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 park are presented in the "Visitor Access and Circulation" section in this chapter.

RECENT TRENDS IN THE GREATER YELLOWSTONE AREA ECONOMY

Analyses for previous winter use planning efforts in the park have predicted that restrictions on some types of winter use (primarily snowmobiles) would be at least partially offset by winter visitors still recreating in the greater Yellowstone area but using other recreational opportunities outside of the park. As a general example, it was predicted that restricting access to the park for some uses, such as snowmobiling, could lead to offsetting increases in use of other greater Yellowstone area recreational opportunities, such as snowmobiling in the national forests; however, there have been declines in both snowmobile visits and total winter visitation to Yellowstone in the past six years. An examination of key tourism-targeted tax collections in the greater Yellowstone area counties bordering the park provides information on the degree to which the economies of these counties and communities are economically dependent on park winter visitation.[2]

[2] All the tax information reported in the tables and figures is as reported by the respective states and does not include an inflation factor. Lodging costs typically increase as a result of inflation; thus, lodging tax revenue (which is a percentage 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). The NPS chooses to present lodging tax information without an inflation adjustment because there are a variety of possible indices, but notes through the reference to Taylor 2007 that such adjustments can be made. Also, another similar report examining tourism in Wyoming (Dean Runyan Associates 2006) and cited by Taylor 2007 does not (except for one table in a 71-page report) take inflation into account.

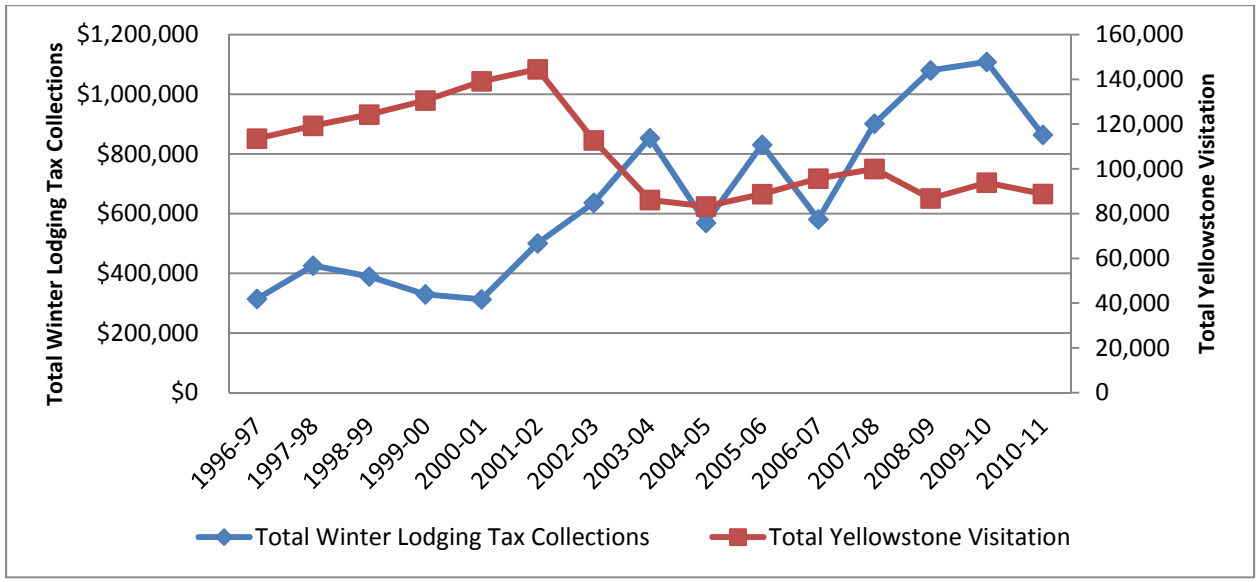
Table 37 and figure 25 present winter lodging collections for Fremont County, Idaho. In general, during the period when winter visitation to Yellowstone was decreasing (2002/2003 through 2005/2006), winter lodging tax collections in Fremont County trended upwards—the opposite of Yellowstone visitation trends. Fremont County winter lodging tax collections in 2005/2006 were more than double the level in the four years prior to 2002 (and the management changes that began in 2003). As table 37 shows, between 2003/2004 and 2009/2010 total sales for lodging in Fremont County for the months of December through March increased by almost 30 percent. Over the same period, annual tax collections for lodging for the State of Idaho increased 18 percent. However, many other factors affect lodging tax revenues in different parts of the state. Therefore, the NPS is unable to draw conclusions or determine causality about differences across different parts of the state.

TABLE 37: FREMONT COUNTY, IDAHO, WINTER LODGING TAX COLLECTIONS COMPARED WITH YELLOWSTONE NATIONAL PARK WINTER VISITATION, 1996/1997 THROUGH 2010/2011

Winter Season	December	January	February	March	Winter Fremont County Lodging Tax Collections	Total Yellowstone Winter Visitation
1996/1997	$42,441	$44,183	$83,866	$143,806	$314,296	113,504
1997/1998	$204,652	$34,754	$114,365	$71,945	$425,716	119,271
1998/1999	$93,591	$55,816	$180,620	$59,299	$389,326	124,275
1999/2000	$76,263	$70,473	$112,822	$69,865	$329,423	130,563
2000/2001	$80,688	$58,952	$101,676	$71,411	$312,727	139,122
2001/2002	$123,261	$76,855	$144,869	$155,416	$500,401	144,490
2002/2003	$61,374	$131,383	$239,068	$204,393	$636,218	112,741
2003/2004	$246,769	$107,345	$406,135	$92,864	$853,113	86,107
2004/2005	$116,323	$4,661	$335,441	$112,605	$569,030	83,235
2005/2006	$221,627	$261,024	$236,964	$111,201	$830,816	88,718
2006/2007	$56,010	$274,561	$101,271	$148,902	$580,744	95,675
2007/2008	$101,340	$366,934	$169,966	$263,416	$901,656	99,975
2008/2009	$199,351	$586,581	$23,043	$271,072	$1,080,047	86,784
2009/2010	$200,363	$185,892	$196,378	$525,717	$1,108,350	93,838
2010/2011	$159,999	$77,092	$358,843	$268,090	$864,024	88,807

Source: Idaho State Tax Commission 2012.

Note: Not adjusted for inflation.



Source: Idaho State Tax Commission (2012).
Note: Lodging collections not adjusted for inflation.

FIGURE 25: COMPARISON OF FREMONT COUNTY, IDAHO, WINTER LODGING COLLECTIONS AND YELLOWSTONE NATIONAL PARK WINTER RECREATIONAL VISITATION, 1996/1997 THROUGH 2010/2011

Park County, Wyoming, on the east side of Yellowstone has similar winter lodging tax information during this same period (table 38 and figure 26). The main community in Park County is Cody. In addition, Park County encompasses the northern portion of Yellowstone, 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 recreational winter visitation levels for Yellowstone 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 Yellowstone OSV visitation between 2002 and 2006. The Mammoth Hot Springs Hotel accounts for 41 percent of the Park County lodging tax in the winter.

Table 39, from Taylor, Foulke, and Coupal (2008), shows local tax revenue collections for the entire year, adjusted for inflation, for Fremont, Hot Springs, and Park counties. Between 1997 and 2006, tax revenues increased in a similar manner to the winter lodgings tax revenue displayed in table 39. Park County has higher travel-related tax revenue than Fremont and Hot Springs. The report by Taylor, Foulke, and Coupal (2008) also presented information on local tax receipts for the counties surrounding Bridger-Teton National Forest (Fremont, Lincoln, Sublette, and Teton counties in Wyoming). Local tax receipts from travel spending, adjusted for inflation, increased from $9.5 million in 1997 to $11.3 million in 2005 (+19.0 percent, and a compound average growth rate of 2.2 percent per year).

Recent lodging and tax data for Fremont and Park counties indicate that declines in snowmobile entries in winter visitation in the park in general, and into Yellowstone in particular, 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. Visitation to Yellowstone can also be compared to other local attractions. The Buffalo Bill Historic Center is in Cody, Wyoming. Figure 27 indicates that overall Yellowstone winter visitation and Buffalo Bill Historic Center winter visitation seem to move together.

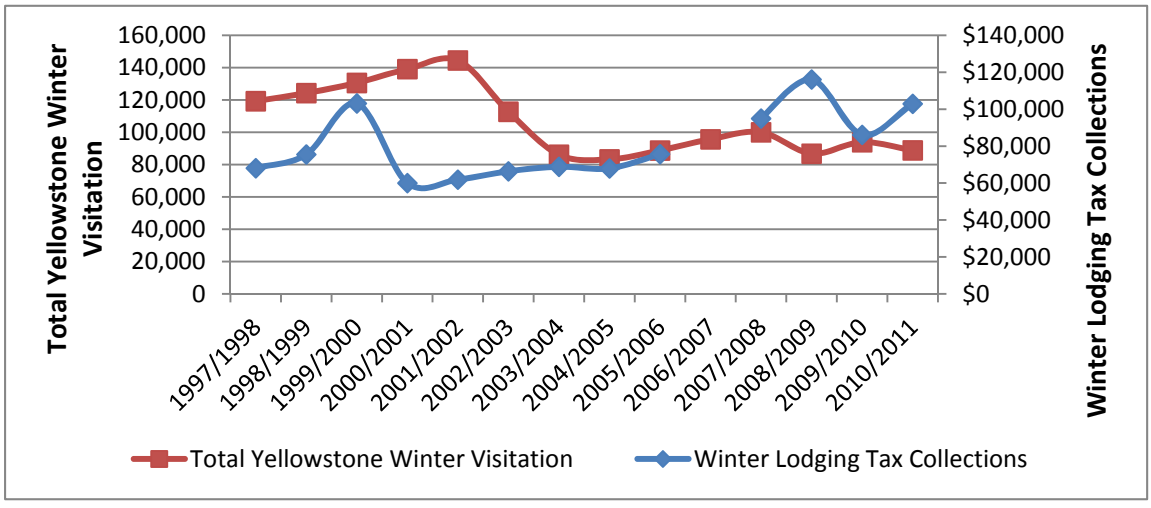
TABLE 38: PARK COUNTY, WYOMING, WINTER LODGING TAX COLLECTIONS, IN TAX YEAR DOLLARS, COMPARED WITH YELLOWSTONE NATIONAL PARK OSV VISITATION, 1997/1998 THROUGH 2010/2011

Winter Season	Dec	Jan	Feb	Mar	Winter Lodging Tax Collections	Total Yellowstone Winter Visitation
1997/1998	$33,155	$8,498	$13,458	$12,965	$68,075	119,271
1998/1999	$24,258	$9,523	$12,509	$29,218	$75,509	124,275
1999/2000	$59,379	$14,971	$10,617	$18,184	$103,151	130,563
2000/2001	$20,467	$9,384	$16,200	$13,955	$60,006	139,122
2001/2002	$26,971	$9,477	$12,352	$13,072	$61,872	144,490
2002/2003	$27,486	$14,217	$10,417	$14,256	$66,376	112,741
2003/2004	$28,765	$12,527	$9,455	$18,090	$68,837	86,107
2004/2005	$27,841	$13,210	$13,313	$13,556	$67,919	83,235
2005/2006	$20,520	$21,382	$20,532	$13,244	$75,679	88,718
2006/2007	(data not available)					95,675
2007/2008	$28,909	$14,111	$25,512	$26,425	$94,957	99,975
2008/2009	$46,397	$18,128	$29,360	$22,199	$116,084	86,784
2009/2010	$31,478	$16,577	$13,463	$24,625	$86,143	93,838
2010/2011	$26,345	$29,678	$23,509	$23,420	$102,952	88,807

Source: Wyoming Department of Revenue 2012.

Notes: Not adjusted for inflation.

The report, "Economic Trends in the Winter Season for Park County, Wyoming" by David T. Taylor (2007) presents different winter lodging tax information (excluding December and lagged two-months) for five of the nine years presented above (from 1997 to 2006). However, the general lodging tax trends (without regard to inflation) are the same in both reports. Additionally, 2007/2008 tax collection data were not available.



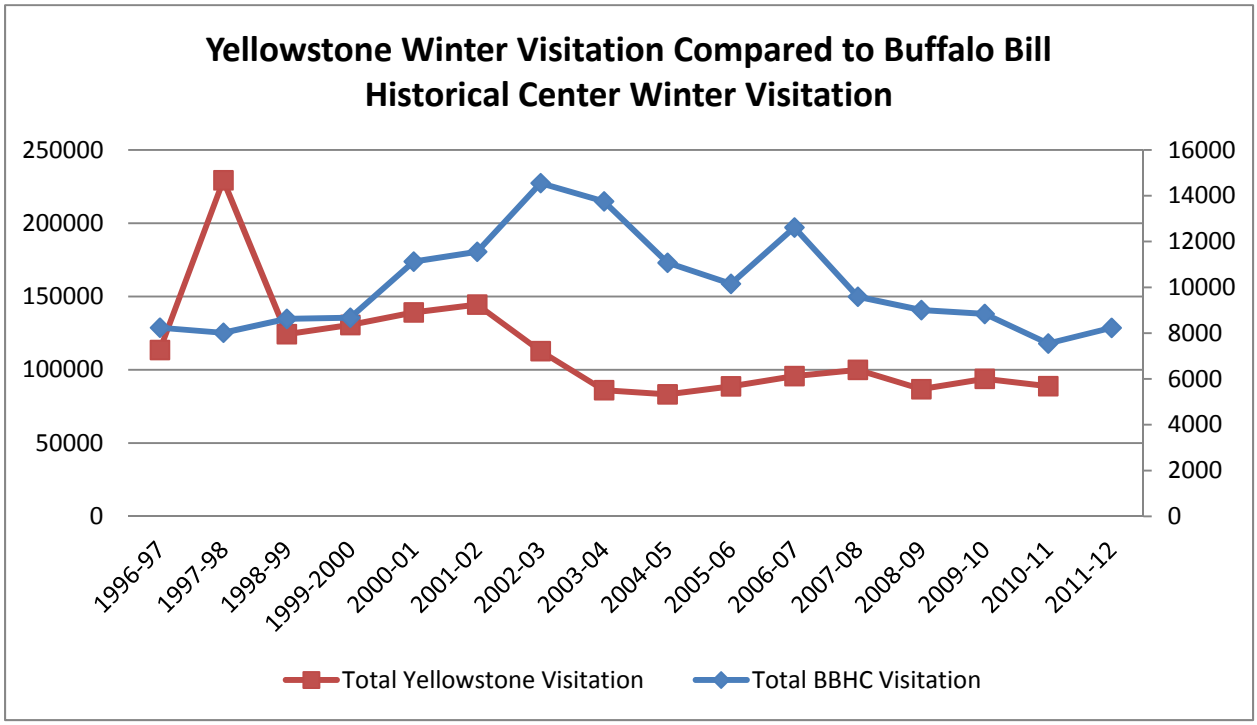
Source: Wyoming Department of Revenue 2012.
Note: Data for 2007/2008 are not available. Lodging tax collections not adjusted for inflation.

FIGURE 26: COMPARISON OF PARK COUNTY, WYOMING, WINTER LODGING TAX COLLECTIONS, AND YELLOWSTONE NATIONAL PARK OVERSNOW VISITATION, 1997/1998 THROUGH 2009/2010

TABLE 39: TRAVEL INDUSTRY LOCAL TAX REVENUE FOR SHOSHONE NATIONAL FOREST AREA (FREMONT, HOT SPRINGS AND PARK COUNTIES), 1997–2006

Year	Deflated			
	Fremont	Hot Springs	Park	Three-county Area
1997	$524,032	$209,613	$1,781,709	$2,515,354
2001	$585,943	$292,972	$2,050,801	$2,929,716
2002	$671,869	$287,944	$2,207,569	$3,167,382
2003	$657,870	$281,944	$2,255,554	$3,195,369
2004	$639,702	$274,158	$2,193,263	$3,107,123
2005	$707,965	$353,982	$2,389,381	$3,451,327
2006	$772,088	$428,938	$2,316,264	$3,517,290
Total Change 1997 to 2006	47.3%	104.6%	30.0%	39.8%
Annual Change 1997 to 2006	4.4%	8.3%	3.0%	3.8%

Source: Taylor, Foulke, and Coupal 2008.



Source: BBHC 2012.

FIGURE 27: COMPARISON OF BUFFALO BILL HISTORICAL CENTER WINTER VISITATION WITH YELLOWSTONE NATIONAL PARK OVERALL WINTER VISITATION (WHEELED AND OVERSNOW), 1996/1997 THROUGH 2009

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 Yellowstone and Grand Teton National Park winter visitation would not be detectable. For example, the observed change in visitation at the South Entrance in response to the 2004 Temporary Winter Use Plan was estimated to have an expenditure impact on the order of $4 million per year. By comparison, the five-county greater Yellowstone area economy (largely driven by Gallatin and Teton counties) was on the order of $6 billion in 1999 and in 2008 (the most recent data available for modeling) had grown to about $8 billion. Similarly, impacts from changes in the park's winter visitation levels for the three-state economy would not be detectable.

However, the size of the economic impacts relative to the size of the county economies masks impacts on some individual businesses, which have indicated a considerable reduction in their winter operations. Other employment patterns have changed (year-round work for some employees is no longer available) as a result of changing visitation patterns (Ecosystem Research Group 2006).

At the North Entrance gateway of Gardiner, Montana (Park County), almost all winter use is wheeled vehicle entries. Neither the 2004 Temporary Winter Use Plan (NPS 2004a) nor the final 2007 EIS (NPS 2007c) 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), other Yellowstone locations, or to recreate in and around Cooke City, Montana (which is in Park County, Montana).

Another indicator of 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 Yellowstone visitors. Winter visitors interested in wolf watching, who constitute about 3.1 percent of the annual visitation to Yellowstone, contribute about $1.3 million to the 17-county economy related to wolf presence in Yellowstone. This is about 5.8 percent of the total annual $22.5 million direct spending impact of wolf watching to the 17-county economy (Duffield, Neher, and Patterson 2006).

The remaining major gateway community for Yellowstone is West Yellowstone, at the West Entrance to Yellowstone. Table 40 provides time series data for this entrance, shown graphically in figure 28. Included in the table are winter resort tax collections for the town of West Yellowstone, winter entries through the West Entrance to Yellowstone, winter snowmobile visits to the Hebgen Lake District of the Gallatin National Forest, which abuts the town to the west, and the number of skiers at the Rendezvous ski trail. Unlike the cases of Park and Fremont counties discussed above, reductions in winter park visits through the West Entrance and to the national forests between 2002/2003 and 2005/2006 are correlated with declines in resort tax collections. However, 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 although park visitation fell 48.5 percent on average, winter tax collections only fell 19.7 percent. Montana's statewide lodging tax rose 17 percent during the same period; however, many other factors affect lodging tax revenues in different parts of the state so it is difficult to draw conclusions about differences across different parts of the state.

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 percent) of the variation in winter resort tax collections. The model indicates a $5.26 increase in tax collections for each West Entrance visit. Because the tax rate is 3 percent, 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

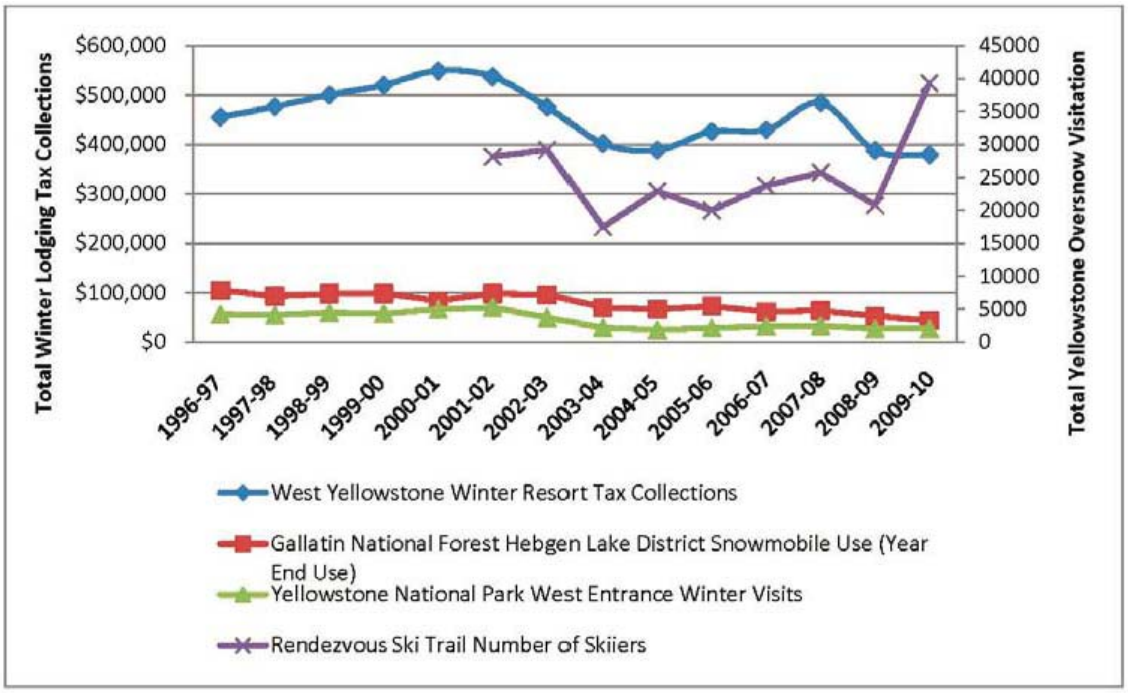
resort tax collections. This could possibly be snowmobile use on the adjacent national forest lands, as discussed below.

Table 40 and figure 28 present data for snowmobile use in the Hebgen Lake District of the Gallatin National Forest. This district includes many miles of groomed snowmobile trails that are accessible primarily from the West Yellowstone area. In the last three winters, snowmobile use in this national forest area adjacent to West Yellowstone has declined at the same time as park visits through the West Entrance declined. Causation; however, is complicated by the short time series and a drought and relatively low snow pack in recent years, including the winter of 2004/2005. These data do suggest that restrictions on snowmobile access at the West Entrance have not led to noticeably increased use in the adjacent national forest.

Table 40 and figure 28 indicate 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 in 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 Yellowstone 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 Yellowstone West Entrance visits, snowmobiling in the adjacent national forests is also important for the West Yellowstone economy (Duffield and Neher 2006).

TABLE 40: WEST YELLOWSTONE WINTER RESORT TAX COLLECTIONS, HEBGEN LAKE DISTRICT SNOWMOBILE USE, YELLOWSTONE WEST ENTRANCE WINTER VISITS, AND RENDEZVOUS SKI TRAIL VISITS 1996/1997 THROUGH 2009/2010

Winter Season	West Yellowstone Winter Resort Tax Collections	Gallatin National Forest Hebgen Lake District Snowmobile Use (Year End Use)	Yellowstone National Park West Entrance Winter Visits	Rendezvous Ski Trail Number of Skiers
1996/1997	$455,035	105,182	56,212	n/a
1997/1998	$476,508	93,208	54,859	n/a
1998/1999	$500,473	98,326	59,928	n/a
1999/2000	$520,566	98,838	58,154	n/a
2000/2001	$549,182	83,721	66,302	n/a
2001/2002	$536,996	98,595	70,371	28,139
2002/2003	$476,037	95,924	49,703	29,139
2003/2004	$401,664	69,996	28,880	17,461
2004/2005	$388,222	66,889	24,510	22,912
2005/2006	$425,933	73,065	28,243	19,974
2006/2007	$429,336	61,240	31,686	23,741
2007/2008	$484,278	64,019	32,942	25,714
2008/2009	$387,444	52,791	26,830	20,799
2009/2010	$378,687	44,031	26,527	39,322



Note: Sales tax receipts not adjusted for inflation.

FIGURE 28: WEST YELLOWSTONE WINTER RESORT TAX COLLECTIONS, HEBGEN LAKE DISTRICT SNOWMOBILE USE, YELLOWSTONE WEST ENTRANCE WINTER VISITS, AND RENDEZVOUS SKI TRAIL VISITS 1996/1997 THROUGH 2009/2010

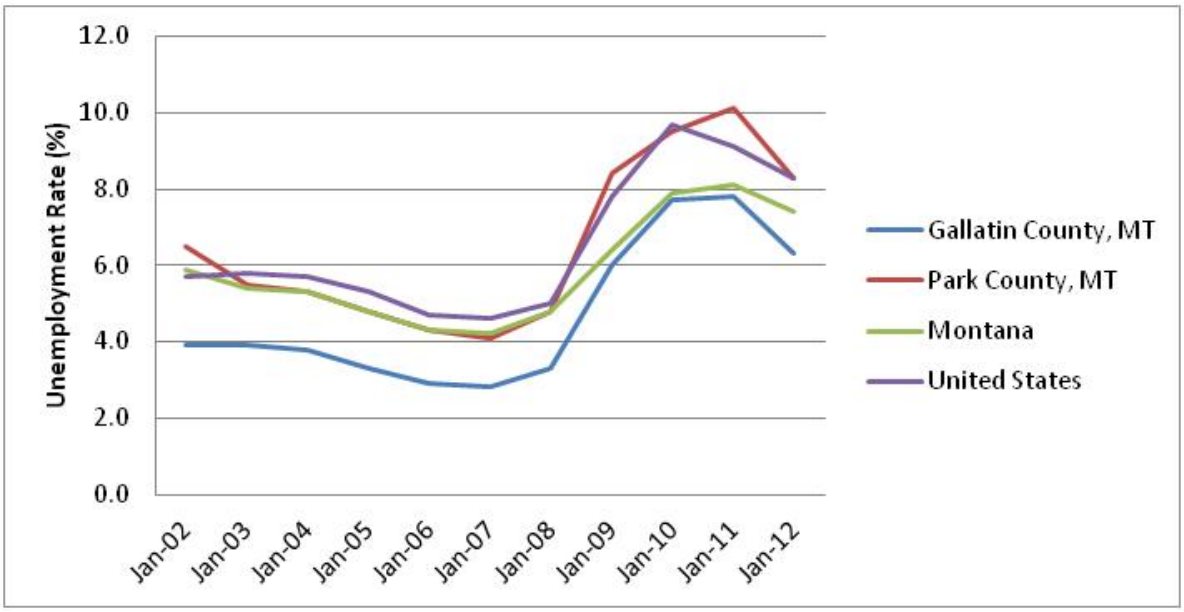
Of the five regional economic areas examined in this analysis, there is a detectable impact on West Yellowstone's economy from winter use in Yellowstone (and in the surrounding national forests). These results are consistent with the predicted impacts from the socioeconomic impacts section of the SEIS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

It is notable that winter access by autos, recreational vehicles and buses, all of which in a normal winter would be 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 Yellowstone 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 partial substitution within motorized OSV use from snowmobiles to snowcoaches. Snowmobile visitation dropped by some 60,000 and snowcoach visitors increased by approximately 10,000.

The Recent Economic Downturn

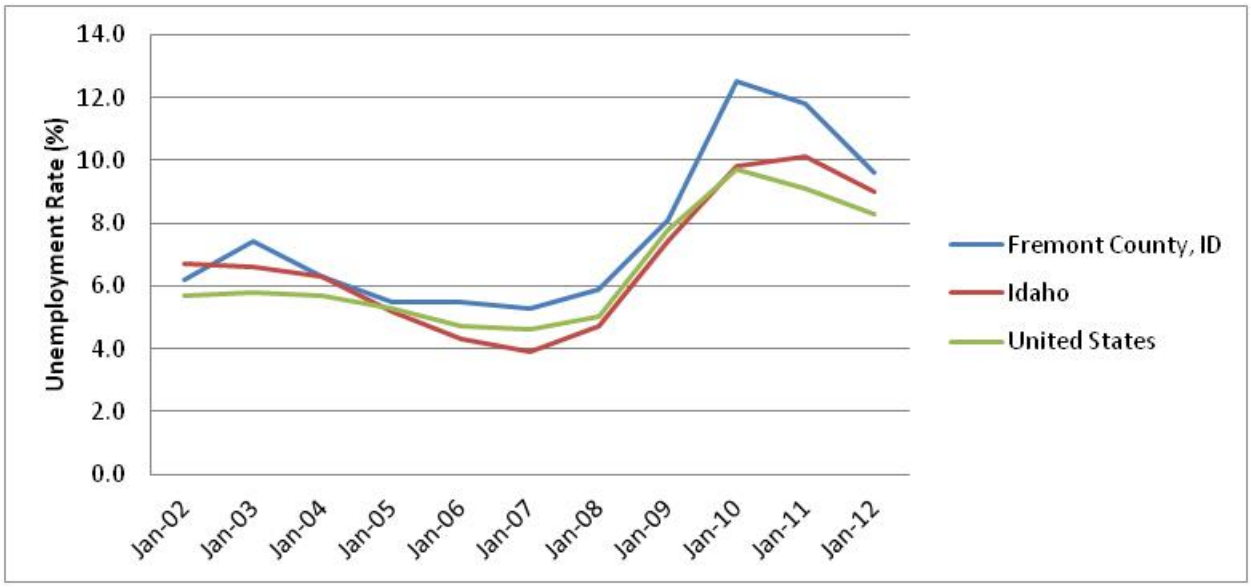
Economic conditions have worsened considerably since September 2008. The economic downturn has most likely impacted visitation to the greater Yellowstone area and spending by visitors who come to the area. Figures 29 to 31 compare the unemployment rates in each of the affected counties to those of their respective states as well as the United States as a whole. In Montana (figure 29), unemployment in Gallatin and Park counties has remained below that of the United States for the most part, although Park County's unemployment rate surpassed the national rate in 2010. After a spike near the end of 2009 and continuing into 2010, unemployment in Idaho's Fremont County (figure 30) declined back toward the

statewide rate in 2011. In Wyoming, Park County generally mirrored the statewide unemployment rate until 2008 when the rate began growing more steeply. In Teton County, although staying below both the national and statewide rates, the unemployment rate grew steeply from 2008 to 2010 then began to grow less steeply 2011 (figure 31). As of December 2011, all counties in the affected area except for Park County, Montana, and Fremont County, Idaho, had unemployment rates below the national average. However, all counties continue to experience unemployment rates well above levels seen prior to 2008. As the economy improves, visitor spending should increase through the area. Montana, Idaho, and Wyoming, and the counties contained in these states, experience much more seasonal variation in unemployment rates than observed at the national scale.



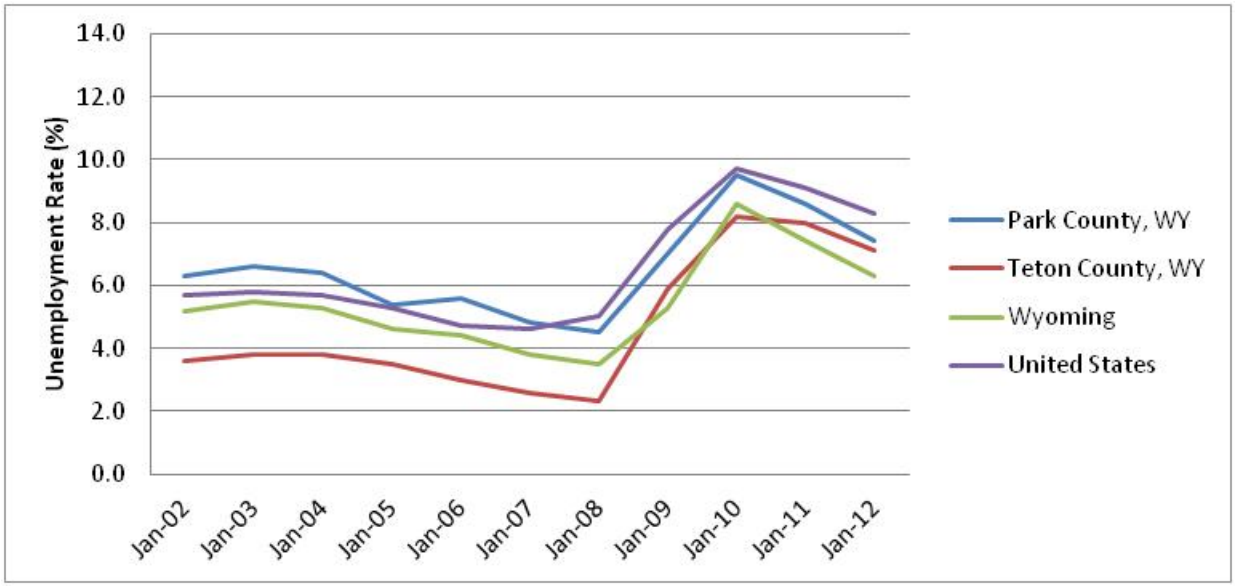
Source: Bureau of Labor Statistics 2012 (Series LAUCN30031006, LAUCN30067006, LAUST30000006, LNS14000000).

FIGURE 29: UNEMPLOYMENT RATES IN GALLATIN COUNTY, PARK COUNTY, MONTANA, AND THE UNITED STATES, JANUARY 2002–JANUARY 2012



Source: Bureau of Labor Statistics, 2010, (Series LAUCN16043006, LAUST16000006, LNS14000000).

FIGURE 30: UNEMPLOYMENT RATES IN FREMONT COUNTY, IDAHO, AND THE UNITED STATES, JANUARY 2002–JANUARY 2012



Source: Bureau of Labor Statistics 2010, (Series LAUCN56029006, LAUCN56039006, LAUST56000006, LNS14000000).

FIGURE 31: UNEMPLOYMENT RATES IN PARK COUNTY, TETON COUNTY, WYOMING, AND THE UNITED STATES, JANUARY 2002–JANUARY 2012

PARK OPERATIONS AND MANAGEMENT

The NPS, park concessioners, contractors, researchers, and other duly permitted parties depend on snowmobiles and snowcoaches for their administrative functions. These uses of the park are not within the purpose and need of this plan, but are within the scope of analysis in this plan/SEIS because as shown in the analysis for some impact topics, such as soundscapes, winter operations have an effect on park operations and management.

NPS EMPLOYEES AND CONCESSIONS

Approximately 82 permanent and seasonal NPS employees, including those at the West Entrance, plus their family members, have overwintered in the interior of Yellowstone in recent years. Additionally, Xanterra Parks & Resorts have stationed approximately 150 employees in the interior during the winter season, almost exclusively at Old Faithful (Regula pers. comm. 2010). 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 because they have no wheeled vehicle access to their homes. Their only access to groceries, supplies, and medical care is by 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. 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, have conducted similar work and personal activities by OSV. Park guides and outfitters have also been 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 park to carry out its mission 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 park, and protecting park resources.

Guests of any employees have been required to use BAT OSVs when authorized to enter the park. Permitted researchers have also been required to use BAT vehicles as a condition of their permit unless special circumstances exist.

The vast majority of the NPS administrative OSV fleet in Yellowstone is now BAT. For the 2011/2012 winter season, Yellowstone had 118 snowmobiles (both leased and owned) in its administrative fleet, of which 93 percent met BAT requirements. The non-BAT snowmobiles (8 in total) are needed for specialized use, such as law enforcement (boundary patrol, search and rescue) and other administrative purposes on a limited basis where the heavier weight and lower horsepower of current BAT machines do not perform adequately.

In addition to administrative snowmobiles, Yellowstone operates 14 other OSVs. These include groomers, two OSVs on loan from the state of Wyoming, ambulances, fire trucks, vans, and trucks, which are seasonally tracked and converted to OSV use.

The NPS has been shifting to a leased snowmobile fleet, rather than purchasing snowmobiles, to save on maintenance costs. An average of 1,700 miles is put on each snowmobile per winter. The park has used about 23,000 gallons of biodiesel (primarily for grooming equipment) and about 14,000 gallons of

ethanol blend gasoline per winter in its oversnow fleet (average of the winters 2002/2003 through 2005/2006).

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 have included resource monitoring, personal use, and concession support such as laundry and luggage service.

COST TO OPERATE SYLVAN PASS

Winter operational expenses include the cost of grooming snow roads, leasing and maintenance of park OSVs (snowmobiles and tracked vehicles), fuel, supplies and material, Sylvan Pass management, operation of the warming huts, utilities, and the employees needed during this time. In determining the cost to operate Sylvan Pass in winter, data from Fiscal Year 2011 was used by the Yellowstone National Park Budget Focus Group as the baseline year for this analyses. The costs of spring opening were not included.

The following costs were estimated:

- In Fiscal Year 2011
  - Total winter operational expenses were $5,586,858 (base and non-base sources).
  - Lake/East Entrance operations expenses were $1,607,145 including all costs associated with Sylvan Pass operations.

The following parameters were used for analysis:

- The East Entrance Road would close the first Monday following the first full week in November.
- The East Entrance Road would open the first Friday of May. Yellowstone staff most familiar with Sylvan Pass operations estimated that, based on historical conditions, this would be the average opening date should avalanche mitigation efforts not be undertaken during the winter season or to facilitate spring opening.
- No motorized travel would be permitted over the pass between the fall closure and spring opening dates except in emergency situations (closed means closed).
- Avalanche Forecasting would be at a reduced frequency commensurate with maintaining information relevant to understanding the snowpack for spring opening. The park would still need to maintain a fairly high level of forecaster ability, with a minimum of four people that would meet current forecaster requirements to support spring opening forecasting and backcountry forecasting throughout the winter.
- There would be no use of explosives to mitigate avalanches on the pass, including howitzer or helicopter dispensed explosives except in emergency situations (SAR). The costs of the unexploded ordinance program are outside the bounds of this cost projection exercise and were not included in the analyses. For budget estimation, there were zero costs associated with avalanche mitigation. This includes personnel costs and explosives, etc.
- Four individuals would be required to staff East Entrance from fall closure until spring opening (dates defined above). No staff from other divisions would be required at the East Entrance. Lake would be staffed similar to other interior locations, and staffing levels were allocated to be

commensurate with needs for grooming, life/safety, educational, grooming, and other responsibilities in the District.

It would cost approximately $1,482,277 to operate the Lake/East Entrance District with Sylvan Pass closed to all OSV use from the first Monday following the first full week in November through the first Friday of May. The net cost savings for Yellowstone National Park should Sylvan Pass be closed would be $124,868 ($1,607,145 (FY2011 costs for Lake/East Entrance) less $1,482,277 (projected cost to operate Sylvan Pass)).