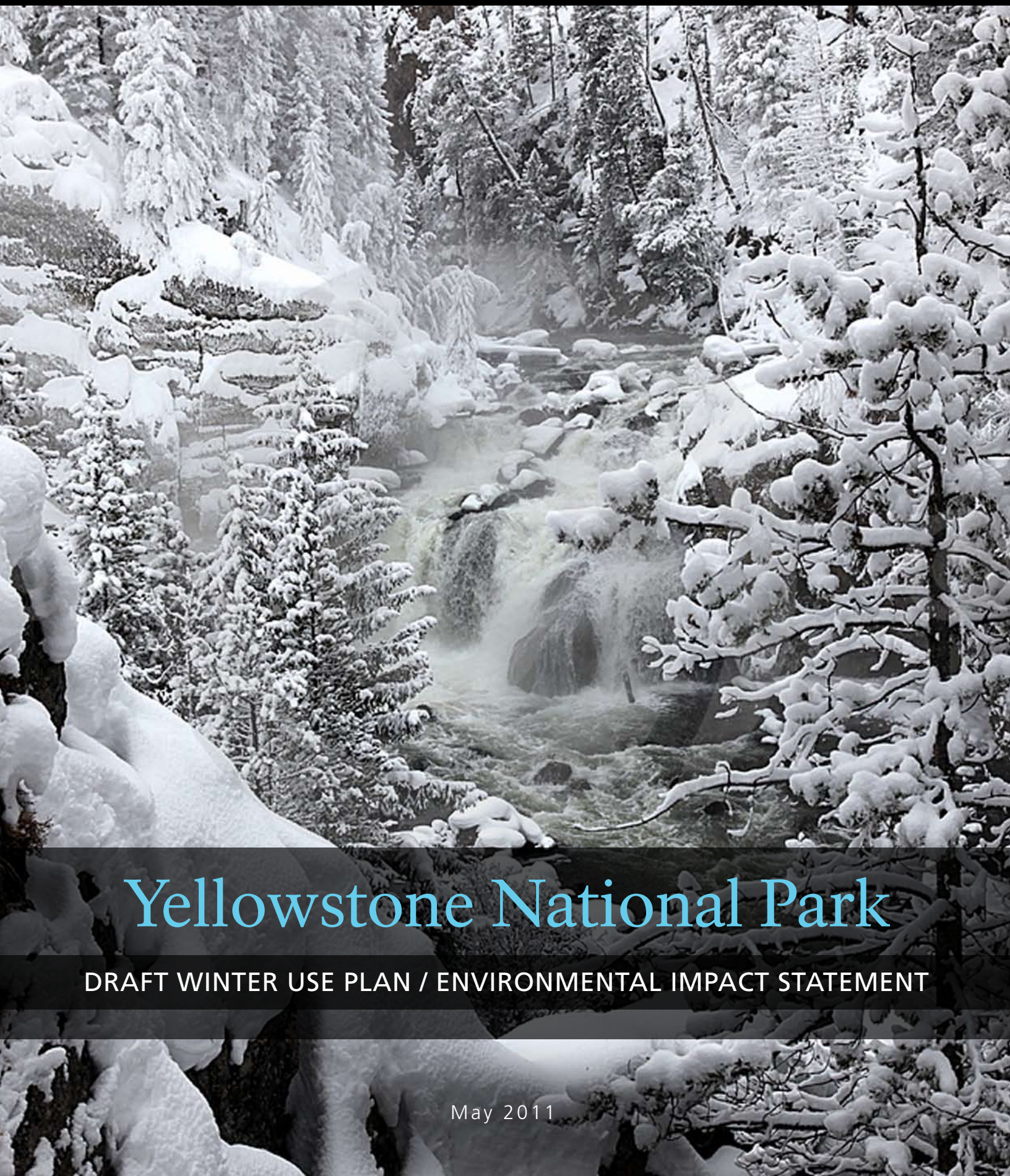
National Park Service
U.S. Department of the Interior

Yellowstone National Park
Wyoming, Montana, Idaho



Yellowstone National Park

DRAFT WINTER USE PLAN / ENVIRONMENTAL IMPACT STATEMENT

May 2011

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

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

This Yellowstone National Park Draft Winter Use Plan / Environmental Impact Statement (plan/EIS) evaluates the impacts of a range of alternatives for managing winter use/access 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/EIS 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 for at least the next 20 years. 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 draft plan/EIS evaluates the impacts of the no-action alternative (alternative 1) and six action alternatives (alternatives 2, 3, 4, 5, 6, and 7). Alternative 1 would not permit public OSV use in Yellowstone because the 2009 interim rule expired March 15, 2011, 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 2009 interim rule (up to 318 snowmobiles and 78 snowcoaches per day). Alternative 3 would allow for snowmobile and snowcoach use levels to increase to the levels set forth in the 2004 plan (up to 720 snowmobiles and 78 snowcoaches per day). Alternative 4 would allow for commercially guided wheeled vehicles, in addition to OSVs (up to 100 commercially wheeled vehicles, 110 snowmobiles, and 30 snowcoaches per day). Alternative 5 would initially allow for the same level of use as alternative 2 (up to 318 snowmobiles and 78 snowcoaches per day), but would provide for a transition to snowcoaches only if user demand is present to support such a transition or at the discretion of the park Superintendent. Upon complete transition, there would be zero snowmobiles and up to 120 snowcoaches per day. Alternative 6 would provide for use levels that vary each day, with a seasonal limit of up to 32,000 snowmobiles and 4,600 snowcoaches, and a daily limit of up to 540 snowmobiles and 78 snowcoaches. Up to 25 percent of snowmobile permits under alternative 6 would be for unguided or non-commercially guided use. Alternative 7 would also allow for variable use levels throughout the season, with snowmobile use ranging from 110 to 330 snowmobiles per day and snowcoach use ranging from 30 to 80 vehicles per day. The varying use levels would provide for high and low OSV use days, allowing for a variety of motorized and non- motorized visitor experiences throughout the winter season. Alternative 7 is the NPS Preferred Alternative**.** The draft plan/EIS analyzes impacts of these alternatives in detail for wildlife and wildlife habitat, air quality, soundscapes and the acoustic environment, visitor use and experience, visitor accessibility, health and safety, socioeconomic values, and park operations and management.

The review period for this document will end 60 days after publication of the U.S. Environmental Protection Agency Notice of Availability in the Federal Register. During the 60-day comment period, comments will be accepted electronically through the NPS Planning, Environment and Public Comment website and in hard copy delivered by the U.S. Postal Service or other mail delivery service or hand-delivered to the address below. Oral statements and written comments will also be accepted during public meetings on the draft plan/EIS. Comments will not be accepted by fax, email, or in any other way than those specified above. Bulk comments in any format (hard copy or electronic) submitted on behalf of others will not be accepted.

For further information, visit http://parkplanning.nps.gov/yell or contact:

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EXECUTIVE SUMMARY

This Yellowstone National Park Draft Winter Use Plan / Environmental Impact Statement (plan/EIS) analyzes a range of alternatives and actions for the management of winter use at Yellowstone National Park (Yellowstone or the park). The draft plan/EIS assesses the impacts that could result from implementation of any of the six 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 draft plan/EIS 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 for at least the next 20 years. 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 National Park, specifically issues related to OSVs, has been the subject of debate for more than 75 years. At least 12 times since 1930, the National Park Service (NPS) and park stakeholders have formally debated what the park should look and be like in winter. Interest in accessing the park in the winter began in the early 1930s and has increased 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 to enter the park, collectively known as OSVs, brought unanticipated problems, specifically air and noise pollution, conflicts with other users, and harassment of wildlife, as documented in past planning efforts. To address these problems, planning for the management of OSV use began with the park's Master Plan in 1974 that was a general, park-wide, planning document. 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.

Recently, as a result of litigation over the 2007 planning effort, on September 15, 2008, the U.S. District Court for the District of Columbia vacated the 2007 Winter Use Plan and Final Environmental Impact Statement, as well as the associated Record of Decision and rule. Because the court's ruling left no provision in place for snowmobile or snowcoach use (effectively meaning that OSV use would not be allowed in the park because there was no rule to support it), the NPS issued an Interim Winter Use Plan / Environmental Assessment on November 3, 2008. A proposed rule to support it was published on November 5, 2008.

However, on November 7, 2008, the U.S. District Court for the District of Wyoming issued an order reinstating the 2004 rule, allowing snowmobile and snowcoach use in Yellowstone until a new rule could be completed. For the winter of 2008/2009, the park operated under the 2004 rule which allowed up to 720 snowmobiles and 78 snowcoaches per day. The Wyoming decision was appealed, but the litigation was declared moot by the 10th Circuit Court of Appeals because the NPS had already developed an interim plan and put into effect a replacement rule.

In 2009, the NPS completed a new Interim Winter Use Plan Finding of No Significant Impact and put into effect a new interim rule. The interim plan and rule allowed access for up to 318 snowmobiles and 78 snowcoaches per day into Yellowstone during the 2009/2010 and 2010/2011 winter seasons. It continued to require all snowmobiles and snowcoaches to be commercially guided, and snowmobiles were required 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 Study 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 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.

PURPOSE OF THE PLAN

The purpose of this draft plan/EIS is to establish a management framework that allows the public to experience the unique winter resources and values at Yellowstone National Park. The draft plan/EIS will be used to determine whether motorized winter use in the interior of the park (including wheeled motor vehicles, snowmobiles, and snowcoaches) 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; however 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 expired March 15, 2011. 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

Objectives are what must be achieved to a large degree for the action to be considered a success under Director's Order 12 (NPS 2001). All alternatives selected for detailed analysis in this draft plan/EIS 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

- 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 background sound levels and to minimize loud noises.
- Air Quality: Manage winter use to minimize impacts to 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 MANAGEMENT/OPERATIONS

- Promote advances of vehicle technology (OSVs and commercial wheeled vehicles) 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; … 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).The 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 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 draft plan/EIS.

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, OSV road grooming, and wheeled vehicles and plowed roads) on wildlife in the interior of the park, have the potential to impact the park's wildlife. Specifically, the species below were selected for detailed analysis in this draft plan/EIS, due to the potential impacts of winter use. Elk and bison have also been the subject of numerous studies relating to OSV use and they 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. These two ungulates are therefore retained for analysis in this draft plan/EIS. Three species, Canada lynx (*Lynx canadensis*), grizzly bear (*Ursus arctos horribilis*), 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 and could be impacted by OSV use and associated actions. However, grizzly bears are unlikely to experience more than minor adverse effects from OSV use, and were therefore not further evaluated in this draft plan/EIS. Canada lynx and gray wolf; however, have been carried forward for analysis because they could be impacted by OSV use and associated actions. Additional species of concern that could be adversely affected by OSV use and its associated actions and are relatively rare in the park or in need of special protection include the wolverine (*Gulo gulo*), bald eagle (*Haliaeetus leucocephalus*), and trumpeter swan (*Cygnus buccinator*). These species 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 suggestions for how air quality should be analyzed in the draft plan/EIS (consideration of new technologies, development of an air monitoring protocol, among others). Because of the potential impacts of snowmobile, snowcoach, and/or bus travel on air quality, including emissions, visibility, and air-quality related values, impacts to air quality are assessed in this draft plan/EIS.
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, both biological and physical. 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 the visitor experience as well as the natural wildlife interactions. Winter soundscapes in Yellowstone consist of 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 of snowmobile, snowcoach, and bus travel on the park's natural soundscape, impacts to soundscapes and the acoustic environment are assessed in this draft plan/EIS.
Visitor use and Experience	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 used 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 the impacts of snowmobile, snowcoach, and bus travel on park visitor use and experience, impacts to soundscapes and the acoustic environment are assessed in this draft plan/EIS.
Visitor Accessibility	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 draft plan/EIS 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, mobility issues were not considered to be of primary concern; rather, 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	During public scoping for this planning effort, as well as past planning efforts, public and cooperating agency comments indicated concerns for safety regarding the operation of Sylvan Pass, as well as noted potential safety benefits with road plowing in the interior of the park. Health and safety issues associated with some of the actions under consideration in this draft plan/EIS include • The effect of motorized vehicular emissions and noise on employees and visitors • Avalanche hazards • Safety problems where different modes of winter transport are used in the same place or in close proximity. Because of these potential impacts to health and safety, this topic is analyzed in detail in this draft plan/EIS.

Issue	Reason for Analysis
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. Because of the potential impacts on socioeconomics, this topic is analyzed in detail in this draft plan/EIS.
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. Because of the potential impacts to park operations from the alternatives under consideration in this draft plan/EIS, this topic is analyzed in detail.

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. Alternatives under consideration must include a "no-action" alternative in accordance with 40 CFR 1502.14. 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, and information from the Yellowstone Science Advisory Team, resource workshops, and cooperating agencies, as well as past planning efforts. These alternatives meet the management objectives of the park, while also meeting the overall purpose of and need for the proposed action. Dismissed from further analysis were alternative elements that were considered but were not technically or economically feasible, did not meet the purpose of and need for the project, created unnecessary or excessive adverse impacts to resources, and/or conflicted with the overall management of the park or its resources.

The elements of all seven alternatives are detailed in tables ES-2 and ES-3. How each of these alternatives meets the objectives of the draft plan/EIS is detailed in table ES-4.

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 by 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 guide requirements.

Accessibility

All alternatives would continue implementation of transition and action plans for accessibility. All 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

At a minimum, under all alternatives the following roads would continue to be plowed for travel by private wheeled vehicles:

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

Non-motorized Access

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 in the "Management Actions Common to all Winter Use" 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.

Research Program

The NPS would continue to monitor 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 give the NPS the information necessary to assess impacts of any alternative on park resources and values, and visitor access, and to make adjustments, as appropriate, in winter use management.

Education and Outreach

Under all alternatives, the park would continue to direct education efforts to visitors in wheeled vehicles along the northern road to Cooke City. The visitor center in Mammoth Hot Springs would remain open to the public during the winter.

NO-ACTION ALTERNATIVE

The Council on Environmental Quality requires that the alternatives analysis in an EIS "include the alternative of no action" (40 CFR 1502.14(d)). The no-action alternative is developed for two reasons. First, a no-action alternative may represent the agency's past and current actions or inaction on an issue continued into the future, which may represent a viable alternative for meeting the agency's purpose and

need. If this alternative were implemented, Yellowstone would be operated like other national parks in northern latitudes (e.g., Glacier, Mt. Rainier, Lassen Volcanic, for example) that have limited wheeled vehicle access during the winter. Second, a no-action alternative may serve to set a baseline of existing impacts against which to compare the impacts of the action alternatives.

Under alternative 1, the 2009 interim rule (up to 318 snowmobiles and 78 snowcoaches) expired after the 2010/2011 winter season. Future public OSV use in the winter would not be permitted. Non-motorized access and wheeled vehicle use along the northern road would still be allowed.

Under the no-action alternative, the only motorized 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 park's interior, the winter season would begin once enough snow accumulates to allow for skiing and snowshoeing. The east entrance road would be managed as backcountry; no administrative OSV travel would be allowed and avalanche control operations would not occur 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**. At a minimum, the BAT requirements now in place would continue to be implemented. Individual alternatives may include additional BAT requirements, as noted below. BAT guidelines would also be developed and implemented for snowcoaches by the 2014/2015 season. Snowcoach BAT requirements would require vehicles that meet Model Year 2010 (or newer) U.S. Environmental Protection Agency (EPA) emission standards as of winter 2014/2015. They would also require that by winter 2014/2015, vehicle sound not to exceed 73 dBA when operating at or near full speed. As part of efforts to limit sound and pollution from OSVs, idling would be limited to no more than 5 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. 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 should include avalanche rescue gear (shovel, probe, and transceiver), as appropriate.
- **Licensing and Registration**. OSV drivers would be required to possess and carry at all times a valid motor vehicle operator's license. A learner's permit would not satisfy this requirement. The license must be carried by the driver at all times. 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 45 miles per hour (mph). Speed limits could be lower in more congested areas or wildlife sensitive corridors. For example, between West Yellowstone and Old Faithful the speed limit would be 35 mph. In developed areas, the speed limit would be 15 to 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.

- **Cave Falls Road**. Up to 50 snowmobiles per day would be allowed on the snowmobile route to Cave Falls. These snowmobiles would not be required to meet BAT requirements. The 50 snowmobile per day limit for the Cave Falls route would not be part of the snowmobile limits discussed below under the action alternatives.
- **OSV Management**. Early and late entries 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.
- **Sylvan Pass Avalanche Control**. For action alternatives that include maintaining Sylvan Pass for OSV access (all alternatives, excluding alternative 4), 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 and an Operational Risk Management Assessment would be reviewed and the NPS would evaluate additional avalanche mitigation techniques and risk assessment tools to further improve safety and visitor access.
- **Adaptive Management**. All action alternatives incorporate adaptive management initiatives that are designed to assist the park in meeting the objectives of this draft plan/EIS. See appendix A 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.

The action alternatives, alternatives 2-7, are as follows:

Alternative 2: Continue Snowmobile/Snowcoach Use at 2008 Plan Limits. Under alternative 2, management of OSVs would allow for snowmobile and snowcoach use levels to continue at the current level of up to 318 snowmobiles and 78 snowcoaches per day. All OSV requirements under the 2009 interim rule would continue including all OSV commercial guide requirements, hours of operation restrictions, and BAT requirements for snowmobiles. BAT requirements would be developed and implemented for snowcoaches.

Alternative 3: Return Snowmobile/Snowcoach Use to 2004 Plan Limits. Alternative 3 would allow for snowmobile and snowcoach use levels to increase to the levels set forth in the 2004 plan of up to 720 snowmobiles and 78 snowcoaches per day. All OSV requirements under the 2009 interim rule would continue including all OSV commercial guide requirements, hours of operation restrictions, and BAT requirements for snowmobiles. BAT requirements would be developed and implemented for snowcoaches.

Alternative 4: Mixed-Use: Snowcoaches, Snowmobiles, and Road Plowing for Wheeled Vehicles. Alternative 4 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. The roads from West Yellowstone and Mammoth Hot Springs to Old Faithful would be plowed for access to the park by up to 100 wheeled commercial multi-passenger vehicles (buses and vans) per day. The south entrance would be groomed for use of up to 110 snowmobiles and 30 snowcoaches per day. East entrance (Sylvan Pass) would be closed to use during the winter season. All OSV requirements under the 2009 interim rule would continue including all OSV

commercial guide requirements, hours of operation restrictions, and BAT requirements for snowmobiles. BAT requirements would be developed and implemented for snowcoaches.

Alternative 5: Transition to Snowcoaches meeting BAT Requirements Only. Under alternative 5, OSV access to the park would be via BAT snowcoach only. This could be accomplished by phasing out snowmobiles beginning in the 2014/2015 season when all snowcoaches must meet BAT requirements. Snowcoaches could replace snowmobiles within a five-year period (depending on coach user demand or at the discretion of the park). Should snowcoach user demand not reach 120 snowcoaches, some level of snowmobile use would remain. Alternative 5 would initially provide for both snowmobile and snowcoach access under 2009 interim rule use levels of up to 318 snowmobiles and 78 snowcoaches per day. After the 2014/2015 season, snowcoach numbers could increase up to 120 per day, with a corresponding decrease in snowmobile numbers during the phase-out period. In the event that snowmobile technology improves in the future, this alternative would allow an operator to replace BAT coaches with electric, hybrid, or low emission snowmobiles as long as the combined CO+HC+ NO_x emissions do not exceed 50 grams per mile (or the equivalent grams per kilowatt-hour) and the sound level is less than 70 dbA, when measured by current J192 test procedures.

Alternative 6: Implement Variable Management. Alternative 6 would manage OSV and visitor use to increase the variety of winter experiences by creating times and places for higher and lower levels of use and opportunities for undisturbed skiing and snowshoeing. OSV use would have a seasonal limit of up to 32,000 snowmobiles and 4,600 snowcoaches, with a daily limit of up to 540 snowmobiles and 78 snowcoaches. Up to 25 percent of snowmobile permits would be for unguided or non-commercially guided use. Most of the OSV requirements under the 2009 interim rule would continue including hours of operation restrictions and BAT requirements for snowmobiles. BAT requirements would be developed and implemented for snowcoaches. In addition, operators would have the potential to increase their daily limits if they include and use newer, and cleaner, technologies in their fleets.

Alternative 7: Provide a Variety of Use Levels and Experiences for Visitors. Alternative 7 proposes a variety of use levels, which would establish a maximum number of snowmobiles and snowcoaches permitted in the park for specific days throughout the winter season. Four different use levels for each OSV type would be implemented; the combination of which may vary by day. Snowmobile use would range from 110 to 330 per day and snowcoach use would range from 30 to 80 per day. The varying use levels would provide for high and low OSV use days, and allow for a variety of motorized and non-motorized visitor experiences throughout the winter season. All OSV requirements under the 2009 interim rule would continue including all OSV commercial guide requirements, hours of operation, and BAT requirements for snowmobiles. BAT requirements would be developed and implemented for snowcoaches, as well as additional BAT for snowmobiles that address NO_x and require snowcoaches not to exceed 73 dBA when operating at or near full speed for the 2014/2015 winter season. All OSV would be required to enter the park by 10:30 a.m. In addition, OSV concessioners could have the potential to increase their daily limits if they include newer, cleaner technologies in their fleets.

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 the public and decision-makers 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 to measure the change in the park's resources that would occur with the implementation of each management alternative. Intensity definitions were established for each impact topic to help understand the severity and magnitude of changes in resource conditions, both adverse and beneficial.

Each management alternative was compared to baseline conditions (alternative 1, no OSV use) to determine the context, duration, and intensity of resource impacts.

Table ES-5 summarizes the results of the impact analysis for the impact topics that were assessed.

TABLE ES-3. SUMMARY OF ALTERNATIVE ELEMENTS

	Alternative 1: No Action - No Snowmobile / Snowcoach Use	Alternative 2: Continue Snowmobile / Snowcoach Use at 2008 Plan Limits	Alternative 3: Return Snowmobile / Snowcoach use to 2004 Plan Limits	Alternative 4: Mixed Use: Snowcoaches, Snowmobiles, and Road Plowing for Wheeled Vehicles	Alternative 5: Transition to BAT Snowcoaches Only Based on User Demand	Alternative 6: Implement Variable Management	Alternative 7: Provide a Variety of Use Levels and Experiences for Visitors
General Description	Once the 2009 interim rule expired (after the 2010/2011 season) there would be no rule in 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 interim rule – up to 318 snowmobiles and up to 78 snowcoaches per day.	OSV levels in the park would return to the 2004 plan limits – up to 720 snowmobiles and 78 snowcoaches a day.	Access to the park would be by commercial wheeled vehicles (north and west entrances) and snowmobiles and snowcoach (south entrance) only. No private vehicles would be permitted. The east entrance would be closed to through travel for OSVs, but open for non-motorized use.	OSV access into the park could transition towards snowcoaches meeting BAT requirements. Snowcoaches could replace snowmobiles beginning in the 2014/2015 winter season, when all snowcoaches must meet BAT requirements. Snowcoaches could replace snowmobiles within a five-year period, depending on snowcoach use demand.	Management of winter use would be structured to increase the variety of winter experiences. OSV levels would vary by creating times and places for higher and lower levels of use. Additional opportunities for undisturbed skiing and snowshoeing would also be created.	Various use levels would establish a maximum number of snowmobiles and snowcoaches permitted in the park for specific days throughout the winter season. Four different use levels for each OSV type would be implemented; the combination of which may vary by day. Snowmobile use would range from 110 to 330 per day and snowcoach use would range from 30 to 80 per day.
Elements Related to Snowmobile Use							
Daily Snowmobile Limits (with allocations by entrance)	n/a	Up to 318 snowmobiles per day (Actual current average is about 187 per day). Entrance allocations: • West – 160 • South – 114 • East – 20 • North – 12 • Old Faithful – 12	Up to 720 snowmobiles per day. Entrance allocations: • West – 414 • South – 246 • East – 20 • North – 20 • Old Faithful – 20	Up to 110 snowmobiles per day. Entrance allocations: • South – 66 • Old Faithful – 22 • Norris – 22	Up to 318 snowmobiles per day through 2014/2015 winter season. Initial entrance allocations are the same as alternative 2. Gradual reduction to zero snowmobiles would occur after the 2014/2015 season, as BAT snowcoach numbers increase (see "Elements Related to Snowcoaches," below). As parkwide snowmobile numbers are reduced, entrance allocations would be reduced proportionally.	32,000 snowmobiles would be permitted each season. Daily numbers could vary between 0 and 540.	Up to 330 snowmobiles per day maximum for one-half of the winter season (45 days) Entrance allocations: • West: 176 • South: 110 • East: 22 • North: 11 • Old Faithful: 11 Up to 220 per day maximum for one-third of winter season (30 days) Entrance allocations: • West: 110 • South: 66 • East: 0 to 22 (East closed Dec. 15–21 and March 2–15) • North: 11 (1 group) • Old Faithful: 11 (1 group) Between 110 and 143 per day maximum for one-sixth of winter season (16 days) Entrance allocations: • West: 66 • South: 44 • East: 0–11 (East closed Dec. 15–21 and March 2-15) • North: 0 – 11 (North closed early for spring plowing) • Old Faithful: 0 – 11
Variable snowmobile numbers	n/a	Daily snowmobile levels would be fixed for the season. No variation would occur.	Daily snowmobile levels would be fixed for the season, with no variation.	Daily snowmobile levels would be fixed for the season, with no variation.	Daily snowmobile levels would be fixed for the season, with no variation.	Snowmobile levels would vary (daily, weekly or monthly) based on a pre-determined seasonal schedule.	Snowmobile levels would vary (daily, weekly, or monthly) based on a pre-determined seasonal schedule. The schedule would provide low and high use opportunities during holiday and non-holiday periods.

	Alternative 1: No Action - No Snowmobile / Snowcoach Use	Alternative 2: Continue Snowmobile / Snowcoach Use at 2008 Plan Limits	Alternative 3: Return Snowmobile / Snowcoach use to 2004 Plan Limits	Alternative 4: Mixed Use: Snowcoaches, Snowmobiles, and Road Plowing for Wheeled Vehicles	Alternative 5: Transition to BAT Snowcoaches Only Based on User Demand	Alternative 6: Implement Variable Management	Alternative 7: Provide a Variety of Use Levels and Experiences for Visitors
Variable entrance allocations	n/a	Entrance allocations would be fixed (may not be shared between entrances).	Entrance allocations would be fixed (no sharing between entrances).	Entrance allocation could be flexible, based on the demand at the three snowmobile entrance locations (sharing allowable among South, Norris, and Old Faithful).	Allocation of snowmobiles by entrance could be flexible, based on demand (i.e., sharing among West, South, East, North, and Old Faithful).	Daily entrance allocation for commercially guided groups could be flexible, to provide and accommodate a variety of winter experiences. For example, daily allocations not used at one gate could be used at another gate that same day.	Allocation of snowmobiles by entrance could be flexible, based on demand (i.e., sharing among West, South, East, North, and Old Faithful).
Snowmobile Guide Requirements, including maximum group size (if applicable)	n/a	100 percent commercially guided. Group size (including guide):11	100 percent commercially guided. Group size (including guide):11	100 percent commercially guided. Group size (including guide):11	100 percent commercially guided. Group size (including guide):11	Mostly guided, with up to 25 percent of snowmobile use unguided or non-commercially guided. Group size (including guides): Maximum group sizes may vary between 11 and 22 snowmobiles. Groups up to 11 would have one guide, between 12 and 22 would have two guides.	100 percent commercially guided. Group size (including guide):11
BAT Requirements for Snowmobiles	n/a	BAT required for snowmobiles.	BAT required for snowmobiles.	BAT required for snowmobiles.	BAT required for snowmobiles.	BAT required for snowmobiles. As this technology improves (hybrid, electric, etc.), consider additional permits for those companies that use them.	Develop additional BAT standard for NO_x, to be implemented by 2014/2015 winter. Proposal: Sum of NO_x and HC not to exceed 15 g/kW-hr. Adopt updated SAE sound testing methodology by 2014/2015 (the barometric pressure variance would no longer apply). As technology improves (hybrid, electric, etc.), consider additional permits for those companies that use them.
Fee for snowmobile use	n/a	Yes	Yes	Yes	Yes	Current fees for snowmobile use and commercial operators would continue. A comparable special use fee may be charged for non-guided/non-commercially guided snowmobile use to manage that use.	Yes

	Alternative 1: No Action - No Snowmobile / Snowcoach Use	Alternative 2: Continue Snowmobile / Snowcoach Use at 2008 Plan Limits	Alternative 3: Return Snowmobile / Snowcoach use to 2004 Plan Limits	Alternative 4: Mixed Use: Snowcoaches, Snowmobiles, and Road Plowing for Wheeled Vehicles	Alternative 5: Transition to BAT Snowcoaches Only Based on User Demand	Alternative 6: Implement Variable Management	Alternative 7: Provide a Variety of Use Levels and Experiences for Visitors
Elements Related to Snowcoach Use							
Daily Snowcoach Limits (with allocations by entrance)	n/a	Up to 78 snowcoaches per day. Entrance allocations: • West – 34 • South – 13 • North – 13 • East – 2 • Old Faithful – 16	Up to 78 snowcoaches per day through 2014. Entrance allocations: • West – 34 • South – 13 • North – 13 • East – 2 • Old Faithful – 16	Up to 30 snowcoaches per day. Entrance allocations: • South – 20 • Old Faithful – 8 • Norris – 2	Up to 78 snowcoaches per day initially, allocated by entrance the same as in alternative 2. As of 2014/1015, increase to up to 120 BAT snowcoaches per day (with a corresponding decrease in snowmobiles over a five-year period as snowcoach numbers increase). As the number of snowcoaches throughout the park increases, their allocation by entrance would rise proportionally.	4,600 snowcoaches would be permitted per season. Daily use limits would vary between 0 and 78.	Up to 80 snowcoaches per day maximum for one-half of winter season (45 days) Entrance allocations: • West: 36 • South: 14 • East: 2 • North: 12 • Old Faithful: 16 Up to 50 snowcoaches per day maximum for one-third of winter season (30 days) Entrance allocations: • West: 22 • South: 8 • East: 0 to 2 (East closed Dec. 15–21 and March 2–15) • North: 8 • Old Faithful: 10 Between 30 and 80 snowcoaches per day maximum for one-sixth of winter season (16 days) under one of two entrance allocations Allocation 1: • West: 12 • South: 6 • East: 0 (East closed Dec. 15–21 and March 2–15) • North: 6 (North closed early for spring plowing) • Old Faithful: 6 Allocation 2: • West: 36 • South: 14 • East: 2 • North: 12 • Old Faithful: 16
Variable snowcoach numbers	n/a	Daily snowcoach levels would be fixed for the season. No variation would occur.	Daily snowcoach levels would be fixed for the season. No variation would occur.	Daily snowcoach levels would be fixed for the season. No variation would occur.	Daily snowcoach levels would be fixed for the season. No variation would occur.	Snowcoach levels would vary (daily, weekly or monthly) based on a pre-determined seasonal schedule.	Snowcoach levels would vary (daily, weekly or monthly) based on a pre-determined seasonal schedule.

	Alternative 1: No Action - No Snowmobile / Snowcoach Use	Alternative 2: Continue Snowmobile / Snowcoach Use at 2008 Plan Limits	Alternative 3: Return Snowmobile / Snowcoach use to 2004 Plan Limits	Alternative 4: Mixed Use: Snowcoaches, Snowmobiles, and Road Plowing for Wheeled Vehicles	Alternative 5: Transition to BAT Snowcoaches Only Based on User Demand	Alternative 6: Implement Variable Management	Alternative 7: Provide a Variety of Use Levels and Experiences for Visitors
Variable entrance allocations	n/a	Entrance allocations would be fixed (may not be shared between entrances).	Entrance allocations would be fixed (may not be shared between entrances).	Entrance allocation would be flexible, based on the demand at the three snowcoach entry locations (i.e., sharing among South, Norris, and Old Faithful).	Entrance allocation would be flexible, based on the demand at the three snowcoach entry locations (i.e., sharing among West, South, East, North, and Old Faithful).	Daily entrance allocation for snowcoaches would be flexible, to provide and accommodate a variety of winter experiences. For example, daily allocations not used at one gate could be used at another gate that same day.	Daily entrance allocation for snowcoaches would be flexible, to provide and accommodate a variety of winter experiences. For example, daily allocations not used at one gate could be used at another gate that same day.
Snowcoach Guide Requirements	n/a	Common to all action alternatives: snowcoach entry by commercial guide only.					
Snowcoach BAT requirements	n/a	Common to all action alternatives: BAT would be developed and implemented for snowcoaches by the 2014/2015 season. Draft proposal: Require vehicles meet Model Year 2010 EPA emission standards. Not to exceed 73 dBA when operating at or near full speed.					
Wheeled Vehicle Access							
	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.	Wheeled vehicle access would continue along the road from Mammoth Hot Springs to Cooke City. No other roads would be plowed for wheeled vehicle use.	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.	Wheeled vehicle access would continue along the road between Mammoth Hot Springs and Cooke City. In addition, the north (Mammoth) and west (West Yellowstone) entrance roads would be plowed to Old Faithful to accommodate multi- passenger commercial vehicles (e.g., vans, buses, etc.). No private vehicles would be permitted. Daily limit of up to 100 Tier 2 (EPA standard) vehicles.	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.	Wheeled vehicle access would continue along the Mammoth to Cooke City Road. No other roads would be plowed for wheeled vehicle use.	Wheeled vehicle access would continue along the road from Mammoth Hot Springs to Cooke City. No other roads would be plowed for wheeled vehicle use.
Other/General Elements							
Road Grooming	Minimal road grooming needed to maintain administrative access. Sylvan Pass management would not be maintained.	Continue road grooming. Manage Sylvan Pass in accordance with the Sylvan Pass Working Group agreement.	Continue road grooming. Manage Sylvan Pass in accordance with the Sylvan Pass Working Group agreement.	Continued road grooming needed to maintain snowcoach and administrative access. Sylvan Pass would be closed to vehicle traffic and not be maintained.	Continue road grooming. Manage Sylvan Pass in accordance with the Sylvan Pass Working Group agreement.	Continue road grooming. Manage Sylvan Pass in accordance with the Sylvan Pass Working Group agreement. Certain side roads would be groomed for non-motorized uses only during certain times/days of the season.	Continue road grooming. Manage Sylvan Pass in accordance with the Sylvan Pass Working Group agreement.

	Alternative 1: No Action - No Snowmobile / Snowcoach Use	Alternative 2: Continue Snowmobile / Snowcoach Use at 2008 Plan Limits	Alternative 3: Return Snowmobile / Snowcoach use to 2004 Plan Limits	Alternative 4: Mixed Use: Snowcoaches, Snowmobiles, and Road Plowing for Wheeled Vehicles	Alternative 5: Transition to BAT Snowcoaches Only Based on User Demand	Alternative 6: Implement Variable Management	Alternative 7: Provide a Variety of Use Levels and Experiences for Visitors
Zoning – Temporal and Spatial	n/a	Continued temporal and spatial zoning of some side roads (e.g., snowcoaches only in the morning, snowmobiles and snowcoaches in the afternoons).	Continued temporal and spatial zoning of some side roads (e.g., snowcoaches only in the morning, snowmobiles and snowcoaches in the afternoons).	Most side roads would become cross-country ski and snowshoe routes.	Most side roads would become cross-country ski and snowshoe routes.	Side roads would become ski and snowshoe routes at certain times of the season. OSV use would end at West Thumb Junction and at the Canyon developed area for the last two weeks of the season to accommodate more non-motorized snow recreation on the east side of the park. OSV permits would be allocated in ways that allow for zoning by space and time to accommodate a variety of visitor uses and to protect park resources.	Side roads would become ski and snowshoe routes throughout the season. These roads would be groomed. OSV use would end at West Thumb Parking Area Junction and at the South Canyon Rim Drive for the last two weeks of the season to accommodate more non-motorized snow recreation on the east side of the park. All OSVs must enter the park by 10:30 a.m.
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.	Continue to groom 35 miles of secondary roads for cross-country skiers and snowshoers. Use will be permitted subject to Winter Severity Index.	Use would be permitted subject to Winter Severity Index. Use on South and East entrance roads could increase during the park’s spring “shoulder” season. Continue to groom 35 miles of secondary roads for cross-country skiers and snowshoers. Additional secondary roads (approximately 10 miles) would be groomed for non-motorized use access at stopping points along plowed roads (primarily West to Old Faithful). Backcountry experience on east side of park would be available for non-motorized users.	Non-motorized use would be permitted subject to a Winter Severity Index for temperature and weather. Use along the South and East entrance roads could increase during the park’s spring “shoulder” season. Continue to groom 35 miles of secondary roads for cross-country skiers and snowshoers. Additional secondary roads (approximately 10 miles) would be groomed for non-motorized use access at stopping points along plowed roads (primarily from West Yellowstone to Old Faithful).	Allowed subject to Winter Severity Index. Manage non-motorized use in time and space to provide for a variety of visitor uses (see Zoning).	In addition to the roads and areas described above in Zoning – Temporal and Spatial, continue to groom 35 miles of secondary park roads for cross-country skiers and snowshoers. Use would 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).	No change in current dates for motorized and non-motorized winter use in the park.	No change in current dates for motorized and non-motorized winter use in the park.	No change in current dates for motorized and non-motorized winter use in the park.	No change in current dates for motorized and non-motorized winter use in the park.	Opening and closing dates could vary to accommodate a variety of visitor experiences and needs. The schedule would be determined no later than Dec. 1 of the previous year.	No change in current dates for motorized and non-motorized winter use in the park; however, OSV use would not start before snow conditions permit.

	Alternative 1: No Action - No Snowmobile / Snowcoach Use	Alternative 2: Continue Snowmobile / Snowcoach Use at 2008 Plan Limits	Alternative 3: Return Snowmobile / Snowcoach use to 2004 Plan Limits	Alternative 4: Mixed Use: Snowcoaches, Snowmobiles, and Road Plowing for Wheeled Vehicles	Alternative 5: Transition to BAT Snowcoaches Only Based on User Demand	Alternative 6: Implement Variable Management	Alternative 7: Provide a Variety of Use Levels and Experiences for Visitors
Estimated number of daily vehicle passengers (excludes Mammoth to Cooke City)	Zero OSVs or wheeled vehicles	Snowmobile = 413 Snowcoach = 624 Total = 1,037	Snowmobile passengers = 936 Snowcoach passengers = 624 Total = 1,560	Snowmobile passengers = 143 Snowcoach passengers = 240 Wheeled vehicle passengers = 2000 Total = 2,383	Snowmobile passengers = 413 (potentially 0 after phase out) Snowcoach passengers = 624 (potentially 960 after phase out) Total = 1,037 (potentially 960 after phase out)	Snowmobile passengers = 408 Snowcoach passengers = 361 Total = 769	Days with 330 snowmobiles and 80 coaches: • Snowmobile passengers = 429 • Snowcoach passengers = 640 • Total = 1,069 Days with 220 snowmobiles and 50 coaches: • Snowmobile passengers = 286 • Snowcoach passengers = 400 • Total = 686 Days with 110 snowmobiles and 30 coaches: • Snowmobile passengers = 143 • Snowcoach passengers = 240 • Total = 383 Days with 143 snowmobiles and 80 coaches: • Snowmobile passengers = 186 • Snowcoach passengers = 640 • Total = 886
Transition Period	The 2009 interim rule expired. No transition period.	The 2009 interim rule would continue. No transition period.	There would be a one-season transition period to prepare for implementation of the new winter use plan. Provisions of the 2009 interim rule would continue during this transition.		Because the 2009 interim rule provisions are the starting point for alternative 5, there would not be a transition year.	There would be a one-season transition period to prepare for implementation of the new winter use plan. Provisions of the 2009 interim rule would continue during this transition.	
Adaptive Management Program	No adaptive management program would be implemented.	Common to all action alternatives: Adaptive management planning would be standard procedure, but elements and emphases of its use could differ from one alternative to another.					

TABLE ES-4: HOW ALTERNATIVES MEET OBJECTIVES

Objective	Alternative 1: No Action - No Snowmobile / Snowcoach Use	Alternative 2: Continue Snowmobile / Snowcoach Use at 2008 Plan Limits	Alternative 3: Return Snowmobile / Snowcoach use to 2004 Plan Limits	Alternative 4: Mixed Use: Snowcoaches, Snowmobiles, and Road Plowing for Wheeled Vehicles	Alternative 5: Transition to BAT Snowcoaches Only Based on User Demand	Alternative 6: Implement Variable Management	Alternative 7: Provide a Variety of Use Levels and Experiences for Visitors (Preferred Alternative)
Visitor Use							
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 accessible only by non-motorized users and difficult to access by most visitors. Visitors could also 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 wheeled vehicles and OSVs from all entrances. Daily use limits of 318 snowmobiles and 78 snowcoaches would be similar to current use levels, which monitoring has shown allow for resource protection. Visitors could also 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 able to experience the interior of the park with wheeled vehicles and OSVs from all entrances. The increase in visitation over the current condition may lead to challenges in ensuring resource protection. Visitors could also continue to experience the park virtually through the park's website and webcam at Old Faithful.	Fully meets objective because visitors would have a wide variety of choice in how to access the interior of the park, with these choices likely being more economical. With the addition of plowed roads, it is likely more visitors would be able to visit the park and see Yellowstone's unique winter resources. Use levels, and mix of use, would be expected to ensure resource protection. Visitors could also 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, it is likely that the mode in which one can enter would be limited to snowcoaches. This alternative would reduce overall OSV traffic, below current levels, and would ensure resource protection. Visitors could also continue to experience the park virtually through the park's website and webcam at Old Faithful.	Meets objective to a large degree because the variety of winter experiences would increase by creating times and places for higher and lower levels of use and opportunities for undisturbed skiing and snowshoeing. Although there would be the potential for days with higher use than the current condition, there would also be lower use days, and overall this alternative would ensure resource protection. Visitors would be able to experience the interior of the park with OSVs from all entrances. Visitors could also continue to experience the park virtually through the park's website and webcam at Old Faithful.	Fully meets objective because the variety of winter experiences would increase by creating times and places for higher and lower levels of use and opportunities for undisturbed skiing and snowshoeing. Although use would have higher and lower use days, the maximum use days would be at levels that are similar to those currently permitted. With levels of use that those levels or less, this alternative would ensure resource protection. Visitors would be able to experience the interior of the park with OSVs from all entrances. Visitors could also 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. 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.	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 objectives 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 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.	Fully meets objective 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 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 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 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.

Objective	Alternative 1: No Action - No Snowmobile / Snowcoach Use	Alternative 2: Continue Snowmobile / Snowcoach Use at 2008 Plan Limits	Alternative 3: Return Snowmobile / Snowcoach use to 2004 Plan Limits	Alternative 4: Mixed Use: Snowcoaches, Snowmobiles, and Road Plowing for Wheeled Vehicles	Alternative 5: Transition to BAT Snowcoaches Only Based on User Demand	Alternative 6: Implement Variable Management	Alternative 7: Provide a Variety of Use Levels and Experiences for Visitors (Preferred Alternative)
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, including sensitive species, in the interior of the park would no longer have interactions with recreational OSV. Interactions with non-motorized users would continue to occur, 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 similar to those currently occurring, which monitoring has shown disrupts wildlife minimally.	Meets objective some 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 greater than those currently occurring, which could result in more disruption to wildlife.	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 wheeled vehicles and OSVs. Winter use levels would be similar or less than to those currently occurring, which monitoring has shown disrupts wildlife minimally.	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 less than to those currently occurring once the transition to snowcoaches only is complete, which monitoring has shown disrupts wildlife minimally.	Meets objective some 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 greater than those currently occurring, which could result in more disruption to wildlife.	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 similar to those currently occurring, which monitoring has shown disrupts wildlife minimally. Lower use days below the levels that are currently occurring would result in less disruption to wildlife.
Sound: Manage winter use to protect naturally occurring background sound levels and to minimize loud noises.	Meets objectives 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 some degree because OSV use would occur in the interior of the park, at levels that would reduce times of natural quiet compared to current use levels.	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 objectives to some degree because OSV use would occur in the interior of the park, at levels that would reduce times of natural quiet compared to current use levels.	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.
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 similar to current use levels, which monitoring has shown 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. Levels of use would be similar to current use levels, which monitoring has shown 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. Levels of use would be similar to current use levels, which monitoring has shown 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. Levels of use would be similar to current use levels, which monitoring has shown 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. Levels of use would be similar to current use levels, which monitoring has shown 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. Levels of use would be similar to or less than current use levels, which monitoring has shown to be below all regulatory standards.
Wilderness: Manage winter use to protect wilderness character and values.	Meets objective to a large degree because minimal OSV use (administrative use only) would not 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 has 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.	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.	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.	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.	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.

Objective	Alternative 1: No Action - No Snowmobile / Snowcoach Use	Alternative 2: Continue Snowmobile / Snowcoach Use at 2008 Plan Limits	Alternative 3: Return Snowmobile / Snowcoach use to 2004 Plan Limits	Alternative 4: Mixed Use: Snowcoaches, Snowmobiles, and Road Plowing for Wheeled Vehicles	Alternative 5: Transition to BAT Snowcoaches Only Based on User Demand	Alternative 6: Implement Variable Management	Alternative 7: Provide a Variety of Use Levels and Experiences for Visitors (Preferred Alternative)
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; 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 over the health and safety of visitors such as hour 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 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 hour 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 the objectives to a large degree because wheeled vehicle, 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 hour of operation, BAT and guiding requirements. The requirement for all wheeled vehicles to be commercially guided would further promote the health and safety of visitors. 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 because 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 hour 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 some degree because 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 hour 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 some degree because 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 hour 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 objectives because the park would continue to coordinate and communicate with park partners, gateway communities, and other stakeholders.	Fully meets objectives because the park would continue to coordinate and communicate with park partners, gateway communities, and other stakeholders.	Fully meets objectives because the park would continue to coordinate and communicate with park partners, gateway communities, and other stakeholders.	Fully meets objectives because the park would continue to coordinate and communicate with park partners, gateway communities, and other stakeholders.	Fully meets objectives because the park would continue to coordinate and communicate with park partners, gateway communities, and other stakeholders.	Fully meets objectives because the park would continue to coordinate and communicate with park partners, gateway communities, and other stakeholders.	Fully meets objectives because the park would continue to coordinate and communicate with park partners, 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 this alternative.	Fully meets objective because adaptive management would occur under this alternative.	Fully meets objective because adaptive management would occur under this alternative.	Fully meets objective because adaptive management would occur under this alternative.	Fully meets objective because adaptive management would occur under this alternative.	Fully meets objective because adaptive management would occur under this alternative.

Objective	Alternative 1: No Action - No Snowmobile / Snowcoach Use	Alternative 2: Continue Snowmobile / Snowcoach Use at 2008 Plan Limits	Alternative 3: Return Snowmobile / Snowcoach use to 2004 Plan Limits	Alternative 4: Mixed Use: Snowcoaches, Snowmobiles, and Road Plowing for Wheeled Vehicles	Alternative 5: Transition to BAT Snowcoaches Only Based on User Demand	Alternative 6: Implement Variable Management	Alternative 7: Provide a Variety of Use Levels and Experiences for Visitors (Preferred Alternative)
Promote advances of vehicle technology (OSVs and commercial wheeled vehicles) 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. 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. No additional steps would be taken to promote technology.	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. Further incentives for the advancement of snowcoaches would be provided as more snowcoaches would be permitted as BAT becomes available. In addition, as new technologies come on line (electric for example) snowmobile operators would have the potential to replace BAT coaches.	Fully meets objective because BAT requirements would continue to be implemented for snowmobiles and would further be developed and implemented for snowcoaches. In addition, as new technologies come on line (electric for example) operators would have the potential to increase their daily limits if they include newer, and cleaner, technologies in their fleets.	Fully meets objective because BAT requirements would continue to be implemented for snowmobiles and would further be developed and implemented for snowcoaches. In addition, new BAT requirements for NO_x would also be developed, which would also promote advances in technology and operators could have the potential to increase their daily limits if they include newer, and cleaner, technologies in their fleets.
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.	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.	Meets objective to a large degree because services in the northern area of the park (Mammoth) would continue to be provided and OSV and wheeled vehicle use would allow for the continuation of services in the interior of the park in the winter.	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.	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.	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-5: IMPACT SUMMARY

	Alternative 1: No Action - No Snowmobile / Snowcoach Use	Alternative 2: Continue Snowmobile / Snowcoach Use at 2008 Plan Limits	Alternative 3: Return Snowmobile / Snowcoach use to 2004 Plan Limits	Alternative 4: Mixed Use: Snowcoaches, Snowmobiles, and Road Plowing for Wheeled Vehicles	Alternative 5: Transition to BAT Snowcoaches Only Based on User Demand	Alternative 6: Implement Variable Management	Alternative 7: Provide a Variety of Use Levels and Experiences for Visitors (Preferred Alternative)
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 and any beneficial wildlife impacts would likely only be apparent over several decades of minimal OSV traffic in the park. 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 interim rule, with BAT requirements, guiding regulations, speed limits, and restrictions on OSV access to park roads only. Continued monitoring and adaptive management would allow for additional restrictions to be established should negative impacts on wildlife begin to occur. Thus, overall impacts under alternative 2 would be short and long-term minor to moderate adverse. Cumulative impacts would be long-term minor to major adverse, of which alternative 2 would contribute minimally.	Under alternative 3, daily use limits of up to 720 snowmobiles and 78 snowcoaches along with BAT requirements, guiding regulations, speed limits, and restrictions on OSV access to park roads only would result in short and long-term minor to moderate adverse impacts. Continued monitoring and adaptive management would allow for additional restrictions to be established should negative impacts on wildlife begin to occur. Cumulative impacts on bison and elk under alternative 3 would be long-term minor to major adverse.	Under alternative 4, daily use limits of up to 110 snowmobiles, 100 guided wheeled vehicles, and 30 snowcoaches, along with BAT requirements, guiding regulations, speed limits, plowing design, and restrictions on OSV access to park roads only, would result in short- and long-term, negligible to minor adverse impacts. Continued monitoring and adaptive management would allow for additional restrictions to be established should negative impacts on wildlife begin to occur. Cumulative impacts would be long-term minor to major adverse, of which alternative 4 would be a small part.	The existing data suggest that the higher visual profile of a snowcoach may elicit stronger bison and elk behavioral responses than snowmobiles. 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 numbers and associated recreation reduce vehicle-caused mortality, wildlife displacement, behavior or physiology-related energy costs, and the potential for adverse demographic impacts, resulting in short and long-term minor adverse impacts. Cumulative impacts on bison and elk under alternative 5 would be long-term minor to major adverse, to which alternative 5 would contribute a small amount.	The variable number of OSVs allowed per day under this alternative would likely increase the behavioral responses of bison and elk due to daily unpredictability and reduced potential for habituation. These increased responses are due in part to the larger snowmobile group sizes (22 individual vehicles rather than 11) allowed under this alternative, which have been found to increase the probability of strong behavioral and associated physiological responses, leading to possible displacement of bison and elk and resulting in long-term moderate adverse impacts. Additionally, the unguided/non-commercially guided provision, variable daily OSV numbers, and high use limits may result in decreased habituation and increased behavioral, physiological and displacement responses by bison and elk. Measures under this alternative, including BAT snowmobiles, variable use limits, closing of certain roads to motorized traffic two weeks prior to the end of the season, and setting limits on seasonal numbers of snowmobiles and snowcoaches in the park, would help limit wildlife impacts. Impacts under alternative 6 would be long-term minor to moderate adverse, due to unguided provision, variable limits, and increased group size. Cumulative impacts on bison and elk under alternative 6 would be long-term minor to major adverse, to which alternative 6 would contribute a noticeable amount.	Alternative 7 would allow use levels similar to the 2009 interim rule, with BAT requirements, guiding regulations, speed limits, and restrictions on OSV access to park roads only. Variable use levels allow for continued monitoring and adaptive management to establish additional restrictions to be established should negative impacts on wildlife begin to occur. Thus, overall impacts under alternative 7 would be short- and long-term minor to moderate adverse. Cumulative impacts would be long-term minor to major adverse, to which alternative 7 would contribute a small amount.

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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, of which alternative 1 would contribute minimally.	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 restrict the east entrance to just 20 snowmobiles and two snowcoaches per day, (five groups of OSVs), 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 long-term minor adverse, with the potential for moderate adverse impacts if lynx and wolverines travel outside the eastern area of the park. Cumulative impacts to lynx and wolverines under alternative 2 would be long-term minor to major adverse, of which alternative 2 would contribute a minimal amount.	This alternative continues to maintain and allow OSV use in Sylvan Pass, the area of the park where human-wolverine interactions are most likely to occur. Restrictions to movements of lynx or wolverines during the winter months due to the presence and high levels of use of OSV routes under alternative 3 (up to 720 snowmobiles and 78 snowcoaches) may also limit reproductive success, dispersal, and overall genetic sustainability of the species due to increased frequency of exposure and duration of exposure to the sights and sounds of human activity. Therefore, impacts predicted under this alternative would be long-term moderate adverse. Cumulative impacts to lynx and wolverines under alternative 3 would be long-term minor to major adverse, of which alternative 3 would contribute a minimal amount.	Under this alternative Sylvan Pass would be closed to OSVs and maintenance activities would cease in the area of the park where human-wolverine interactions are most likely to occur. Restrictions to movements of lynx or wolverines during the winter months due to the presence and relatively low levels of use of OSV routes under alternative 4 (up to 110 snowmobiles, 100 wheeled buses, and 30 snowcoaches) would have few impacts on the reproductive success, dispersal, and overall genetic sustainability of the species due to decreased frequency and duration of exposure to the sights and sounds of human activity. Therefore, impacts under alternative 4 would be short and long-term minor adverse, with long-term beneficial impacts from the removal of human presence at Sylvan Pass. Cumulative impacts under alternative 4 would be long-term minor to major adverse, of which alternative 4 would contribute a minimal amount.	Restrictions to movements of lynx or wolverines during the winter months due to the presence and relatively low levels of use of OSV routes under alternative 5 (up to 120 snowcoaches) and the low levels of OSV entry limits at the east entrance would have few impacts on reproductive success, dispersal, and overall genetic sustainability of the species due to decreased frequency and duration of exposure to the sights and sounds of human activity. Therefore, impacts predicted under alternative 5 would be short and long-term negligible to minor, adverse. Cumulative impacts to lynx and wolverines under alternative 5 would be long-term minor to major adverse, to which alternative 5 would contribute minimally.	Restrictions to movements of lynx or wolverines during the winter months due to the presence and relatively high levels of use of OSV routes under alternative 6 (up to 540 snowmobiles and 78 snowcoaches), and the potential for higher OSV entry limits at the east entrance would have increased impacts on reproductive success, dispersal, and overall genetic sustainability of the species due to the increased frequency and duration of exposure to the sights and sounds of human activity. Therefore, impacts predicted under alternative 6 would be short and long-term moderate adverse. Cumulative impacts to lynx and wolverines under alternative 6 would be long-term minor to major adverse, of which alternative 6 would contribute a noticeable amount.	This alternative would maintain and allow OSV use in Sylvan Pass, the area of the park where human-wolverine interactions would be most likely to occur. However, daily entrance limits restrict the east entrance to just 22 snowmobiles and 2 snowcoaches per day, (five groups of OSVs), 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 the 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 area of the park. Cumulative impacts to lynx and wolverines under alternative 7 would be long-term minor to major adverse, to which alternative 7 would contribute a small amount.

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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 minor adverse, and alternative 1 would contribute a minimally to the overall cumulative impacts to eagles and swans.	Alternative 2 would limit impacts to 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 to eagles and swans under alternative 2 would be localized short- to long-term negligible to minor adverse. 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 limit impacts to swans and eagles as described in alternative 2, but would allow for a greater number of OSVs in the park on a daily basis and would result in short and long-term minor adverse impacts. Cumulative impacts would be long-term minor adverse, and alternative 3 would contribute a noticeable amount to the overall adverse cumulative impact.	Alternative 4 would limit impacts to swans and eagles due to low use limits, reduction in overall motorized vehicle use in the winter within the park, guiding requirements, and little overlap with active swan nesting season. The low use levels and guiding requirements would result in localized short and long-term negligible adverse impacts to eagles and swans under alternative 4. Cumulative impacts would be long-term minor adverse, and alternative 4 would contribute a small amount to the overall adverse cumulative impacts.	Alternative 5 would limit the impacts to swans and eagles through low use limits, guiding requirements, and little overlap between OSV use and the active swan nesting season. The low use levels and guiding requirements would limit impacts to eagles and swans under alternative 5 and result in localized short and long-term, negligible, adverse impacts. Cumulative impacts would be long-term minor adverse, and alternative 5 would contribute a small amount to the overall adverse cumulative impacts.	Alternative 6 would limit impacts to swans and eagles due to use-limits, guiding requirements, and little overlap between OSV use and the active swan nesting season, but would increase OSV use levels on some days beyond current use levels. Impacts to eagles or swans under alternative 6 would be short- and long-term minor to moderate adverse because use levels would increase and up to 25% unguided/non-commercially guided snowmobile use would be permitted. Cumulative impacts would be long-term minor to moderate adverse, and alternative 6 would contribute a noticeable amount to the overall adverse cumulative impacts.	Alternative 7 would limit impacts to 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 to eagles and swans under alternative 7 would be localized short- to long-term negligible to minor adverse. Cumulative impacts would be long-term minor to moderate adverse, and alternative 7 would contribute minimally to the overall adverse cumulative impacts.
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 would be limited to current use levels, which would reduce the frequency of OSV encounters, and limit the duration of interaction and the approach distance of OSV users due to guiding requirements. 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 minor adverse impacts on wolves in the park because OSV use would increase the frequency and duration of OSV exposure. The guiding requirement regulates the interaction time and approach distance of OSV users, limiting adverse impacts from direct interaction. Cumulative impacts would be long-term minor adverse, and alternative 3 would contribute a noticeable 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 because motorized vehicle use would be limited to low use levels, which would reduce the frequency of motorized vehicle encounters with wolves, and limits duration and approach distance of OSV users when encountering wolves due to guiding requirements. Cumulative impacts would be long-term minor adverse, and alternative 4 would contribute a small amount to the overall adverse cumulative impacts.	Alternative 5 would result in short- and long-term negligible to minor adverse impacts on wolves in the park because OSV use would be limited to low use levels which reduces the frequency of motorized vehicle encounters with wolves, and limits duration and approach distance of OSV users when encountering wolves due to guiding requirements. Cumulative impacts would be long-term minor adverse, and alternative 5 would contribute a small amount to the overall adverse cumulative impacts.	Alternative 6 would result in long-term minor to moderate adverse impacts on wolves in the park because OSV use would increase to relatively high use levels, which would increase the frequency of OSV encounters with wolves and the duration of OSV presence. The unguided snowmobile provision may result in improper behavior and decreased approach distance of OSV users when encountering wolves. Cumulative impacts would be long-term minor to moderate adverse and alternative 6 would contribute a noticeable amount to the overall adverse cumulative.	Alternative 7 would result in short- and long-term negligible to minor adverse impacts on wolves in the park because OSV use would be limited to current use levels, which would reduce the frequency of OSV encounters and limit the duration and approach distance of OSV users due to guiding requirements. Cumulative impacts would be long-term minor adverse, and alternative 7 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 negligible adverse. Cumulative impacts would result in long-term minor adverse impacts on air quality.	The effect of alternative 2 on air quality would be long-term minor adverse. The effect of alternative 2 on visibility would be long-term negligible adverse. Cumulative impacts to air quality and visibility would be long-term minor adverse.	The effect 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 to air quality and visibility would be long-term minor adverse.	The effect of alternative 4 on air quality would be long-term minor adverse. The effect of alternative 4 on visibility would be long-term minor adverse. Cumulative impacts to air quality and visibility would be long-term, minor adverse.	The effects of alternative 5 on air quality would be long-term minor adverse. The effect of alternative 5 on visibility would be long-term negligible adverse. Cumulative impacts to air quality and visibility would be long-term minor adverse.	The effect of alternative 6 on air quality would be long-term minor adverse. The effect of alternative 6 on visibility would be long-term negligible adverse. Cumulative impacts to air quality and visibility would be long-term minor adverse.	The effect of alternative 7 on air quality would be long-term minor adverse. The effect of alternative 7 on visibility would be long-term negligible adverse. Cumulative impacts to air quality and visibility would be long-term minor adverse.

	Alternative 1: No Action - No Snowmobile / Snowcoach Use	Alternative 2: Continue Snowmobile / Snowcoach Use at 2008 Plan Limits	Alternative 3: Return Snowmobile / Snowcoach use to 2004 Plan Limits	Alternative 4: Mixed Use: Snowcoaches, Snowmobiles, and Road Plowing for Wheeled Vehicles	Alternative 5: Transition to BAT Snowcoaches Only Based on User Demand	Alternative 6: Implement Variable Management	Alternative 7: Provide a Variety of Use Levels and Experiences for Visitors (Preferred Alternative)
Soundscapes	The effects of alternative 1 on soundscapes would be long-term, minor to moderate, and adverse due to administrative OSV use. Moderate impacts would be limited to travel corridors. Cumulative impacts to soundscapes would be long-term, minor and adverse.	The effects of alternative 2 on soundscapes would be long-term, moderate and adverse due to the level of OSV use permitted. Cumulative impacts to soundscapes would be long-term, moderate and adverse.	The effects of alternative 3 on soundscapes would be long-term, moderate to major and adverse. Major impacts would be limited to the travel corridor, due to the increased level of OSV use. Cumulative impacts to soundscapes would be long-term, moderate to major and adverse.	The effects of alternative 4 on soundscapes would be long-term, moderate and adverse, due to the permitted level of OSV use. Cumulative impacts to soundscapes would be long-term, moderate and adverse.	The effects of alternative 5 on soundscapes would be long-term, moderate and adverse, both before and after the phase out to snowmobiles only. Cumulative impacts to soundscapes would be long-term, moderate and adverse.	The effects of alternative 6 on soundscapes would be long-term, moderate to major, adverse representing the range between low and high use days under alternative 6. Cumulative impacts to soundscapes would be long-term, moderate to major and adverse.	The effect of alternative 7 on soundscapes would be long-term, moderate adverse. Cumulative impacts to soundscapes would be long-term, moderate and adverse.
Visitor Use and Experience	Restricting winter access to the interior of the park by non-motorized means would result in long-term major adverse impacts on the visitor use and experience. 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 in accordance with the 2009 interim rule limits would meet recent demand for winter visitation and provide limited opportunities for growth. Both motorized and non-motorized winter users would experience the benefits of continued access to the park's interior. Resource conditions (i.e., wildlife, soundscapes, and air quality), which support a quality visitor experience, would experience long-term negligible to moderate adverse effects. Therefore, alternative 2 would result in long-term benefits to visitor use and experience. Cumulative impacts to visitor use and experience under alternative 2 would be long-term and beneficial.	Under alternative 3, increasing OSV numbers and allowing access in accordance with the 2004 plan limits would provide opportunities for OSV users to experience Yellowstone in the winter, and would allow for some growth in OSV use as compared to what was observed between 2004 and 2009. Both motorized and non-motorized winter users would experience the benefits of continued access to the park's interior, but all users could experience a decrease in satisfaction because resources could be impacted by increased OSV use. Resource conditions (i.e., wildlife and soundscapes) would be affected to a greater extent than in recent years and may affect the ability to view wildlife and experience natural sounds. Overall, alternative 3 would result in long-term benefits to visitor experience and access, with long-term minor adverse impacts occurring from any decrease in visitor satisfaction. Cumulative impacts to visitor use and experience under alternative 3 would be long-term and beneficial.	Under alternative 4, changes in visitor access and experience created by introducing wheeled vehicles access and limiting OSV access would result in a distinctively different winter visitor experience. Parkwide, long-term beneficial impacts would result compared with alternative 1. Both motorized and non-motorized winter users would experience the benefits of continued access to the park's interior. However, expectations for OSV access and experience would not likely be met because of the decrease in the number of snowmobiles and snowcoaches permitted in the park on any given day, resulting in long-term moderate adverse impacts for this user group. Overall, alternative 4 would result in long-term beneficial impact and long-term minor to moderate adverse impacts to visitor experience and access. Cumulative impacts to visitor use and experience would be long-term minor to moderate adverse and long-term beneficial.	Under alternative 5, changes in visitor experience created by the potential 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 a specific, individual snowmobile experience as offered in the past would be lost. This would result in the potential for visitors' expectations not to be met. Overall, alternative 5 would result in long-term beneficial impacts to visitor experience and access, with long-term moderate adverse impacts to those wishing to engage in snowmobile use. Cumulative impacts to visitor use and experience would be long-term beneficial and long-term moderate adverse.	Under alternative 6, increases in OSV allocations and flexibility in daily use would result in parkwide, long-term beneficial impacts 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, and visitors could plan their trip around the use level for that day and their desired experience. Resource conditions (e.g., wildlife and soundscapes) would be affected to a greater extent than in recent years, somewhat affecting the visitors' ability to view wildlife and experience natural sounds. Overall, alternative 6 would result in long-term benefits to visitor experience and access, with potential negligible to minor impacts for visitors that cannot accommodate their desired experience. Cumulative impacts would be long-term minor adverse as well as long-term beneficial.	Under alternative 7, varying OSV allocations and flexibility in daily use would result in parkwide, long-term beneficial impacts compared to the no-action alternative. Visitors could plan their trip around desired use and experiences, but limited OSV availability early and later in the winter season may result in unmet expectations for OSV visitors. Resource conditions (soundscapes and wildlife) would be affected to a lesser extent than in recent years, somewhat improving visitors' ability to view experience natural sounds and view wildlife. Overall, alternative 7 would result in long-term benefits to visitor experience and access, with potential minor to moderate adverse impacts for visitors that cannot obtain their desired experience. Cumulative impacts would be long-term, minor to moderate, adverse, as well as long-term beneficial.

	Alternative 1: No Action - No Snowmobile / Snowcoach Use	Alternative 2: Continue Snowmobile / Snowcoach Use at 2008 Plan Limits	Alternative 3: Return Snowmobile / Snowcoach use to 2004 Plan Limits	Alternative 4: Mixed Use: Snowcoaches, Snowmobiles, and Road Plowing for Wheeled Vehicles	Alternative 5: Transition to BAT Snowcoaches Only Based on User Demand	Alternative 6: Implement Variable Management	Alternative 7: Provide a Variety of Use Levels and Experiences for Visitors (Preferred Alternative)
Visitor Accessibility	Restricting winter access to the interior of the park to non-motorized methods would result in long-term major adverse impacts to visitor accessibility; including the very young, the elderly, and the mobility-impaired visitors. Accessible regional opportunities for winter recreation would offset these adverse impacts somewhat. Cumulative impacts to visitor accessibility would be long-term major adverse, to which alternative 1 would contribute a large part.	Under alternative 2, continuing OSV numbers and routes in accordance with the 2009 interim rule limits would meet demand (based on use levels for the 2009/2010 winter season) for accessible winter visitation for the very young, the elderly, and the mobility impaired. Opportunities for increased visitation for those with mobility needs would also be accommodated. Thus, alternative 2 would result in long-term beneficial impacts to visitor accessibility. Cumulative impacts under alternative 2 would be long-term and beneficial.	Under alternative 3, OSV numbers and routes in accordance with the 2004 Winter Use Plan limits would meet the demand (based on use levels for the 2009/2010 winter season) for a winter experience that can be enjoyed by the very young, the elderly, and the mobility impaired. Opportunities for increased accessible visitation would also be accommodated. Therefore, alternative 3 would result in long-term benefits to visitor accessibility. Cumulative impacts under alternative 3 would be long-term and beneficial.	Under alternative 4, distinct accessibility options of snowcoaches, snowmobiles, and wheeled vehicles would be available for exploring Yellowstone in winter. However, accessible snowcoach experiences may not be available to all seeking them. Nonetheless, the availability of wheeled, accessible vehicles would potentially provide the greatest degree of accessibility of the proposed alternatives. This would result in parkwide, long-term beneficial impacts to accessibility when compared to the no-action alternative, with the potential for long-term minor adverse impacts due to the limited availability of snowcoach access. Cumulative impacts would be long-term beneficial.	Under alternative 5, changes in visitor experience created by the potential transition to snowcoach access only would result in parkwide, long-term beneficial impacts compared to the no-action alternative. For those seeking snowmobile experiences, impacts would be long-term, minor to moderate adverse. Cumulative impacts would be long-term and beneficial.	Under alternative 6, total snowcoach allocations would be similar to those in the 2009/2010 winter season. Flexibility in routes and gate entry numbers would potentially increase accessible snowcoach use. This would result in parkwide, long-term beneficial impacts to accessibility compared to the no-action alternative. Cumulative impacts would be long-term and beneficial.	Under alternative 7, OSV allocations would vary within the winter use season, and would be expected to support current and future accessibility demands. This would result in parkwide, long-term beneficial impacts to accessibility compared to the no-action alternative. Cumulative impacts would be long-term and 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 to health and safety would be long-term negligible adverse and long-term beneficial to health and safety, 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 to 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 to 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.	Under alternative 4, impacts to 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. Cumulative impacts would be long-term negligible adverse.	Under alternative 5, impacts to 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, both before and after the transition to snowcoach only. Cumulative impacts would be long-term minor adverse.	Under alternative 6, impacts to 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 to moderate adverse from user conflicts and exposure to the elements. Cumulative impacts would be long-term minor adverse.	Under alternative 7, impacts to 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 2008 Plan Limits	Alternative 3: Return Snowmobile / Snowcoach use to 2004 Plan Limits	Alternative 4: Mixed Use: Snowcoaches, Snowmobiles, and Road Plowing for Wheeled Vehicles	Alternative 5: Transition to BAT Snowcoaches Only Based on User Demand	Alternative 6: Implement Variable Management	Alternative 7: Provide a Variety of Use Levels and Experiences for Visitors (Preferred Alternative)
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. 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 continues current 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 result in negligible to beneficial, long-term impacts for the states, counties and communities surrounding Yellowstone. West Yellowstone could experience larger beneficial, long-term impacts compared to the other communities. Alternative 3 has higher daily limits on snowmobile and snowcoach use, and so the alternative could accommodate higher growth in visitation than all the alternatives, except alternative 4. If demand for snowmobile and snowcoach tours grew beyond the current limits, alternative 3 would allow for a larger increase in visitation by out-of-region visitors. However, the lower estimate of visitation is equal to alternative 2 because the snowmobiles must still be part of a guided tour and must meet BAT restrictions. Cumulative impacts would be long-term beneficial.	Compared to alternative 1, all the communities are expected to experience beneficial, long-term impacts and West Yellowstone is expected to experience the largest beneficial impacts. The impacts of these past, present, and reasonably foreseeable future actions, combined with the long-term beneficial impacts of alternative 4 would result in long-term beneficial cumulative impacts on the socioeconomic environment. The size of the impacts would depend on demand for commercial, wheeled vehicle tours out of the west and north entrances, which would represent a new winter experience for visitors. Cumulative impacts would be long-term beneficial.	Compared to alternative 1, alternative 5 is expected to have on average beneficial, long-term impacts for all the communities, as seen in tables 65, 66 and 67. In order to generate larger beneficial impacts under this alternative, demand for snowcoach tours must increase to more than make up for the eventual phase-out of snowmobiles. Cumulative impacts would be long-term beneficial.	Compared to alternative 1, alternative 6 could provide beneficial, long-term impacts for all the communities, the three-state area, and the five-county area. West Yellowstone could experience larger, beneficial long-term impacts, on average, as reported in tables 65, 66 and 67. The larger beneficial impacts are more likely under this alternative compared to others because of the provision for unguided snowmobile trips, which were historically more popular. Cumulative impacts would be long-term beneficial.	Compared to alternative 1, alternative 7 could provide beneficial, long-term impacts for the three-state area, the five-county area, and the three communities. West Yellowstone could reach larger, beneficial, long term impacts, on average, as reported in tables 65, 66 and 67. Cumulative impacts would be long-term beneficial.

	Alternative 1: No Action - No Snowmobile / Snowcoach Use	Alternative 2: Continue Snowmobile / Snowcoach Use at 2008 Plan Limits	Alternative 3: Return Snowmobile / Snowcoach use to 2004 Plan Limits	Alternative 4: Mixed Use: Snowcoaches, Snowmobiles, and Road Plowing for Wheeled Vehicles	Alternative 5: Transition to BAT Snowcoaches Only Based on User Demand	Alternative 6: Implement Variable Management	Alternative 7: Provide a Variety of Use Levels and Experiences for Visitors (Preferred Alternative)
Park Operations and Management	Alternative 1 would have long-term negligible adverse impacts to 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 green house gas emissions would be reduced from current levels because the number of staff needed in the interior of the park, and therefore OSV use, would be reduced. Cumulative impacts under alternative 1 would be long-term, negligible to minor 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 would be similar to those currently funded, and this level of funding would be expected to continue. 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, of which alternative 2 would constitute a large part.	Alternative 3 would result in long-term minor to moderate adverse impacts because the staffing and resource requirements would require additional funding that may or may not be available in the park's annual budget. Any additional resources required may impact park operations and could be slightly noticeable to park staff and visitors when resources are allocated from one part of the park to another. Cumulative impacts under alternative 3 would be long-term minor to moderate adverse, of which alternative 3 would constitute a large part.	Alternative 4 would result in long-term negligible to minor adverse impacts to park operations and management because the staffing and resource requirements for implementation of the alternative would likely be met with existing funding sources. Additional requirements (one-time costs) of this alternative 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 4 would be long-term negligible to minor adverse, of which alternative 4 would constitute a large part.	Alternative 5 would result in long-term negligible to minor adverse impacts to park operations and management because the staffing and resource requirements for implementation of the alternative would likely be met with existing funding sources. Additional requirements (one-time costs) of this alternative as well as the slight increase in funding required over current conditions 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 5 would be long-term negligible to minor adverse, of which alternative 5 would constitute a large part.	Alternative 6 would result in long-term negligible to minor adverse impacts because the staffing and resource requirements would be similar to those currently funded (if not slightly lower), and this level of funding expected to continue. 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 6 would be long-term negligible to minor adverse, of which alternative 6 would constitute a large part.	Alternative 7 would result in long-term negligible to minor adverse impacts because the staffing and resource requirements would be similar to current funding (if not slightly lower), and this level of funding would be expected to continue. 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 7 would be long-term negligible to minor adverse, of which alternative 7 would constitute a large part.

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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
BBHC	Buffalo Bill Historic Center
BLM	U.S. Bureau of Land Management
BTNF	Bridger-Teton National Forest
CAA	Clean Air Act
CBA	choosing by advantages
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
dbA	decibel (A-weighted)
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FPPA	Farmland Protection Policy Act
GC	glucocorticoids
GHG	greenhouse gas
GIS	Geographical Information System
GPS	Global Positioning System
HAP	hazardous air pollutant
IBMP	Interagency Bison Management Plan
LEED	Leadership in Energy and Environmental Design
MBTA	Migratory Bird Treaty Act
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NIOSH	National Institute for Occupational Safety and Health
NPOMA	National Parks Omnibus Management Act
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/EIS	Winter Use Plan and Environmental Impact Statement
PRB	policy relevant background
PSD	prevention of significant deterioration
REL	recommended exposure limits
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
USGS	U.S. Geological Survey
UTV	utility-type vehicle
VEC	Visitor Education Center
VOC	volatile organic compound

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 draft Winter Use Plan / Environmental Impact Statement (plan/EIS) presents six 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 at all (no-action alternative) or implements any of the six action alternatives. Upon conclusion of the draft plan/EIS and decision-making process, the alternative selected for implementation will become the winter use plan, which will specifically address the issue of OSV use in the interior of the park for at least the next 20 years. 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.

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 draft plan/EIS, as well as issues and impact topics dismissed from further analysis.

PURPOSE OF THE PLAN

The purpose of this draft plan/EIS is to establish a management framework that allows the public to experience the unique winter resources and values at Yellowstone National Park. This draft plan/EIS will be used to determine whether motorized winter use in the interior of the park (including wheeled motor vehicles, snowmobiles, and snowcoaches) 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."*
> *Director's Order 12, Section 2.2(A)*

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

> "***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."*
> *Director's Order 12, Section 2.2(B)*

expired on March 15, 2011. 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

Objectives are what must be achieved to a large degree for the action to be considered a success under Director's Order 12 (NPS 2001). All alternatives selected for detailed analysis in this draft plan/EIS 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.

***Objectives** are "…goals the park must accomplish by taking action for the action to be considered a success." Director's Order 12, Section 2.1, Item 2*

VISITOR USE

- 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 background sound levels and to minimize loud noises.
- Air Quality: Manage winter use to minimize impacts to 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 MANAGEMENT/OPERATIONS

- Promote advances of vehicle technology (OSVs and commercial wheeled vehicles) 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 draft plan/EIS is Yellowstone National Park within the states of Wyoming, Montana, and Idaho, (see 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, 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

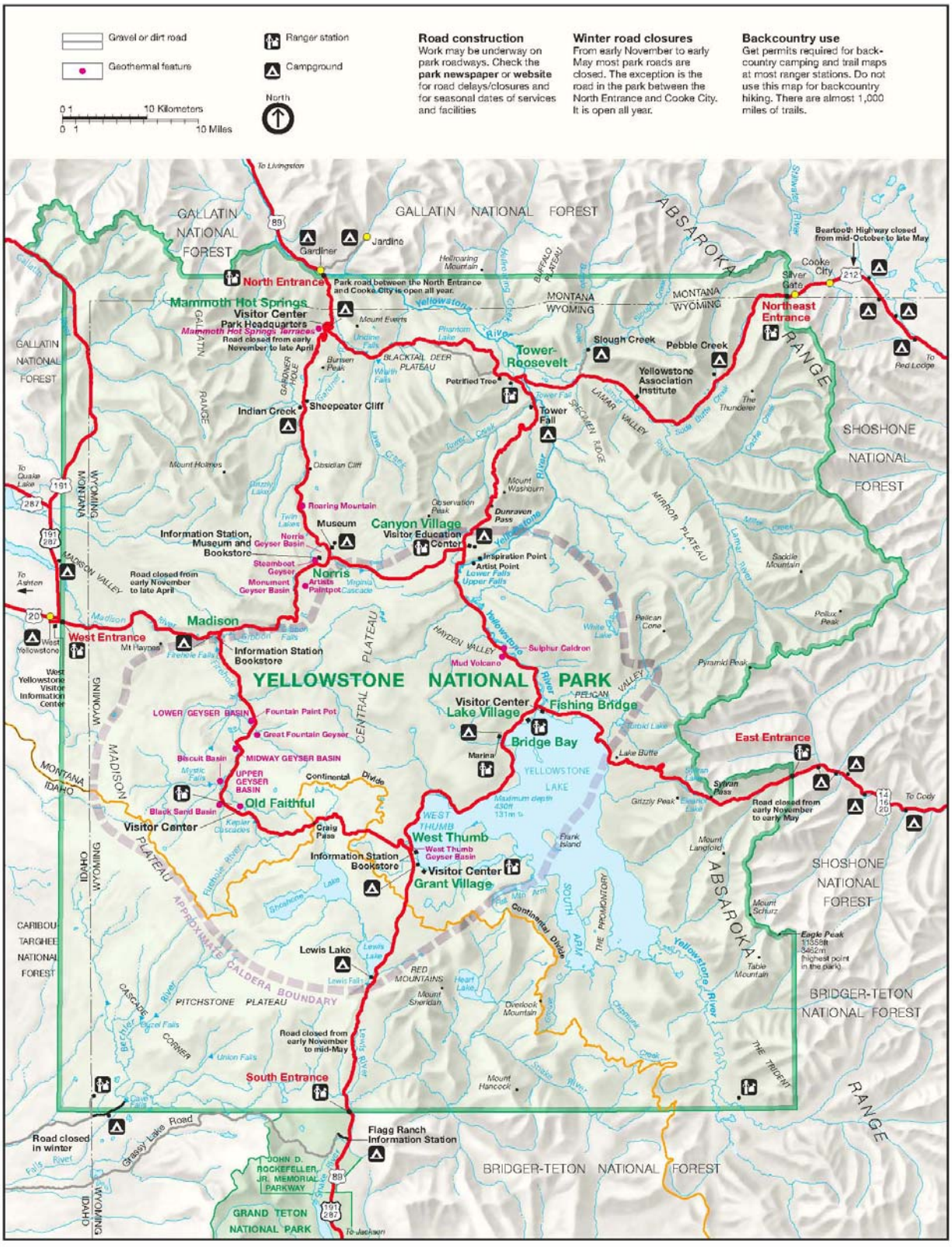


FIGURE 1: YELLOWSTONE NATIONAL PARK MAP

- 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 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.

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 formally debated what the park should look and be like in winter. 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 accessing the park, collectively known as OSVs, brought unanticipated problems including air and noise pollution, conflicts with other users, and wildlife harassment, as documented in past planning efforts. To address these problems, planning for the management of OSV use began with the Master Plan in 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.

Recently, as a result of litigation over the 2007 planning effort, on September 15, 2008, the U.S. District Court for the District of Columbia vacated the 2007 Winter Use Plan and Final Environmental Impact Statement, as well as the associated Record of Decision and rule. Because the court's ruling left no provision in place for snowmobile or snowcoach use (effectively meaning that OSV use would not be allowed in the park because there was no rule to support it), the NPS issued the Interim Winter Use Plan / Environmental Assessment on November 3, 2008. A proposed rule was published on November 5, 2008.

However, on November 7, 2008, the U.S. District Court for the District of Wyoming issued an order reinstating the 2004 rule, allowing snowmobile and snowcoach use in Yellowstone until a new rule could be completed. For the winter of 2008/2009, the park operated under the 2004 rule which allowed up to 720 snowmobiles and 78 snowcoaches per day. The Wyoming decision was appealed, but the litigation was declared moot by the 10th Circuit Court of Appeals because the NPS had already developed an interim plan and promulgated a replacement rule.

In 2009, the NPS completed a new Interim Winter Use Plan Finding of No Significant Impact and promulgated a new 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 commercially guided and snowmobiles were required 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 Study 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 (allowing for up to 318 snowmobiles and 78 snowcoaches per day) 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.

SUMMARY OF SCIENTIFIC LITERATURE ON OVERSNOW VEHICLE USE

The information presented in this draft plan/EIS, 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, three additional processes were undertaken to assist in the development of this draft plan/EIS, as described below.

SCIENTIFIC ASSESSMENT OF YELLOWSTONE NATIONAL PARK WINTER USE

The Scientific Assessment of Yellowstone National Park Winter Use is available at the Yellowstone Winter Use website at http://www.nps.gov/yell/planyourvisit/winteruse.htm and the Planning, Environment, and Public Comment website at http://parkplanning.nps.gov/yell. The Scientific Assessment refers to available scientific information related to the potential effects of OSV use on natural resources.

SCIENCE ADVISORY TEAM

The Superintendent of Yellowstone established a Science Advisory Team (SAT) to support the development of this draft plan/EIS. 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 to park resources, values, and visitor experience resulting from managed winter use.
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 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. 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.

OPERATIONAL RISK MANAGEMENT ASSESSMENT

Additional supporting information for this winter use planning process was provided from the Operational Risk Management Assessment process that occurred for the operation of Sylvan Pass in August 2010. This review was a follow up to the initial Operational Risk Management Assessment 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 gains (for visitor access, agency cost, resource protection, and effectiveness of avalanche control) of several new and different potential avalanche control options, with the operation's mission being to avoid negative avalanche-human contact. This information was considered and incorporated into the health and safety section of this document.

ISSUES AND IMPACT TOPICS

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

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 draft plan/EIS. The issues were identified by the NPS, cooperating agencies, other agencies, and the public throughout the scoping process. Public scoping began on January 29, 2010, with the publication of a Notice of Intent in the Federal Register. During the scoping period, six public scoping open houses were held in Idaho (1), Montana (2), Wyoming (2), and Washington, D.C. (1), with subsequent webinars and public conference calls introducing the range of alternatives. The public scoping period closed on March 30, 2010; the NPS received more than 9,000 comments on the scope of this draft plan/EIS. Comments received included suggestions for alternative elements (should OSV be allowed in the park, how many OSV should be allowed in the park, what should BAT and guiding requirements look like, should wheeled vehicles be permitted in the interior of the park, etc.). Additional comments included impact topics that should be considered, such as wildlife, air quality, soundscapes, and visitor use.

Impact topics are a more refined set of concerns analyzed for each of the winter use alternatives. The impact topics were derived from issues. Each impact topic is explained in the "Affected Environment" chapter. In the "Environmental Consequences" chapter, the impact topics were used to explain the extent to which an issue would be made better or worse by the actions of a particular alternative.

Public Scoping Meeting Held in Idaho Falls, Idaho

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, OSV road grooming, and wheeled vehicles/plowed roads, on wildlife in the interior of the park, have the potential to impact the park's wildlife. Specifically,

the species below were selected for detailed analysis in this draft plan/EIS, due to the potential impacts of winter use.

Bison Foraging in Winter

Winter use of the park by ungulates such as elk and 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, and are brought up as a species of concern by the public during scoping. These two ungulates are therefore retained for analysis in this draft plan/EIS. 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 draft plan/EIS (see "Issues Considered but Dismissed from Further Analysis" (page 11)). Canada lynx and gray wolf; however, have been carried forward for analysis because they could be impacted from OSV use and associated actions. Additional species of concern that could be adversely affected by OSV use and its associated actions and are relatively rare in the park or in need of special protection 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 Considered but Dismissed from Further Analysis," below (see page 11).

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 of 1970 and its amendments. The management policies also note that the NPS actively promotes and pursues measures to protect air-quality related values from the adverse impacts of air pollution and seeks to protect integral vistas (those views perceived from within certain national parks of a specific landmark or panorama outside the park), through cooperative means.

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 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 suggestions for how air quality should be analyzed in the draft plan/EIS (consideration of new technologies, development of an air monitoring protocol, among others).

Because of the potential impacts of snowmobile, snowcoach, and/or bus travel on air quality, including emissions, visibility, and air-quality related values, impacts to air quality are assessed in this draft plan/EIS.

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, both biological and physical. 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 the visitor experience as well as natural wildlife interactions.

Whenever OSV use occurs in the park, winter soundscapes in Yellowstone consist of 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 of snowmobile, snowcoach, and bus travel on the park's natural soundscape, impacts to soundscapes and the acoustic environment are assessed in this draft plan/EIS.

VISITOR USE AND EXPERIENCE

Issues related to visitor use are addressed in Section 7 of NPS *Management Policies 2006* (NPS 2006a). 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 used 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.

Example of the Visitor Experience in Yellowstone in the Winter

Because of the potential for the impacts of snowmobile, snowcoach, and bus travel on park visitor use and experience, impacts to soundscapes and the acoustic environment are assessed in this draft plan/EIS.

VISITOR ACCESSIBILITY

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. NPS *Management Policies 2006* emphasize the need to provide access to persons with disabilities in section 8.2.4, which states, "This policy reflects the commitment to provide access to the widest cross section of the public, and to ensure compliance with the intent of the Architectural Barriers Act of 1968 and the Rehabilitation Act of 1973. The Service will also comply with section 507 of the Americans with Disabilities Act (42 USC 12207), which relates specifically to the operation and management of federal wilderness areas. Other areas of NPS *Management Policies 2006* that address access are the need to comply with the Americans with Disabilities Act and Architectural Barriers Act in Section 5.3.2 and Physical Access for Persons with Disabilities in Sections 1.9.3, and 9.1.2. Other mandates include the requirement to provide reasonable accommodation to known disabilities of qualified applicants and employees (Director's Order 16A, Reasonable Accommodation for Applicants and Employees with Disabilities) and to ensure that facilities

are readily accessible to and usable by individuals with disabilities, including individuals who use wheelchairs (Director's Order 42, Accessibility for Visitors with Disabilities in National Park Service Programs and Services). 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, snowmobiles, and wheeled vehicles) play in providing visitors access to the winter experience in the interior of the park.

This draft plan/EIS 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 who are mobility challenged. For these individuals, mobility issues were not considered to be of primary concern; rather, 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.

HUMAN 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 as 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 with road plowing in the interior of the park.

Health and safety issues associated with some of the actions under consideration in this draft plan/EIS include 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. Because of these potential impacts to health and safety, this topic is analyzed in detail in this draft plan/EIS.

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 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. Because of the potential impacts on socioeconomics, this topic is analyzed in detail in this draft plan/EIS.

PARK WINTER 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 managing winter use in the park presents logistical and financial challenges. Any changes to 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 and during past planning efforts, public and cooperating agency commenters raised

concern about the amount of staff and resources needed to carry out each alternative. Because of the potential impacts to park operations from the alternatives under consideration in this draft plan/EIS, 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 draft plan/EIS, 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 draft plan/EIS 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 the likelihood of 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.

The NPS uses the concept of "no measurable effects" to determine whether impact topics are dismissed from further evaluation to concentrate its analyses on issues that are truly significant to the action in question, rather than amassing needless detail (CEQ NEPA regulations, 40 CFR 1500.1(b)).

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 or wheeled vehicle use under consideration in this draft plan/EIS 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 to geologic and geothermal resources from the range of alternatives evaluated are dismissed from further analysis in this draft plan/EIS.

Topography and soils are considered geologic resources. Geology is a major determinant of water and soil chemistry, the type 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 draft plan/EIS; OSV use as proposed under the action alternatives would not impact topography or soils. Any proposed OSV or wheeled vehicle use in the park under consideration in this draft plan/EIS would occur on existing paved roads, which are the same roads open to wheeled vehicle traffic in the summer. Therefore, 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 to soils or topography, the potential impacts to these resources have been dismissed from further analysis in this draft plan/EIS.

GEOHAZARDS

A geohazard is an event related to geological features and processes that cause loss of life and severe damage to property and the natural and built environment, such as an earthquake or rock slide. 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 draft plan/EIS.

OTHER WILDLIFE AND WILDLIFE HABITAT

Issues and concerns about impacts to 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 are expected to be minimally affected by the alternatives considered in this draft 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 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. The current population of grizzly bears in Yellowstone is estimated at between 431 and 588 in the Yellowstone ecosystem (NPS 2010a), and Yellowstone's grizzly bear population 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% 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% 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 et al. 1986). In spring, males are first to emerge from winter hibernation, starting as early as mid-February, and females with cubs emerge usually 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 et al. 1991; Mattson et al. 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 of human recreation on bears is mitigated by park established bear management areas, where human disturbance is limited by 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 10.

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 and wheeled vehicle use as proposed in this draft plan/EIS in the park has little potential to disturb them. Although there is overlap with the proposed winter use season (which extends through March 10) 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 winter use season has ended or areas with denning females are closed, generally 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. Whitebark pine decline in the area may result in changes in bear ecology; however, specifics of how this may affect denning chronology are unknown. All alternatives for winter use management would have, at most under the action alternatives (alternatives 2, 3, 4, 5, 6, and 7), short-term negligible adverse impacts on grizzly bears, because encounters between OSVs and grizzly bears is 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 affects 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*)

Previous analysis has demonstrated that existing winter recreation activities in the park does 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 bear would be no more than short-term negligible adverse under all alternatives considered in this draft plan/EIS. Therefore, potential impacts on black bears from the alternatives under consideration in this plan are not analyzed in further detail.

Cougar

Cougars are secretive predators, weighing from 75 to 165 pounds as adults, that primarily prey on elk calves and mule deer 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. Results of this research provide a good estimate of cougar population, and their role in the ecology of Yellowstone. Yellowstone's northern range currently supports an estimated population of 14 to 23 adult cougars and numerous kittens. Human hunting, 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 draft plan/EIS would be rare and impacts to cougars from OSV use in the park would be short-term, negligible to minor adverse under the action alternatives (alternatives 2, 3, 4, 5, 6, and 7). The short-term minor adverse impacts expected under alternative 3 would be due to the higher amount of OSV use. The short-term minor adverse impacts expected under alternative 6 would be due to the allowance for non-commerically guided/unguided use. Under the no-action alternative (alternative 1), no affects would be assumed from 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

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 (47%), with 30% showing no visible response, 12% travel, and 12% alarm-attention (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 lose its fear of humans and frequent areas of human use, searching for food or begging (Taber 2006; Van Etten et al. 2007).

The guiding requirements presently 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 trash cans and areas of human food waste at developed sites. The primary issue regarding impacts of OSV use on coyotes is the effect of unguided users feeding or not securing food from scavenging coyotes (Taber 2006).

Because there is no OSV use under the no-action alternative, no effects are assumed under alternative 1. Alternatives 2, 3, 4, 5, and 7 include commercial guiding requirements, with trained drivers operating both snowcoaches and wheeled buses, and guides leading groups of up to 11 snowmobiles. This commercial guiding requirement reduces the possibility for problem behaviors in coyotes because trained commercial guides would continue to instruct their clients regarding food storage and feeding. Also, under these alternatives, daily entry requirements limit OSV visitation levels to a level below historical limits. Most impacts to coyotes increase with increased vehicle numbers, so this measure would limit such impacts. 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 unacceptable impacts on coyotes that cannot be mitigated, selected areas of the park may be closed to visitor use. Therefore, alternatives 2, 3, 4, 5, and 7 would result in short-term negligible adverse effects on coyotes.

Under alternative 6, up to 25% of snowmobiles would enter the park unguided or non-commercially guided, increasing the likelihood of visitor-wildlife interactions. Although attempts would be made to educate unguided visitors about proper wildlife interactions, this may not be as effective as commercial guides ensuring visitor compliance. Similar to the other action alternatives, monitoring of human-wildlife encounters would continue. If this monitoring indicates the presence and activities of winter visitors are impacting coyotes, selected areas of the park may be closed to visitor use to mitigate the potential impacts. Alternative 6 would, therefore, be expected to have short-term minor adverse effects on coyotes.

Impacts to coyotes under all alternatives would be no more than minor impacts from OSV use. Therefore, potential impacts on coyotes from the alternatives under consideration in this plan 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, and red fox. The reason for dismissal of these species is discussed below. The wolverine and Canada lynx are included in the detailed analysis in this draft plan/EIS.

The bobcat and red fox are managed as furbearers in the greater Yellowstone area, and thus may be hunted and trapped. Populations are considered stable (Olliff et al. 1999). OSV use as proposed under the alternatives considered in detail in this draft plan/EIS would occasionally interact with these species, but such interactions would be rare. Therefore, interactions with OSVs would have short-term negligible to minor adverse impacts on the population of red fox and bobcat in the park under the action alternatives (alternatives 2, 3, 4, 5, 6, and 7). The short-term minor adverse impacts expected under alternative 3 would be due to the higher amount of OSV use and the impacts under alternative 6 would be due to the allowance for non-commerically guided/unguided use. Under the no-action alternative (alternative 1), no affects would be assumed from the limited administrative use that would occur. Therefore, potential impacts on bobcat and red fox 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 fisher (Murphy et al. 2006; USFWS 2010b). Although there have been no recent verified sightings, fishers likely exist at very low numbers within the greater Yellowstone area (USFWS 2010b). Within 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, and interactions between fisher and OSVs are likely very rare. 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 et al. 2001). Impacts to fisher from OSVs use under the alternatives evaluated in detail in this draft plan/EIS would be short-term, negligible adverse. 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 fisher 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. Availability of dens is important for survival of 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 marten, and disturbance of natal dens could limit survival of young. Because OSV use

in Yellowstone would be restricted to roads under the alternatives in this draft plan/EIS and are not present in the park during the sensitive marten denning season, impacts from OSVs on martens under the alternatives evaluated would be short-term, negligible adverse. 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 subnivian (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 draft plan/EIS. OSV use is limited to road corridors, which limits the exposure of weasels to OSVs. Impacts to this species from OSV use are expected to be at most, short-term and negligible, adverse. Therefore, potential impacts on weasels from the alternatives under consideration in this plan are not analyzed in further detail.

Moose

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 upon 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 overwinter locations within the greater Yellowstone area include Hermitage Point area, Buffalo valley, Willow Flat, and the Snake and Gros Ventre river corridors. Within 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 one-mile segment along Falls River to Cave Falls. OSV routes under the alternatives being considered in this draft plan/EIS 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 draft plan/EIS 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" 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 draft plan/EIS would have, at most, short-term negligible adverse impacts on moose. Therefore, potential impacts on moose from the alternatives under consideration in this plan are not analyzed in further detail.

Bighorn Sheep

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 competition with other ungulates (elk, mule deer, and bison) especially during severe winters, disease, and drought. 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% following an outbreak of pink-eye (Meagher 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 Evert. 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 (Schoeneker et al. 2004). Any road use or human development that affects the migration of sheep from their lower elevation winter range to 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 draft plan/EIS do not currently cross bighorn sheep winter range, with the closest motorized route to the Mt. Evert 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 on-foot winter travelers. Impacts to bighorn sheep under all alternatives considered in this draft plan/EIS would be short-term negligible adverse. Therefore, potential impacts on bighorn sheep from the alternatives under consideration in this plan are not analyzed in further detail.

Pronghorn, Mule Deer, and White-tailed Deer

Pronghorn in Yellowstone spend the winter in the area between the north entrance and Reese Creek, in a 30-km 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 of 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 pronghorn, mule deer and white-tailed deer winter outside of the park or in areas that are not exposed to winter OSV use proposed under the alternatives considered in this draft plan/EIS, impacts under all of the alternatives considered would be long-term negligible adverse. Therefore, potential impacts on pronghorn, mule deer and white-tailed deer from the alternatives under consideration in this plan are not analyzed in further detail.

Raven

Ravens are common throughout the park and a flourishing population is found in Yellowstone. 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 access food. After 2003, guiding requirements restricted any feeding and clients were instructed to store food in places inaccessible to ravens, eliminating the success of ravens at obtaining human-supplied food (Tabor 2006). As such, the effects of OSV use on ravens under any alternative are expected to be minimal under the alternatives considered in this draft plan/EIS.

Similar to coyotes, no effects are assumed under alternative 1. Alternatives 2, 3, 4, 5, and 7 require commercial guides for any motorized vehicles entering the park. This commercial guiding requirement removes the possibility for problem behaviors from ravens because trained guides would continue to instruct their clients regarding food storage and feeding. Therefore, alternatives 2, 3, 4, 5, and 7 would result in short-term negligible adverse effects on ravens.

Under alternative 6, up to 25% of snowmobiles would enter the park unguided or non-commercially guided, increasing the likelihood of visitor-wildlife interactions. Although attempts would be made to educate unguided visitors on proper wildlife interactions, this may not be as effective as commercial guides ensuring visitor compliance. Therefore, alternative 6 would be expected to have short-term negligible to minor adverse effects on ravens.

Ravens are widespread in the park and impacts would not be greater than short- and long-term minor adverse under all of the alternatives. Therefore, potential impacts on ravens from the alternatives under consideration in this plan 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 or their habits are not considered threatened 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. Other raptor species in Yellowstone are not monitored as intensively as osprey, bald eagle, and peregrine falcon, mostly because they are common in the park and/or the NPS capability to inventory and monitor them is limited. Casual observations by bird monitors of common raptors such as golden eagles indicate that their population is stable. A USFWS golden eagle monitoring flight over the park in summer 2009 observed no golden eagles. These observations probably indicate that golden eagle density in the park is low (Baril et al. 2010). Annual winter wildlife monitoring reports observed very few golden eagle and OSV interactions. Out of about 5 to 8 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; McClure et al. 2008; Davis et al. 2007). In the absence of any data indicating population decline, strong behavioral response, or displacement of golden eagles due to OSV use in the park, impacts to golden eagles from OSVs under the alternatives considered in this draft plan/EIS are predicted to be short-term negligible to minor adverse under the action alternatives (alternatives 2, 3, 4, 5, 6, and 7). The short-term minor adverse impacts expected under alternative 3 would be due to the higher amount of OSV use and impacts under alternative 6 would be due to the allowance for non-commerically guided/unguided use. Under the no-action alternative (alternative 1), no affects would be assumed from the limited administrative use that would occur. Therefore, potential impacts on other bird species (including peregrine falcons, osprey, and golden eagles) from the alternatives under consideration in this plan are not analyzed in further detail.

Subnivian Fauna

Subnivian fauna are small mammals that live under snow during winter, including shrews, voles, pocket gophers, and mice. They are active throughout the year, eat a variety of plant and animal foods, and generally occupy habitats on or below the ground. They are important prey species for a variety of birds and mammals. In general, subnivian fauna are abundant residents of the park and any potential loss of habitat caused by road grooming or plowing operations is 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 upon during non-winter months, no impacts to subnivian species or their habitat are likely. Research in other areas indicates that subnivian pits and burrows have been found currently under roads groomed for OSV use and in snowmobile play areas (Wildlife Resource Consultants 2004). Because of this, impacts under all of the alternatives considered in this draft plan/EIS would be short-term negligible adverse. Therefore, potential impacts on subnivian fauna from the alternatives under consideration in this plan are 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 articus*), the snake river cutthroat (*Oncoryhynchus clarki bouvieri*), the westslope cutthroat trout (*Oncorhynchus Clarki 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 short- and long-term negligible adverse impacts on reptiles, amphibians, fish, or invertebrates under the alternatives considered in this draft plan/EIS. Reptiles and amphibians are inactive or hibernate during the winter and are therefore not exposed to the impacts of OSV use; 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 was 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 to reptiles, amphibians, fish, or invertebrates would be non-existent (alternative 1) or short- and long-term negligible adverse (alternatives 2, 3, 4, 5, 6, and 7) under the alternatives considered in this draft plan/EIS. Therefore, potential impacts on reptiles, amphibians, fish, or invertebrates from the alternatives under consideration in this plan 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 draft plan/EIS would occur in or encroach upon 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 alternatives occur and mitigation be designed prior to development in wetlands. No actions proposed in this draft plan/EIS would occur in or encroach upon 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 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 OSV, 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 draft plan/EIS) 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 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 draft plan/EIS, potential impacts on these resources are not analyzed in further detail.

Wilderness

Yellowstone contains proposed 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 of OSV use under the alternatives considered in this draft plan/EIS to wilderness may include impacts to the soundscape. Requirements to use BAT in Yellowstone limit sound levels per snowmobile to 73 dBA or lower (NPS 2009a), but these requirements do not consider frequency. Sounds in the low frequency range (below 250 hertz (Hz)) generally travel farther than higher frequency sounds. When low frequencies are combined with specific sound pressures (dBA), tonal peaks occur. Tonal peaks produce long-traveling, loud sounds and are common to certain models of snowmobiles and snowcoaches (Menge and Ernenwein 2002; Hastings et al. 2008). These low frequency, tonal peaks are likely the parts of OSV sounds commonly heard at backcountry sites, including wilderness within the park, far from travel corridors. These potential impacts to the proposed wilderness in the park are described in this draft plan/EIS under the "Soundscapes" section. Other attributes related to wilderness that could be impacted are also discussed under other sections of this draft plan/EIS such as "Visitor Use and Experience" and "Air Quality." Winter use would not impact proposed wilderness areas in other ways because it would occur on established paved roads outside of any proposed Wilderness. Therefore, potential impacts on wilderness (as a standalone impact topic) from the alternatives under consideration in this plan 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 not damaging to the resources of a designated river or curtailing 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 draft plan/EIS 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 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

Archeological Resources

Archeological resources are the remains of past human activity and records documenting the scientific analysis of these remains. There are no known archeological resources in areas where winter use activities under consideration in this plan would occur. Therefore, potential impacts on archeological resources from the alternatives under consideration in this plan are not analyzed in further detail.

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 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. 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 sculpture. In Yellowstone National Park, 17 sites are listed on the National Register of Historic Places. While some of these sites may be in proximity to 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 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 archeology 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 to these resources would be addressed under other impact

topics in this document, such as wildlife and wildlife habitat. Furthermore, the majority of these resources would not be 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 are not analyzed in further detail.

Museum Collections

Yellowstone's museum collections storage area is in the Heritage and Research Center in Gardiner, Montana. These collections are not in areas where any of the winter use activities considered in this plan would occur, including OSV use, and would not be affected by the implementation of any of the alternatives considered in this draft plan/EIS. Therefore, potential impacts on museum collections from the alternatives under consideration in this plan are not analyzed in further detail.

Paleontological Resources

Paleontological resources (fossils and their associated data) are a major source of evidence of past life. They are the basis for our understanding of the history of life on Earth, and are an integral part of our planet's biodiversity. No paleontological resources would be impacted by winter use activities considered in this plan, therefore, potential impacts on paleontological resources from the alternatives under consideration in this plan are not analyzed in further detail.

Prime and Unique Agricultural Lands

According to the Farmland Protection Policy Act (FPPA), "farmland" includes prime farmland, unique farmland, and land of statewide or local importance. Farmland subject to FPPA requirements does not have to be currently used for cropland. It can be forest land, pastureland, cropland, or other land, but not water or urban built-up land. Based on the FPPA's definition, there are no prime or unique farmlands within the park. Therefore, potential impacts on prime and unique agricultural lands from the alternatives under consideration in this plan 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 consultation is the inclusion of cooperating agencies for this draft plan/EIS. 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.

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 draft plan/EIS. 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 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 draft plan/EIS considers the issue of energy resources and sustainability in chapters 3 and 4 under the Park Winter 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 implementation of initiatives such as the Greening of Yellowstone. The greening initiative includes recycling, waste reduction, energy reduction, building a compost facility for park wastes, 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 activities that contribute to climate change. In addition, the park has investigated historic snowpack trends to explore the role of winter use in climate change and conservation potential by tracking both snowmelt as well as temperatures throughout the winter season (Farnes and Hansen 2005).

Some of the activities associated with winter use, including OSVs, would result in fossil fuel consumption. 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 to 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 make the up 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 amount of the 13 percent.

In addition, all alternatives considered in this draft plan/EIS 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 draft plan/EIS would be expected to be negligible in comparison to local, regional, and national GHG emissions. Therefore, the impacts of OSV management and use activities contributing to climate change through GHG emissions under the alternatives considered in this plan was 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. The entire range of alternatives evaluated in this draft plan/EIS, with their prescribed mitigations, would not create adverse effects on sacred sites or Indian trust resources. Scoping for this draft plan/EIS did not identify any new issues relative to these resources. The NPS has and will continue to consult with tribes on winter use and other planning and management topics and 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 are not analyzed in further detail.

RELATED LAWS, POLICIES, PLANS, AND CONSTRAINTS

GUIDING LAWS AND POLICIES

The following laws, policies, and 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 this draft plan/EIS will need to operate under 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

By enacting the NPS Organic Act of 1916, Congress directed the U.S. Department of the Interior and NPS to manage units of the national park system "to conserve the scenery and the natural and historic objects and the wildlife 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). The 1978 Redwood Amendment reiterates this mandate 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 1 a-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 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. Yet, the NPS has discretion to allow negative impacts when necessary (NPS 2006a sec. 1.4.3, 10). Although some actions and activities cause impacts, the NPS cannot allow an adverse impact that constitutes resource impairment (NPS 2006a sec. 1.4.3, 10). 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 1978 Amendment prohibits actions that impair park resources unless a law directly and specifically allows for the action (16 USC 1a-1) (NPS *Management Policies 2006*, Section 1.4.3.1).

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 1978 Amendment prohibits actions that impair park resources unless a law directly and specifically allows for the action (16 USC 1a-1) (NPS Management Policies 2006, Section 1.4.3.1).

Because park units vary based on their enabling legislation, natural resources, cultural resources, and missions, management activities appropriate for each unit, and for areas in each unit, vary as well.

Yellowstone National Park Organic Act USC, Title 16, sec. 22 (16 USC 22)

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). The Yellowstone National Park Protection Act, signed March 1, 1872, established the park and set forth its mission. The Organic Act (1916) built 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 5901 et seq.) is fundamental to NPS park management decisions. This act provides direction for articulating and connecting the ultimate resource management decision to the analysis of impacts, using appropriate technical and scientific information.

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 draft plan/EIS. 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, sec. 4.4.1).

Architectural Barriers Act of 1968

The Architectural Barriers Act requires access 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 (which have been 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 of 1969, as Amended

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 Part 46), Director's Order 12: Conservation Planning, Environmental Impact Analysis, and Decision-making, and its accompanying handbook (NPS 2001). Section 102 (2)(C) of NEPA requires that an EIS be prepared for proposed major federal actions that may significantly affect the quality of the human environment.

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 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 draft plan/EIS include endangered, threatened, and rare species management; native animal management; and air resources management.

Wilderness Act of 1964 and Director's Order 41: Wilderness Preservation and Management (1999)

The Wilderness Act states, "In order to assure that an increasing population, accompanied by expanding settlement and growing mechanization, does not occupy and modify all areas within the United States and its possessions, leaving no lands designated for preservation and protection in their natural condition, it is hereby declared to be the policy of the Congress to secure for the American people of present and future

generations the benefits of an enduring resource of wilderness." Despite the great similarity between the NPS Organic Act and the Wilderness Act, Congress applied the Wilderness Act to NPS to strengthen its protective capabilities.

Under the Wilderness Act, 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.

The purpose of Director's Order 41 is to provide accountability, consistency, and continuity to the NPS wilderness management program, and to otherwise guide servicewide efforts in meeting the letter and spirit of the 1964 Wilderness Act.

Endangered Species Act of 1973, as Amended

The 1973 ESA provides for the conservation of ecosystems upon which threatened and endangered species of fish, wildlife, and plants depend. Section 7 of this act 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), enacted in 1940, and amended several times since then, 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 (1974)

The Yellowstone National Park Master Plan addresses winter use by stating that "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)." 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.

Yellowstone National Park Long-Range Interpretive Plan (2000)

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.

Yellowstone National Park Strategic Plan

The Yellowstone National Park Strategic Plan (NPS 2005d) 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.

Construction Projects throughout the Park

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

- **Reconstruction of the East Entrance Road at Sylvan Pass, Yellowstone National Park (2010)**. 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 along the staff's route to the gun mount and improved safety for avalanche control operations
- **Construction of West Entrance, Yellowstone National Park (2008)**. Yellowstone recently 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.

Winter Activities in Yellowstone

A wide range of activities exist in Yellowstone in the winter that includes photography, wildlife viewing, walking, skiing, and snowshoeing. Yellowstone has 35 miles of groomed trails, or for the adventurous, many miles of backcountry trails available for skiing or snowshoeing. A park concessioner operates lodging accommodations at Mammoth Hot Springs and Old Faithful and concessioners provide other services, including evening programs, snowmobile and snowcoach tours, guided ski and snowshoe tours, wildlife tours, ski shop and repair center, massage therapy, hot tub rentals, and ice skating rinks. In addition a yurt camp is available at Canyon, which is operated by one of the park's snowcoach outfitters. The NPS also provides ranger-led winter programs that offer insight into the history, culture, and geography of Yellowstone National Park. Winter programs begin when the park opens for the winter season December 15 and end on March 15.

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 Record of Decision 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 ORV traffic and the subsequent grooming of roads have the possibility of increasing bison movement within and outside the park, which would trigger bison management under the IBMP.

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 that currently occurs in capture pens near the park boundary because it would not involve 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 Record of Decision 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.

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 draft plan/EIS.

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. These changes 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 prone 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 and experience) as well as habitat available for the lynx (wildlife and wildlife habitat).

Gallatin National Forest Travel Plan Revision

The Gallatin National Forest Travel Plan 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 within the National Forest and the suitability of these areas for travel. The plan reduced the number of permitted OSV useable and ride-able areas within the National Forest (from about 84% of the National Forest to about 53%) but increased the miles of marked and groomed trail, potentially affecting the availability of winter use recreation opportunities in the region, specifically OSV opportunities.

Consolidation of Checkerboard Lands on the Gallatin National Forest

In the last ten 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.

Gardiner Basin and Cutler Meadows Restoration

This plan is for restoring 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.

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 for within wilderness, research natural areas, and recommended wilderness areas. The extent and availability of snowmobile recreation in the region has the potential to impact visitor use and experience, as well as available habitat for wildlife.

Improving OSV Technologies

In 2002, the EPA promulgated nationwide regulations for snowmobile emissions. Those regulations are being implemented in three phases: model years 2006, 2010, and 2012. The 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. As the manufacturers develop technologies to meet the 2012 requirements, the NPS is seeing model year 2011 snowmobiles that produce emissions well below NPS BAT requirements. 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 should also result in lower emissions for snowcoaches.

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 twenty 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, development patterns hold great importance. Development patterns on private lands near public lands can have effects on wildlife, air quality, noise mitigation, water resources, and firefighting. In addition, private developments near public land can affect historic aspects, habitat, and ecosystems. 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 successfully 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. Population growth and an increase in recreational activities may lead to more OSV use within 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). 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 of McLaren Mine Tailings

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 five 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, operation of a water treatment system, 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.

Rendezvous Ski Trail Development Plan

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 to adding additional non-motorized winter use activities near the West Entrance.

Reopening of the Sleeping Giant Ski Area

This ski area is approximately three miles from Yellowstone and within 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 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 and 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.

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 & 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 or 1,000 cubic feet) of gas in 2010 (State of Montana, Department of Natural Resources and Conservation, Trust Management Division 2010). In Wyoming, gas 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 further 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 and 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 to regional air quality and socioeconomics.

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% of the time. Aircraft accounted for 6.7% of the duration of motorized sounds (Burson 2010a). These overflights could affect soundscapes in the park during the winter use season, as well as in the region. At Fern Lake in Yellowstone's backcountry (a location 8 miles from the road where no OSVs were audible), aircraft were audible six percent of the time between 8 a.m. and 4 p.m. during the winter use period (Burson 2007).

CHAPTER 2

Alternatives

CHAPTER 2: ALTERNATIVES

The National Environmental Policy Act (NEPA) requires federal agencies to consider a range of alternatives and fully evaluate a range of reasonable alternatives that address the purpose of and need for the 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, and information from the Yellowstone Science Advisory Team, resource workshops, and cooperating agencies, as well as past planning efforts. These alternatives meet, to a large degree, the management objectives of the park, while also meeting the overall purpose of and need for proposed action. Because each of the identified action alternatives is responsive to the objectives, the alternatives are considered reasonable. Alternatives and actions that were considered but were not technically or economically feasible, did not meet the purpose of and need for the project, created unnecessary or excessive adverse impacts to resources, and/or conflicted with the overall management of the park or its resources were dismissed from further analysis.

The National Park Service (NPS) explored and evaluated six action alternatives and the no-action alternative (summarized in table 10 at the end of this chapter), as follows:

- **Alternative 1: No-Action—No Snowmobile/Snowcoach Use**. Under the no-action alternative, the 2009 interim rule for winter use, which allowed up to 318 snowmobiles and 78 snowcoaches per day, expired in March 2011. As of March 15, 2011, 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 to use during the winter season.
- **Alternative 2: Continue Snowmobile/Snowcoach Use at 2008 Plan Limits**. Under alternative 2, management of OSVs would allow for snowmobile and snowcoach use levels to continue at the current level of up to 318 snowmobiles and 78 snowcoaches per day. All OSV requirements under the 2009 interim rule would continue including all OSV commercial guide requirements, hours of operation restrictions, and best available technology (BAT) requirements for snowmobiles. BAT requirements would be developed and implemented for snowcoaches.
- **Alternative 3: Return Snowmobile/Snowcoach Use to 2004 Plan Limits**. Alternative 3 would allow for snowmobile and snowcoach use levels to increase to the levels set forth in the 2004 plan of up to 720 snowmobiles and 78 snowcoaches per day. All OSV requirements under the 2009 interim rule would continue including all OSV commercial guide requirements, hours of operation restrictions, and BAT requirements for snowmobiles. BAT requirements would be developed and implemented for snowcoaches.
- **Alternative 4: Mixed-Use: Snowcoaches, Snowmobiles, and Road Plowing for Wheeled Vehicles**. Alternative 4 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. The roads from West Yellowstone and Mammoth Hot Springs to Old Faithful would be plowed for access to the park by up to 100 wheeled commercial multi-passenger vehicles (buses and vans). The south entrance would be groomed for use of up to 110 snowmobiles and 30 snowcoaches. The east entrance

(Sylvan Pass) would be closed to use during the winter season. All OSV requirements under the 2009 interim rule would continue including all OSV commercial guide requirements, hours of operation restrictions, and BAT requirements for snowmobiles. BAT requirements would be developed and implemented for snowcoaches.

- **Alternative 5: Transition to Snowcoaches meeting BAT Requirements Only**. Under alternative 5, OSV access to the park would be via BAT snowcoach only. This could be accomplished by phasing out snowmobiles beginning in the 2014/2015 season when all snowcoaches must meet BAT requirements. Snowcoaches could replace snowmobiles within a five-year period (depending on coach user demand, or at the discretion of the park). Should snowcoach user demand not reach 120 snowcoaches, some level of snowmobile use would remain. Alternative 5 would initially provide for both snowmobile and snowcoach access under current use levels of up to 318 snowmobiles and 78 snowcoaches per day. After the 2014/2015 season, snowcoach numbers could increase up to 120 per day, with a corresponding decrease in snowmobile numbers during the phase-out period. In the event that snowmobile technology improves in the future, this alternative would allow an operator to replace BAT coaches with electric, hybrid, or low emission snowmobiles as long as the combined CO+HC+ NO_x emissions do not exceed 50 grams per mile (or the equivalent grams per kilowatt-hour) and the sound level is less than 70 dbA, when measured by current J192 test procedures.
- **Alternative 6: Implement Variable Management**. Alternative 6 would manage OSV and visitor use to increase the variety of winter experiences by creating times and places for higher and lower levels of use and opportunities for undisturbed skiing and snowshoeing. OSV use would have a seasonal limit of up to 32,000 snowmobiles and 4,600 snowcoaches, with a daily limit of up to 540 snowmobiles and 78 snowcoaches. Up to 25 percent of snowmobile permits would be for unguided or non-commercially guided use. Most of the OSV requirements under the 2009 interim rule would continue including hours of operation restrictions and BAT requirements for snowmobiles. BAT requirements would be developed and implemented for snowcoaches. In addition, operators would have the potential to increase their daily limits if they include and use newer, and cleaner, technologies in their fleets.
- **Alternative 7: Provide a Variety of Use Levels and Experiences for Visitors.** Alternative 7 proposes a variety of use levels, which would establish a maximum number of snowmobiles and snowcoaches permitted in the park for specific days throughout the winter season. Four different use levels for each OSV type would be implemented, the combination of which may vary by day. Snowmobile use would range from 110 to 330 per day and snowcoach use would range from 30 to 80 per day. The varying use levels would provide for high and low OSV use days, allowing for a variety of motorized and non- motorized visitor experiences throughout the winter season. All OSV requirements under the 2009 interim rule would continue including all OSV commercial guide requirements, hours of operation restrictions, and BAT requirements for snowmobiles. BAT requirements would be developed and implemented for snowcoaches. BAT requirements would be developed and implemented for snowcoaches as well as additional BAT for snowmobiles that address NO_x and require snowcoaches not to exceed 73 dBA when operating at or near full speed for the 2014/2015 winter season. All OSV would also be required to enter the park by 10:30 a.m. In addition, operators could have the potential to increase their daily limits if they include newer, cleaner, technologies in their fleets.

DEFINITIONS

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

- **Commercial guide** means 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. In this section, "guide" also means "commercial guide."
- **Historic snowcoach** means a Bombardier snowcoach manufactured in 1983 or earlier. Any other snowcoach is considered a non-historic snowcoach.
- **Oversnow route** means 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. Oversnow routes include pullouts or parking areas that are groomed or marked similarly to roadways and are adjacent to designated oversnow routes. 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 means 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.
- **Snowcoach** means 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, and having a capacity of at least 8 passengers. A snowcoach has a maximum size of 102 inches wide, plus tracks (not to exceed 110 inches overall); a maximum length of 35 feet; and a gross vehicle weight rating not exceeding 25,000 pounds. A snowcoach may not be operated if the gross vehicle weight rating of the vehicle (including track systems) is exceeded. As of December 14, 2014, a snowcoach may not be operated if it exerts a ground-surface pressure (calculated by dividing the gross vehicle weight rating (including track weight)) by the number of square inches of track in contact with the snow surface) exceeding 4.5 pounds per square inch.
- **Snowmobile** means 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 adopted for use on snow with track and ski systems.
- **Snowplane** means a self-propelled vehicle intended for oversnow travel and driven by an air-displacing propeller.

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 by 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 guide requirements.

Administrative use of snowmobiles may be supplemented with administrative snowcoaches. When administrative snowmobiles are necessary, the NPS would generally use snowmobiles meeting BAT requirements. 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.

Contractors, researchers, and other partners working in the park would be encouraged to use snowcoaches or they would be required to use snowmobiles that meet BAT requirements unless machines that do not meet BAT requirements are necessary for a particular project and are approved in advance of use by the NPS.

NPS employees and their families living in the interior of Yellowstone (and their guests) may continue to use snowmobiles. Subject to available funding, the NPS would provide snowcoaches and snowmobiles that meet BAT requirements for employee use. Beginning in the 2011/2012 season, all employee-owned snowmobiles operated in the park must meet BAT requirements and guests of these employees must use snowmobiles that meet BAT requirements or snowcoaches.

Concessioners and their employees and families living in the interior of Yellowstone (and their guests) may continue to use snowmobiles. Beginning in the 2011/2012 season, all concessioner employee-owned snowmobiles operated in the park must meet BAT requirements. Exceptions, such as access to power and telephone systems, would be granted on a limited basis. Families and guests of these concessioner employees must also use snowmobiles that meet BAT requirements or snowcoaches.

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 implementation of transition and action plans for accessibility and 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, 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 buildings and existing and new programs, activities, and services, including telecommunications and media, to determine current accessibility and usability by disabled winter visitors.

PLOWED ROADS

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 within 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 for the winter season (to allow for spring plowing). When spring plowing operations approach entrances, the roads would then be closed to skiing and snowshoeing for safety concerns. Bear management closures of the park's backcountry would continue as in previous years, preventing non-motorized use in these areas.
- Sensitive areas within 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 thresholds for each impact category may differ between the zones. Each zone is compared to one of the land classifications used under the Recreation Opportunity Spectrum (ROS), a recognized framework for inventorying, planning, and managing the recreational experience and setting of federal lands.

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

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

"Roaded Natural." Note that this zone for purposes of this draft Winter Use Plan and Environmental Impact Statement (plan/EIS) would not include roads open in the summer to motorized use but closed in the winter to OSV use. Boardwalks and some utility lines would appear in this zone, but no buildings (which are zoned as developed areas).

Transition Zone. Areas indirectly influenced (mainly by sight and sound) by developed areas and roads. Specifically, they include all areas between 100 yards and 1.5 miles from either a developed area or a road corridor. This zone would include those roads not open to OSV travel in winter (with the possible exception of NPS authorized ski trail grooming equipment) but which may be open to motorized travel in summer. Yellowstone's Blacktail Plateau Drive, Bunsen Peak Road, and Lone Star Geyser Trail are examples of secondary roads included within transition zones. For Grand Teton, examples of areas designated as transition zones include the Teton Park Road and Jackson Lake. When a groomed ski trail is designated a transition zone, the zone would be 100 yards on either side of the groomed trail's center line. This zone would be most similar to ROS class "Roaded Natural" within 1/2 mile of roadways. From 1/2 mile to 1.5 miles from roads, "Semi-Primitive Non-motorized" would be the nearest ROS class or, as is sometimes used, "Semi-Primitive Wilderness," since these areas are recommended wilderness. Some utility lines could appear within this zone.

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

RESEARCH PROGRAM

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 to visitors in wheeled vehicles along the northern road to Cooke City. The visitor center in Mammoth Hot Springs would remain open to the public during the winter.

NO-ACTION ALTERNATIVE

ALTERNATIVE 1: NO-ACTION – NO SNOWMOBILE/SNOWCOACH USE

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)). The no-action alternative is developed for two reasons. First, a no-action alternative may represent the agency's past and current actions or inaction on an issue continued into the future, which may represent a viable alternative for meeting the agency's purpose and need. If this alternative were implemented, Yellowstone would be operated like many northern-tier national parks (Glacier, Mt. Rainier, Lassen Volcanic, for example) that have limited wheeled vehicle access during the winter. Second, a no-action alternative may serve to set a baseline of existing impacts continued into the future against which to compare the impacts of the action alternatives (Director's Order 12, NPS 2001 section 2.7).

Under alternative 1, the 2009 interim rule (allowing up to 318 snowmobiles and 78 snowcoaches) expired on March 15, 2011. Therefore, OSV use in the winter would no longer be permitted, but 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, 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 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

- At a minimum, BAT would continue to be required for snowmobiles, following the same BAT requirements that are currently in place. Individual alternatives may include additional BAT requirements, as noted below. Specific BAT requirements would include the following:
  - Air emission requirements: Emission levels would be no greater than 120 grams per kilowatt hour (g/kW-hr) of CO and 15 g/kW-hr for HC.
  - Sound emission requirements: Sound restrictions would require a snowmobile to operate at or below 73 decibels measured using the A scale (dB(A)) while at full throttle, according to Society of Automotive Engineers J192 test procedures (revised 1985) (SAE J192).
- BAT guidelines would be developed and implemented for snowcoaches by the 2014/2015 season. Snowcoach BAT requirements would require vehicles to meet Model Year 2010 (or newer) U.S. Environmental Protection Agency (EPA) emission standards because of the 2014/2015 winter season and would also require that by 2014/2015, noise from OSVs must not exceed 73 dBA when operating at or near full speed.
- For any class of OSV, if the EPA adopts standards that are more stringent than the requirements resulting from this draft plan/EIS, the EPA standards would become the NPS standards.
- As part of limiting sound and pollution from OSVs, idling would be limited to no more than 5 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 recommended to wear and carry personal protective equipment as

appropriate for their winter travel. For all user groups, personal protective equipment should include avalanche rescue gear (shovel, probe, and transceiver), as appropriate.

Licensing and Registration

- OSV drivers must possess a valid motor vehicle driver's license. A learner's permit does not satisfy this requirement. The driver must carry a license at all times.
- Snowmobiles 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 45 miles per hour (mph). Speed limits could be lower in more congested areas or in wildlife sensitive corridors. For example, between West Yellowstone and Old Faithful the speed limit would be 35 mph. In developed areas, the speed limit would be 15 to 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 alternatives 2, 3, 5 6 and 7 and figure 3 for alternative 4. No off-road or off-route OSV use would be permitted.
- 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 commercial 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.
- 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. New routes for snowcoaches could be established based on these same factors. All routes designated for snowmobile use would be open to snowcoaches.

OSV Management

- Early and late entries for special tours would not be permitted, including departures from Snow Lodge. Limited exceptions would be allowed for administrative travel and emergencies.

FIGURE 2: OSV ROUTES UNDER ALTERNATIVES 2, 3, 5, AND 6

FIGURE 3: OSV AND WHEELED VEHICLE ROUTES UNDER ALTERNATIVE 4

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
  - Black Tail 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 (every two or three days) and may be obliterated by snowcoach and snowmobile travel.

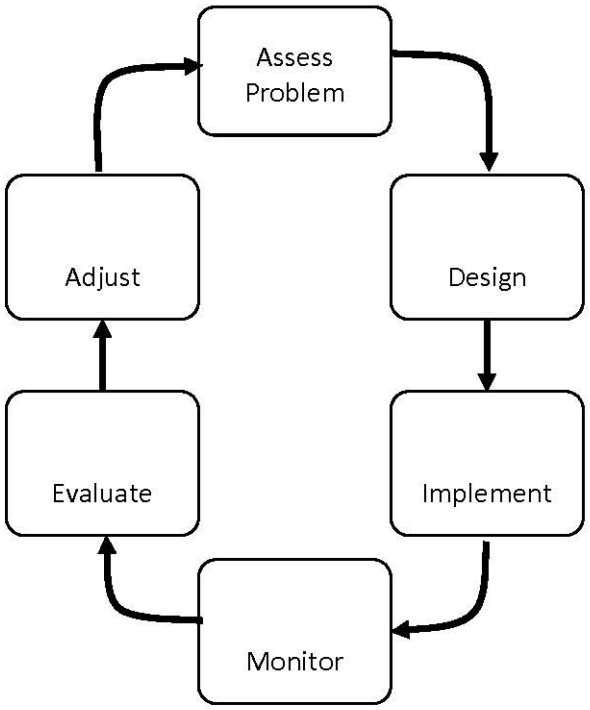
Sylvan Pass Avalanche Control

For action alternatives that include maintaining Sylvan Pass for OSV access (all alternatives, excluding alternative 4), 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 and an Operational Risk Management Assessment 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 December 22 through March 1.

Adaptive Management

Adaptive management—learning by doing—is an important tool for resource management. It is based on the assumption that current scientific knowledge is limited and a level of uncertainty exists. 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). The Department regulations also direct its agencies to use adaptive management (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 4).



Source: Williams et al. 2007

FIGURE 4: 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 draft plan/EIS. The adaptive management strategy is provided in appendix A.

DISCUSSION OF ACTION ALTERNATIVES

ALTERNATIVE 2: CONTINUE SNOWMOBILE/SNOWCOACH USE AT 2008 PLAN LIMITS

Alternative 2 would continue winter use at levels similar to the 2009 interim rule, 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 and 2010/2011 seasons and incorporates concepts of fixed management (no daily variability in OSV numbers or sharing of allocations between gates) to provide predictability to the visitor and park staff. Routes open to snowmobiles and snowcoaches would remain the same as detailed in the 2009 interim rule (and restated below). Sylvan Pass (east entrance road) 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, which would not vary, all of which must meet BAT requirements. In addition to those listed under "Elements Common to all Action Alternatives," the following road segments would be groomed for snowmobile use (see figure 2):

- 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, 12:00 to 9:00 p.m. only
- North Canyon Rim Drive, 12:00 to 9:00 p.m. only
- Riverside Drive, 12:00 to 9:00 p.m. only
- Roads in the developed areas of Madison Junction, Old Faithful, Grant Village, West Thumb, Lake, east entrance, Fishing Bridge, Canyon, Indian Creek, and Norris.

Management of snowmobile use under alternative 2 would require all snowmobiles in the park to travel with a commercial guide affiliated with a commercial guiding service and authorized by contract to operate in the park. No more than 11 snowmobiles would be permitted per group, including at least one commercial guide. Visitors would pay the park entrance fee and a commercial guide fee.

Entrance allocations would be fixed, meaning each entrance would only allow entry to its assigned number of snowmobiles per day. The exception would be Old Faithful and the north entrance, whose operator (currently Xanterra) could share allocations. See table 1 for specific entrance allocation numbers.

TABLE 1: YELLOWSTONE DAILY SNOWMOBILE ENTRY LIMITS UNDER ALTERNATIVE 2

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

Under alternative 2, some of the side roads would continue to be groomed for non-motorized uses, and others would allow certain types of OSV only during certain time periods. For example, some roads would allow snowcoaches only in the morning, and snowmobile and snowcoaches in the afternoon.

Under the proposed snowmobile numbers, 413 daily snowmobile passengers are estimated.

Snowcoach Management. The NPS would permit up to 78 snowcoaches per day into Yellowstone. In addition to the snowmobile routes listed above, the following routes would be open to slowcoach:

- Firehole Canyon Drive, all day (7:00 a.m. to 9:00 p.m.)
- Fountain Flat Road
- North Canyon Rim Drive, all day (7:00 a.m. to 9:00 p.m.)
- Grand Loop Road from its junction with Upper Terrace Drive to its junction with north entrance Road (rubber-tracked coaches only)
- Roads in the developed area of Mammoth Hot Springs (rubber-tracked coaches only)
- Grand Loop Road, from Canyon Junction to the Washburn Hot Springs overlook.

All snowcoaches operating in the park would be required to operate in accordance with a concessions contract. Private snowcoaches would not be allowed. 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 North and Old Faithful could be shared). See table 2 for specific entrance allocation numbers. Visitors would pay the park entrance fee and those charged by the snowcoach operator.

TABLE 2: YELLOWSTONE DAILY SNOWCOACH ENTRY LIMITS UNDER ALTERNATIVE 2

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

Under these proposed allotted snowcoach numbers, 624 daily snowcoach passengers are estimated.

Limited snowcoach use would be allowed to provide drop-offs for non-motorized use up to six miles west of the east entrance from March 2 to March 15 to access non-motorized recreational opportunities (see non-motorized use management under "Elements Common to All Alternatives").

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."

Dates of Operation and Transition to New Plan. Under alternative 2, conditions existing during the winter seasons of 2009/2010 and 2010/2011 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.

ALTERNATIVE 3: RETURN SNOWMOBILE/SNOWCOACH USE TO 2004 PLAN LIMITS

Alternative 3 would allow winter use levels up to 720 snowmobiles and 78 snowcoaches per day in Yellowstone on the routes shown in figure 2. This alternative represents the 2004 winter use plan

conditions in the park and incorporates the concept of fixed management (no daily variability in OSV numbers or sharing of allocations between gates) to provide predictability visitors and park staff. Routes open to snowmobiles and snowcoaches would remain the same as detailed in the 2009 interim rule (and outlined under alternative 2). Sylvan Pass (east entrance road) would be open for OSV travel in accordance to the Sylvan Pass Working Group agreement.

Snowmobile Management. The NPS would permit up to 720 snowmobiles per day into Yellowstone, all of which must meet BAT requirements and must be commercially guided. Road segments open to snowmobile use under alternative 3 (see figure 2), as well as guide, group size, fees, fixed entrance allocation requirements, and BAT requirements, would be the same as those under alternative 2. See table 3 for specific entrance allocation numbers.

TABLE 3: YELLOWSTONE DAILY SNOWMOBILE ENTRY LIMITS UNDER ALTERNATIVE 3

Entrance	Commercially Guided Snowmobiles
West Entrance	414
South Entrance	246
East Entrance	20
North Entrance	20
Old Faithful	20
Total	720

Under these proposed allotted snowmobile numbers, 936 daily snowmobile passengers are estimated.

Limited snowmobile use would be allowed to provide drop-offs for non-motorized use at the east entrance from March 2 to March 15 to access non-motorized recreational opportunities (see non-motorized use management under “Elements Common to All Alternatives”).

Snowcoach Management. The NPS would permit up to 78 snowcoaches per day into Yellowstone, with snowcoach routes the same as those described for alternative 2.

All snowcoaches operating in the park would be required operate in accordance with a concessions contract and daily entrance numbers would be fixed, as described under alternative 2 (as with snowmobiles, Xanterra allocations at the north entrance and Old Faithful could be shared). See table 4 for specific entrance allocation numbers.

TABLE 4: YELLOWSTONE DAILY SNOWCOACH ENTRY LIMITS UNDER ALTERNATIVE 3

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

Under these proposed allotted snowcoach numbers, 624 daily snowcoach passengers are estimated.

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

Non-Motorized Use Management. Under alternative 3, non-motorized uses would continue as described under "Elements Common to All Alternatives."

Dates of Operation and Transition to New Plan. Under alternative 3, a transition period of one year would occur; under which time the daily limits and management under the 2009 interim rule (in effect for the winters of 2009/2010 and 2010/2011) would be in effect. The winter season dates, December 15 to March 15, would remain the same. Hours of operation for OSV use would be between 6:00 a.m. and 9:00 p.m. (8:00 a.m. to 9:00 p.m. for the east entrance).

ALTERNATIVE 4: MIXED-USE: SNOWCOACHES, SNOWMOBILES, AND ROAD PLOWING FOR WHEELED VEHICLES

Under this alternative, OSVs would be able to enter the park from the south entrance with levels of up to 110 snowmobiles and 30 snowcoaches per day. Upper Terrace Drive in Mammoth and the west entrance would be open to commercial wheeled vehicles but not private vehicles. Some side roads would be designated as ski/snowshoe only routes. See figure 3 for OSV and wheeled vehicle routes under alternative 4.

Under alternative 4, Sylvan Pass (the east entrance) would be closed to snowmobiles and snowcoaches. Non-motorized use at the east entrance would include a backcountry experience along this route.

Snowmobile Management. The NPS would permit up to 110 snowmobiles per day into Yellowstone, all of which would meet BAT requirements. The following road segments, in addition to those listed under "Elements Common to all Action Alternatives," would be groomed for snowmobile use (see figure 3):

- Norris Junction to Canyon Junction
- Grand Loop Road, from Old Faithful to West Thumb
- South entrance road, from the south entrance to West Thumb
- Grand Loop Road, from West Thumb to its junction with the east entrance road
- East entrance road, from the Fishing Bridge Junction to Lake Butte Overlook
- Grand Loop Road, from its junction with the east entrance road to Canyon Junction
- Grand Loop Road, from Canyon Junction to the Washburn Hot Springs Overlook
- South Canyon Rim Drive
- Lake Butte Road
- North Canyon Rim Drive
- Roads in the developed areas of Grant Village, West Thumb, Lake, Fishing Bridge, and Canyon
- Roads in the developed areas of Old Faithful, and Norris (also open to wheeled vehicle).

Management of snowmobile use under alternative 4 would require all snowmobiles in the park, except those on Cave Falls Road, to travel with a commercial guide affiliated with a commercial guiding service

and authorized by contract to operate in the park. There would be no more than 11 snowmobiles permitted per group, including at least one commercial guide. Visitors would pay the park entrance fee and a commercial guide fee.

Entrance allocations could be flexible between the three areas where snowmobile use initiates, depending on demand at each area. For example, if there is greater demand for tours from Old Faithful, that allocation could increase, with a corresponding decrease in the allocation in other areas. See table 5 for specific entrance allocation numbers.

TABLE 5: YELLOWSTONE DAILY SNOWMOBILE ENTRY LIMITS UNDER ALTERNATIVE 4

Entrance	Commercially Guided Snowmobiles
South Entrance	66
Old Faithful	22
Norris	22
Total	110

Note: allocations could be shared between the three entrances on a daily basis as long as no more than 110 snowmobiles are operating at one time.

Under these proposed allotted snowmobile numbers, 143 daily snowmobile passengers are estimated.

Snowcoach Management. The NPS would permit up to 30 snowcoaches per day into Yellowstone departing from one of three points: the south entrance, Norris, or Old Faithful. The routes for snowcoaches under alternative 4 would be the same as those for snowmobiles described above. In addition, the east entrance road from the entrance to a point approximately six miles west, would be open to snowcoaches to allow for non-motorized use drop off.

All snowcoaches operating in the park would operate in accordance with a concessions contract. Private snowcoaches would not be allowed. Daily snowcoach levels would be fixed. Entrance allocations would be flexible and based on the demand at the three snowmobile entrance locations as described for snowmobiles. See table 6 for specific entrance allocation numbers.

TABLE 6: YELLOWSTONE DAILY SNOWCOACH ENTRY LIMITS UNDER ALTERNATIVE 4

Entrance	Commercially Guided Snowcoaches
South Entrance	20
Old Faithful	8
Norris	2
Total	30

Note: allocations could be shared between the three entrances on a daily basis as long as no more than 30 snowcoaches are operating at one time.

Under these proposed allotted snowcoach numbers, 240 daily snowcoach passengers are estimated.

Wheeled Vehicle Management. Under alternative 4, in addition to wheeled vehicle access on the northern road, the north (Upper Terrace Drive) and west (West Yellowstone) entrance roads would be plowed to Old Faithful to accommodate multi-passenger commercial vehicles (e.g., vans and buses). No private vehicles would be allowed. A daily limit of up to 100 Tier 2 or model year 2007 diesel (or newer)

(EPA standard) vehicles would be permitted. Visitors would pay the park entrance fee and a commercial guide fee. Specific routes in the park that would be plowed and opened to commercial wheeled vehicles include the following:

- Grand Loop Road, from its junction with Upper Terrace Drive to Norris Junction
- Grand Loop Road, from Norris Junction to Madison Junction
- West entrance road, from the park boundary at West Yellowstone to Madison Junction
- Grand Loop Road, from Madison Junction to Old Faithful
- Roads in the developed areas of Madison, Old Faithful, and Norris (also open to OSV use).

Under these proposed allotted wheeled vehicle numbers, 2,000 daily wheeled vehicle passengers are estimated.

Non-Motorized Management. Non-motorized uses include cross-country skiing, backcountry skiing, hiking, and snowshoeing. Use would be subject to the Winter Severity Index program. This program restricts backcountry use of the park when winter snowpack and weather conditions become severe and appear to be adversely affecting wildlife.

Under alternative 4, the park would continue to groom 35 miles of secondary roads available for cross-country skiing and snowshoeing, as described under "Elements Common to All Alternatives." These roads are mainly used during the summer and are closed to OSV use. Approximately 10 miles of additional secondary roads would be groomed for non-motorized use access at various stopping points along the plowed roads. These points would include the following:

- Firehole Canyon Drive
- Riverside Drive
- Fountain Flat Road.

Dates of Operation, Transition to New Plan, and Facility Construction. Under alternative 4, there would be a transition period of one year, during which time the daily limits and management under the 2009 interim rule (in effect for the winters of 2009/2010 and 2010/2011) would be in effect. The winter season dates, December 15 to March 15, would remain the same. Hours of operation for OSV use would be between 6:00 a.m. and 9:00 p.m. Alternative 4 would include the construction of a warming hut at Norris and a maintenance facility in the West Entrance administrative area to accommodate the multiple uses occurring within the park and to allow wheeled vehicle visitors to use OSV once inside the park.

ALTERNATIVE 5: TRANSITION TO SNOWCOACHES THAT MEET BAT REQUIREMENTS ONLY

Under alternative 5, OSV access into the park could transition towards snowcoaches only, all of which must meet BAT requirements. This would be accomplished by allowing snowcoaches to replace snowmobiles beginning in the 2014/2015 winter season, when all snowcoaches must meet BAT requirements. Snowcoaches could replace snowmobiles within a five-year period. As more snowcoaches meet BAT requirements, the number of snowmobiles would decrease. The transition to snowcoach only could be driven by user demand, or mandated by the park. Sylvan Pass road grooming would be managed in accordance with the Sylvan Pass Working Group agreement. 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 5 would initially permit up to 318 snowmobiles meeting BAT requirements per day into Yellowstone from the 2011/2012 season until the 2014/2015 season. Daily snowmobile limits and entrance allocations during this time would be the same as under alternative 2 (refer to table 1 for specific entrance allocation numbers). The 2014/2015 winter season would begin a transition period with gradual reduction in snowmobiles as the number of snowcoaches meeting BAT requirements increases. After the transition, recreational snowmobile use could be reduced down to zero per day.

To achieve this alternative, the park would issue a prospectus that would allow for both guided snowmobile and snowcoach services. Each company that wins a contract would 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 between all providers and could grow to a total of 120. At the end of each winter season, the NPS would request to know the number of BAT snowcoaches coming on–line 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 snowcoach under each contract is added, if there are any remaining snowmobiles under that contract, they would be replaced by the last snowcoach (that is the last snowcoach might replace anywhere from 7 to 12 snowmobiles).

Although the focus of this alternative is a transition to snowcoaches, with changing snowmobile technology, this alternative could allow operators to replace BAT snowcoaches with improved technology snowmobiles in the future. The NPS is aware of development of electric snowmobiles; prototype models are approaching the capability of travelling from West Yellowstone to Old Faithful and back on a single charge. Also the Society of Automotive Engineers (SAE) Clean Snowmobile Challenge has demonstrated that advanced technology snowmobiles are possible and can reach the same emission levels as the cleanest snowcoaches available. In the future, this alternative would allow an operator to replace BAT coaches with electric, hybrid, or low emission snowmobiles as long as the combined CO+HC+ NO_x emissions do not exceed 50 grams per mile (or the equivalent grams per kilowatt-hour) and the sound level is less than 70 dbA, when measured by current J192 test procedures.

Under one option within this alternative, OSV operators may continue to operate both BAT snowmobiles and BAT snowcoaches, within the specified numerical ranges, depending on visitor desires for access. A second option would be an NPS-mandated phase out of snowmobiles within a five-year period (beginning in 2014/2015).

Routes available to snowmobile use would include the following (also see figure 2):

- 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
- North Canyon Rim 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.

Management of snowmobile use under alternative 5 would require all snowmobiles in the park, except those on Cave Falls Road, to travel with a commercial guide who is affiliated with a commercial guiding service and is authorized by contract to operate in the park. There would be no more than 11 snowmobiles permitted per group, including at least one commercial guide. Visitors would pay the park entrance fee, as well as a commercial guide fee.

Daily snowmobile levels would be fixed for the season and would not vary during the season. As snowmobile numbers are reduced each season, those daily entrance levels would also be fixed. Entrance allocations would be flexible, based on entrance demand. This could be accomplished through sharing between the entrances of west, south, east, north, and Old Faithful. See table 7 for specific initial entrance allocation numbers. As the number of snowmobiles in the park decreases during the transition period, there would be a corresponding decrease to the entrance allocations.

TABLE 7: INITIAL YELLOWSTONE DAILY SNOWMOBILE ENTRY LIMITS UNDER ALTERNATIVE 5

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

*Note: allocations could be shared between the entrances on a daily basis as long as no more than 318 snowmobiles are operating at one time.

Under these proposed allotted snowmobile numbers, 413 daily snowmobile passengers when 318 snowmobiles are estimated, and could reach zero snowmobile passengers at the end of the phase out.

Snowcoach Management. The NPS would permit up to 78 snowcoaches per day into Yellowstone from the 2011/2012 season until the 2014/2015 season. Starting in the 2014/2015 season, all 78 snowcoaches must meet BAT requirements. Daily snowcoach limits initially would be the same as under alternative 2 (refer to table 2 for specific entrance allocation numbers). As of the 2014/2015 winter season, the daily snowcoach limit could increase to 120, with each new snowcoach also required to meet BAT requirements. The 2014/2015 season would also start the five-year transition period, during which the number of snowcoaches meeting BAT requirements increases and the number of snowmobiles permitted per day could decrease.

To achieve this alternative, the park would issue a prospectus that would allow for both guided snowmobile and snowcoach services, as described above under "Snowmobile Management." If after five years 120 snowcoaches meeting BAT requirements are available, the permitted snowmobile use level could be zero. If at the end of the transition period 120 snowcoaches meeting BAT requirements are not available, the snowcoach limit would be set at the number of snowcoaches meeting BAT requirements available at that time, and the level of snowmobile use would continue at the number set at that time. For example, if at the end of five years 100 snowcoaches are available, snowmobile levels would be reduced to 164 per day and would remain at this level.

Snowcoach routes under alternative 5 would be the same as snowmobile routes. No separation of uses would occur on these routes (i.e., both snowcoaches and snowmobiles would be allowed on these routes while the park is open to OSV).

All snowcoaches operating in the park would be required operate in accordance with a concessions contract. Private snowcoaches would not be allowed. Daily snowcoach levels would be fixed and there would be no variation in the total number allowed day to day. Entrance allocations could be flexible, based on the demand at the five snowcoach entry locations. Sharing would occur among the west, south, east, north, and Old Faithful entrances. Refer to table 2 for initial Yellowstone daily snowcoach entry limits, which would be adjusted accordingly as the number of snowcoaches increases.

Under these proposed allotted snowcoach numbers, 624 to 960 daily snowcoach passengers are estimated, depending on the stage of the phase out.

Wheeled Vehicle Management. Under alternative 5, wheeled vehicle access would continue as described under "Elements Common to All Alternatives."

Non-Motorized Management. Non-motorized uses include cross-country skiing, backcountry skiing, hiking, and snowshoeing would continue as described under "Elements Common to All Alternatives."

Additional secondary roads, approximately 10 miles, would be groomed for non-motorized use access at various stopping points along the plowed roads. These points would be primarily between the west entrance to Old Faithful and would include the following:

- Firehole Canyon Drive
- Riverside Drive
- Fountain Flat Road
- In addition, the east entrance road, from the entrance to approximately 4 miles west would be groomed for skiing.

Dates of Operation and Transition to New Plan. Because alternative 5 begins with alternative 2 (2009 interim rule) provisions, there would be no transition year. Dates of operation would be the same as under alternative 4.

ALTERNATIVE 6: IMPLEMENT VARIABLE MANAGEMENT

Under alternative 6, management of winter use would be structured to increase the variety of winter experiences and create more flexibility in how winter use is managed. OSV levels would vary by creating times and places for higher and lower levels of use. Additional opportunities for undisturbed skiing and snowshoeing would also be created. Sylvan Pass would be managed in accordance with the Sylvan Pass

Working Group agreement and the park would continue with road grooming. Certain side roads would be groomed for non-motorized uses only during certain times/days of the season. OSV use would end at West Thumb Junction and at the Canyon developed area for the last two weeks of the season to accommodate more non-motorized snow recreation on the east side of the park.

Snowmobile Management. Alternative 6 would allow up to 32,000 snowmobiles meeting BAT requirements each season, with a daily limit between 0 and 540. Under these proposed allotted snowmobile numbers, an average of 408 daily snowmobile passengers are estimated.

The daily level of snowmobiles permitted would vary (daily, weekly, and monthly) based on a pre-determined seasonal schedule. Based on this schedule, use could be higher on some days and lower on others, but would not exceed 540 on any given day. This would allow the park to accommodate more visitors as well as to implement research projects that would take advantage of the variation in use. During times of higher demand, such as during holiday periods (the week between Christmas and New Year's Day, and Presidents Day weekend), more permits could be issued, and conversely, fewer permits would be provided during other times of the year to balance out use and make sure the overall annual limit is not exceeded. Additionally, permit levels could vary from year to year to provide a range of uses, for example, if snowmobile permits are high one year during holiday weekends, they may be lower the next year to provide for a variety of experiences during these high demand times. Figure 5 provides an example schedule that show how use could be varied throughout the season. If this alternative were selected, actual schedules would be developed.

All existing oversnow routes in the park, as listed under alternative 2, would be open to snowmobile use, with areas subject to occasional closure to allow for non-motorized uses to occur. Alternative 6 would allow for both commercially guided, as well as unguided/non-commercially guided snowmobile use in the park. Group sizes may vary between 11 and 22 snowmobiles, including the guide. Groups of up to 11 would be required to have one guide and groups of between 12 and 22 would be required to have two guides.

Daily entrance allocation for commercially guided groups could be flexible, to provide and accommodate for a variety of winter experiences. For example, daily allocations not used at one gate could be used at another gate that same day. Each day a certain number of permits would be available, with individual operators able to exchange their permits for one day with another operator, for their permit allocation on a different day. As cleaner and quieter OSVs are developed (for example, hybrid snowmobiles or snowcoaches, etc.) the NPS would explore ways to provide incentives for these newer technologies for commercially guided use.

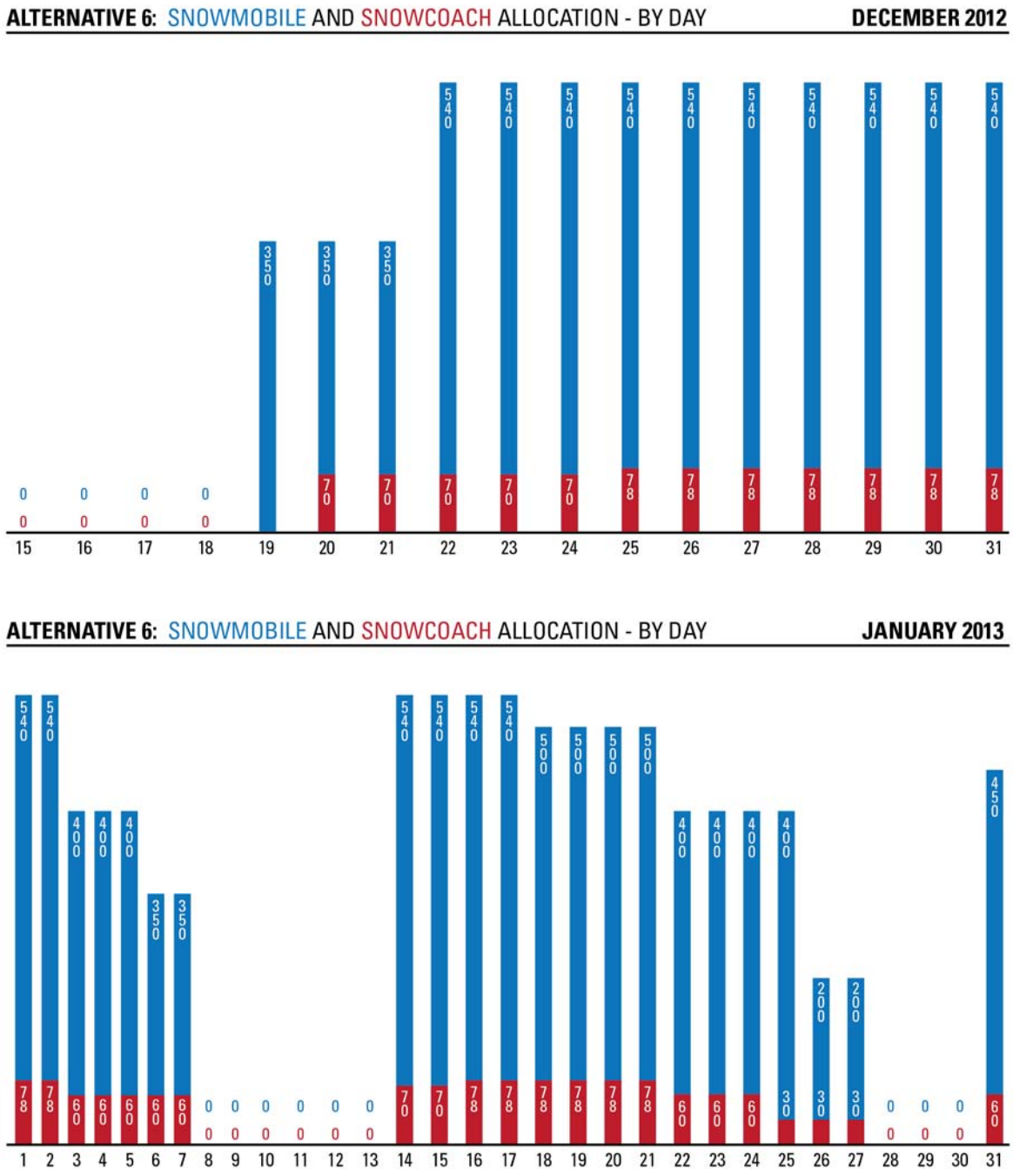


FIGURE 5: EXAMPLE SCHEDULE OF SNOWMOBILE AND SNOWCOACH USE VARIATION IN A SEASON UNDER ALTERNATIVE 6

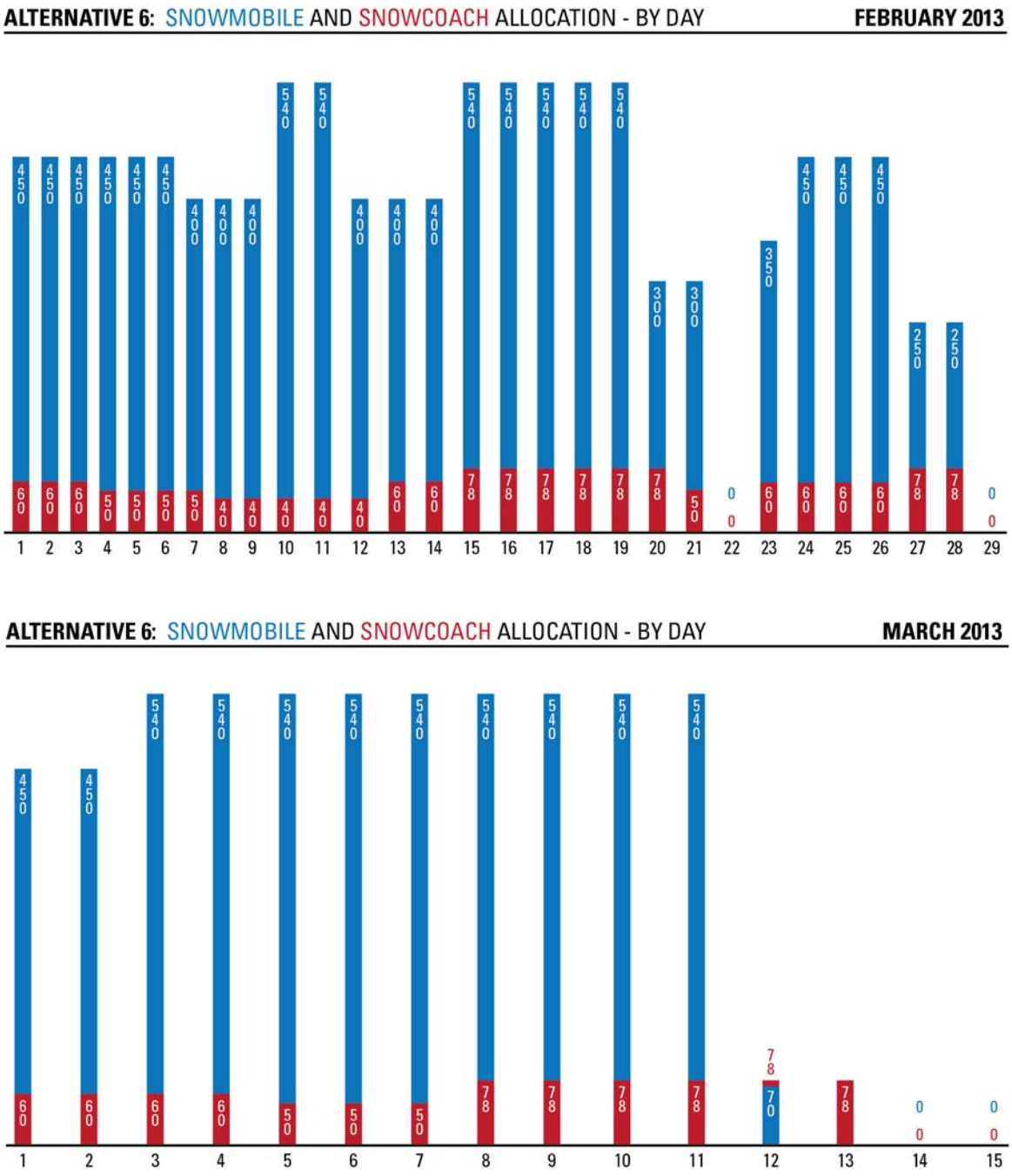


FIGURE 5: EXAMPLE SCHEDULE OF SNOWMOBILE AND SNOWCOACH USE VARIATION IN A SEASON UNDER ALTERNATIVE 6 (CONTINUED)

Alternative 6 would provide for up to 25% of snowmobile use in the park (on a daily basis) to be unguided or non-commercially guided. The percentage could vary, but would not exceed 25%, based on the adaptive management strategy, which would assess the impacts of this type of use. Allowing for unguided/non-commercially guided use could be accomplished in one or more of the following ways:

- Unguided Snowmobiles: When they receive their entrance passes, all park visitors on unguided snowmobiles would be required to attend a short presentation on safety, how to minimize impacts to the park, snowmobile riding etiquette, park regulations, and how to avoid disturbances to wildlife. This presentation could be in person or by video. All members of the unguided group would be required to present a current certificate of completion of a snowmobile safety course administered by a state, province, Tread Lightly, the American Council of Snowmobile Associations, the Canadian Council of Snowmobile Organizations, or other generally recognized certifying organization.
- Non-Commercial Tours with a Certified Group Leader: One member of the tour would be certified by the NPS (or NPS designee) to lead a group of snowmobilers. A Yellowstone-specific certification program, such as the SafeRider! program at www.snowiasa.org would be used or developed. The group leader would be required to present a current certificate of completion of a snowmobile safety course administered by a state, province, Tread Lightly, the American Council of Snowmobile Associations, the Canadian Council of Snowmobile Organizations, or other generally recognized certifying organization.

A special use fee may be charged for managing unguided/non-commercially guided snowmobile use.

Snowcoach Management. Under alternative 6, the NPS would permit up to 4,600 snowcoaches per season. Daily use limits would vary between 0 and 78. Under these proposed allotted snowcoach numbers, 361 daily snowcoach passengers are estimated.

Snowcoach levels would vary (daily, weekly, monthly) based on pre-determined seasonal schedule as shown in figure 5. Based on this schedule, use could be higher on some days and lower on others, but would not exceed 78 in a given day. This would allow the park to accommodate more visitors and to implement research projects that take advantage of the variation in use. During times of higher demand, such as during holiday periods (the week between Christmas and New Year's and Presidents Day weekend), more permits could be issued, and conversely, less permits would be issued during other times of the year to balance out use and make sure the overall annual limit is not exceeded. Additionally, permit levels could vary from year to year to provide a range of uses, for example, if snowcoach permits are high on year during holiday weekend, they may be lower the next year to provide for a variety of experience during these high demand times.

Daily entrance allocations for snowcoaches would be the same as under alternative 2 (refer to table 2), but could be flexible, to provide and accommodate for a variety of winter experiences. For example, daily allocation not used at one entrance could be used at another entrance that same day. Snowcoach routes would be the same as snowmobile routes.

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

Wheeled Vehicle Management. Under alternative 6, wheeled vehicle access would be allowed continue as described under "Elements Common to All Alternatives."

Non-Motorized Use Management. Non-motorized use would be managed as described under "Elements Common to All Alternatives" except that in addition, certain side roads would become ski and snowshoe

routes at certain times of the season, and during these times OSVs would not be permitted in these areas to allow for an experience with more solitude. These ski-snowshoe only side roads could include: Canyon to Washburn Hot Springs Overlook, North Canyon Rim Drive, Riverside Drive, Firehole Canyon Drive, Gull Point Drive, Firehole Lake Drive, Fountain Flat Drive, and other service roads. In addition, OSV use would end at West Thumb Junction and at the South Canyon Rim Drive/Grand Loop junction for the last two weeks of the season (March 2 to March 15) to accommodate more non-motorized snow recreation on the east side of the park.

Dates of Operation and Transition to New Plan. Under alternative 6, the opening and closing dates could vary to accommodate a variety of visitor experiences and needs, but would still take place between December 15 and March 15 of every season. The schedule for each season would be determined at the beginning of the previous season. For example, the schedule for the 2012/2013 season would be released prior to the start of the 2011/2012 season in order to provide both the visitor and concessioner time to prepare of the following season.

Operating hours under alternative 6 would initially be from 6:00 a.m. to 9:00 p.m., but may vary for various uses to accommodate a variety of experience. The NPS could allow non-motorized uses in the morning and OSV use in the afternoon, or the NPS could use another similar management scheme.

A one year transition period to prepare for the implementation of the new winter-use plan would be put in place. Provisions of the 2009 interim rule would continue during this transition.

ALTERNATIVE 7: PROVIDE A VARIETY OF USE LEVELS AND EXPERIENCES FOR VISITORS

Under alternative 7, a variety of proposed use levels would establish a maximum number of snowmobiles and snowcoaches permitted in the park on a given day. There would be four different use levels for each vehicle type; the combination of snowmobile and snowcoach use may change by day. In addition, under alternative 7, all OSVs must enter the park by 10:30 a.m. Daily use levels for the following winter use season would be made available by December 1 of the preceding year. Sylvan Pass would be managed in accordance with the Sylvan Pass Working Group agreement and the park would continue with road grooming.

Snowmobile Management. Under alternative 7, the maximum number of snowmobiles permitted in the park would be separated into four subsets of allowed use throughout the season, each subset allocated between the different entrances. This would be based on the maximum number of snowmobiles allowed, resulting in four different snowmobile caps throughout the winter season. An average of 254 snowmobiles would operate in the park per day for a total of 23,122 per season should the maximum capacity be reached each day throughout the winter season.

Snowmobile use levels (caps) would be based on a pre-determined seasonal schedule, which would be announced one year in advance. The NPS would release this information by December 1 of the preceding year. The schedule would vary by year and be determined by low and high use opportunities during both the holiday season and other times throughout the winter season. An example schedule is shown in figure 6. Daily entrance allocations for groups would be flexible to allow allocations not used at one entrance to be used at another, while still remaining within the pre-set daily use level. Similar to alternative 2, commercially guided snowmobile groups would have a maximum of 11 snowmobiles including the guide. Fees for snowmobile use through commercial operators would continue as described under alternative 2.

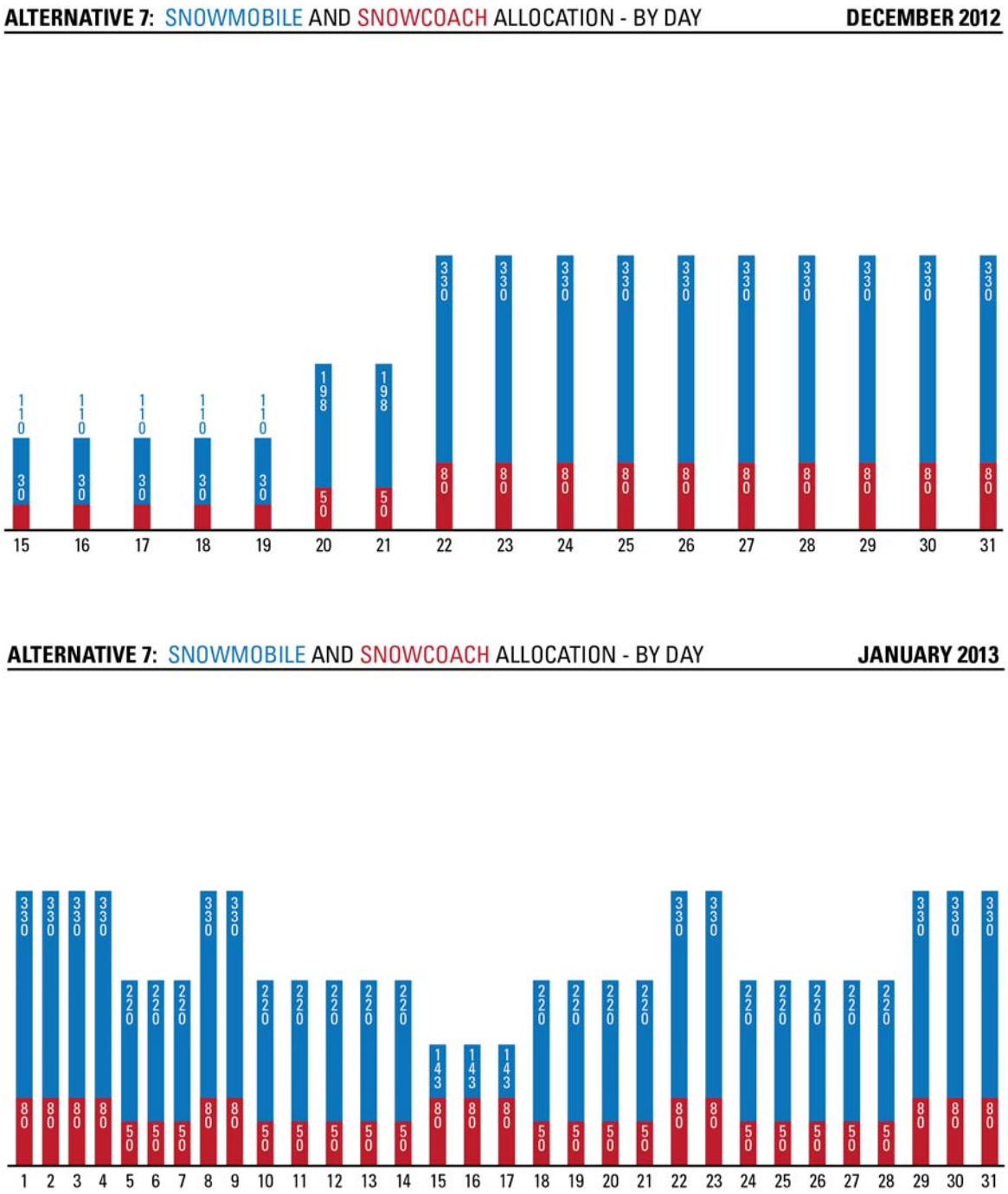


FIGURE 6: EXAMPLE SCHEDULE OF SNOWMOBILE AND SNOWCOACH USE VARIATION IN A SEASON UNDER ALTERNATIVE 7

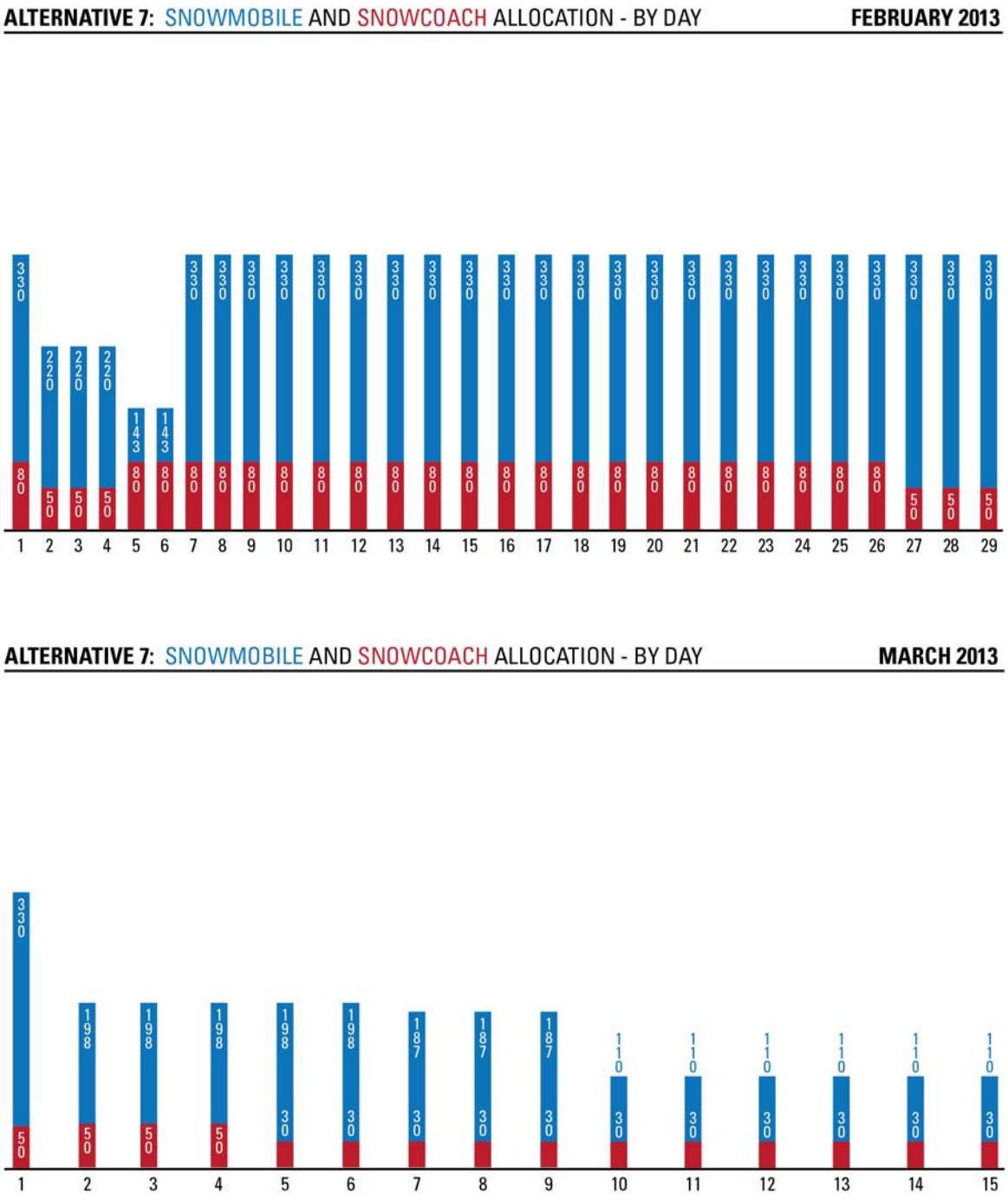


FIGURE 6: EXAMPLE SCHEDULE OF SNOWMOBILE AND SNOWCOACH USE VARIATION IN A SEASON UNDER ALTERNATIVE 7 (CONTINUED)

Under alternative 7, snowmobiles entering the park would follow current BAT requirements. Additional BAT standards for NO_x would be implemented for the 2014/2015 winter season. The NO_x BAT requirement would be that the sum of HC and NO_x would not exceed 15 grams per kilowatt-hour. Updated SAE standards for sound testing methodology, using the current version of SAE J192, would also be implemented for the 2014/2015 winter season[1]. The implementation of additional BAT requirements would be considered as technology improves, including hybrid and electric vehicles, among other improvements. An increased allocation of permits would be considered for companies using vehicles with such improvements.

Routes available to snowmobile use would be the same as those under alternative 6. The following presents a summary of the three use levels that would be implemented throughout the winter season under alternative 7 (also see table 8):

- For half of the winter season (or 45 days), up to 330 snowmobiles per day maximum would be permitted in the park.
- For one-third of the winter season (or 30 days), up to 220 snowmobiles per day would be permitted in the park.
- For one-sixth of the winter season (or 16 days), up to 110 or up to 143 snowmobiles per day would be permitted in the park.

TABLE 8: YELLOWSTONE DAILY SNOWMOBILE ENTRY LIMITS UNDER ALTERNATIVE 7

Entrance	Commercially Guided Snowmobiles
Up to 330 Snowmobiles Per Day for Half of the Winter Season	
West Entrance	176
South Entrance	110
East Entrance	22
North Entrance	11
Old Faithful	11
Up to 220 Snowmobiles Per Day for One-Third of the Winter Season	
West Entrance	110
South Entrance	66
East Entrance	0–22 (Closed Dec. 15–21 and March 2–15)
North Entrance	11
Old Faithful	11
Up to either 110 or 143 Snowmobiles Per Day for One-Sixth of the Winter Season	
West Entrance	66
South Entrance	44
East Entrance	0–11 (Closed Dec. 15–21 and March 2–15)
North Entrance	0–11 (Closed for Early Spring Plowing)
Old Faithful	0–11

[1] Under this alternative there would no longer be a barometric pressure variance.

Snowcoach Management. Similar to snowmobiles, the maximum number of snowcoaches permitted in the park would be separated into four subsets of allowed use throughout the season, each subset allocated between the different entrances. An average of 63 snowcoaches would be allowed to operate in the park per day for a total of 5,730 per season should the maximum capacity be reached each day throughout the winter season.

As described under snowmobile management, snowcoach levels would be based on a pre-determined seasonal schedule, which would be announced one year in advance and daily entrance allocations for groups would be flexible (see figure 6). Similar to other action alternatives, all snowcoaches operating in the park would be required to operate in accordance with a concessions contract. Private snowcoaches would not be permitted and fees for snowcoach use through commercial operators would continue.

BAT would be implemented for the 2014/2015 winter season, similar to other action alternatives. Snowcoach BAT requirements would include snowcoaches meeting Model Year 2010 gasoline or diesel EPA emission standards and not to exceed 73 dBA when operating at or near full speed for the 2014/2015 winter season.

The following presents a summary of the three use subsets that would be implemented under alternative 7. This information is summarized in table 9.

- For half of the winter season (or 45 days), up to 80 snowcoaches per day maximum would be permitted in the park.
- For one-third of the winter season (or 30 days), up to 50 snowcoaches per day maximum would be permitted in the park.
- For one-sixth of the winter season (or 16 days), either up to 30 or up to 80 snowcoaches per day maximum would be permitted in the park.

Wheeled Vehicle Management. Under alternative 7, wheeled vehicle access would continue as described under "Elements Common to All Alternatives."

Non-Motorized Use Management. Non-motorized use would be managed as described under "Elements Common to All Alternatives" except in addition, certain side roads would become ski and snowshoe routes at certain times of the season, and during these times OSVs would not be permitted in these areas to allow for a more solitude experience. These ski-snowshoe only side roads could include Firehole Canyon Drive, North Canyon Rim Drive, Riverside Drive, Fountain Flat Road, Firehole Lake Drive, Grand Loop Road – from Canyon Junction to the Washburn Hot Springs Overlook, and Virginia Cascades.

For the last two weeks of the winter season from March 2 through 15, OSV use would end at the West Thumb Parking Area and at the South Canyon Rim Drive in order to accommodate additional non-motorized snow recreational use on the east side of the park.

TABLE 9: YELLOWSTONE DAILY SNOWCOACH ENTRY LIMITS UNDER ALTERNATIVE 7

Entrance	Snowcoaches
Up to 80 Snowcoaches Per Day for Half of the Winter Season	
West Entrance	36
South Entrance	14
East Entrance	2
North Entrance	12
Old Faithful	16
Up to 50 Snowcoaches Per Day for One-Third of the Winter Season	
West Entrance	22
South Entrance	8
East Entrance	0–2 (closed December 15–21 and March 2–15)
North Entrance	8
Old Faithful	10
Up to 30 Snowcoaches Per Day for One-Sixth of the Winter Season – Allocation 1	
West Entrance	12
South Entrance	6
East Entrance	0 (closed December 15–21 and March 2–15)
North Entrance	6
Old Faithful	6
Up to 80 Snowcoaches Per Day for One-Sixth of the Winter Season – Allocation 2	
West Entrance	35
South Entrance	14
East Entrance	2
North Entrance	12
Old Faithful	16

Dates of Operation and Transition to New Plan. Under alternative 7, there would be no change in the dates for either motorized or non-motorized winter use in the park; the winter season would run from December 15 through March 15. OSV use would not begin until snow conditions permit.

Operating hours under alternative 7 would be from 6:00 a.m. to 9:00 p.m. However, the east entrance would open at 8:00 a.m. rather than 6:00 a.m. The entrance would also close at 9:00 p.m. Under alternative 7, all OSVs must enter the park by 10:30 a.m.

A one-season transition period to prepare for the implementation of the new winter-use plan would be put in place. Provisions of the 2009 interim rule would continue during this transition.

HOW ALTERNATIVES MEET OBJECTIVES

As stated in chapter 1 of 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 draft plan/EIS, which are stated in chapter 1 of 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 10 is a summary of alternative elements. Table 11 compares how each of the alternatives described in this chapter would meet the plan objectives. Chapter 4 of this document describes the effects of each alternative on each impact topic. These impacts are summarized in table 12. Tables 10–12 are included at the end of this chapter.

ALTERNATIVES AND ACTIONS CONSIDERED BUT DISMISSED FROM FURTHER CONSIDERATION

Comments received during scoping for this draft plan/EIS, at meetings and open houses associated with planning included suggestions for alternatives or actions within alternatives. For various reasons, some of these alternatives or actions were 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 dismissing them are presented here.

ESTABLISH A MONORAIL SYSTEM IN YELLOWSTONE

Constructing a monorail in Yellowstone would be prohibitively expensive, particularly given Yellowstone's seismically active nature, unstable thermal ground, harsh weather, and remoteness. A 1994 study, for example, estimated the cost of building a 16-mile monorail through Hayden Valley at $880 million (BRW Inc. 1994). Ongoing maintenance costs would be exorbitant in Yellowstone's harsh climate. Many of these costs would have to be passed on to the visitor, which would dramatically increase the cost of a Yellowstone visit, making it unaffordable for many. Further, the visitor experience would be substantially altered, because a monorail could only stop and discharge passengers at fixed locations (unlike snowcoaches, buses, or automobiles, which may stop almost anywhere), and the monorail would physically distance visitors from the natural world much more than any other mode of transportation. Additionally, even though such a monorail would presumably be constructed on or near existing roadways, its intrusion upon the landscape would be far greater than that of contemporary roadways and traffic in the park (BRW Inc. 1994). Such limitations of the visitor experience and visual intrusions would not meet the objectives set out in this draft plan/EIS. Finally, it is uncertain whether wildlife would learn to pass under the monorail system. If they did not, one of the needs for this draft plan/EIS would not be addressed. Because of the factors above, and following CEQ guidance on reasonable alternatives, the concept of constructing a monorail in Yellowstone was not carried forward in this winter use plan. A monorail would be unreasonably expensive; implementing such a system would not meet park mandates to protect wildlife and visual quality (which would also be inconsistent with park statements of purpose and significance); and the construction and operation of a monorail system could impact park resources.

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

Currently Yellowstone snowmobile standards are more stringent than EPA standards. 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 carbon monoxide, 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 requirements are more than double, and in the case of hydrocarbons 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 USE OF PERSONAL VEHICLES ON PLOWED ROADS

The idea of plowing Yellowstone's roads in winter was first suggested in 1932 and has been debated numerous times since then. Visitor and employee safety is a concern; winter road traveling conditions can be far more hazardous due to severe expected and unexpected storms and fast changing conditions. Private vehicles may lack the necessary equipment needed in case of emergency. Plowed roads would require a higher level of emergency response for accidents. Response time would depend on road and weather conditions, making it difficult and unsafe for emergency situations. Also, a higher level of road maintenance would be required. For these reasons, the element of plowing park roads for private vehicle use would not meet the purpose, need, and objectives of this plan and was dismissed from further analysis; however, the range of alternatives does address the request to analyze wheeled vehicle access by providing for plowing. Use of commercial vehicles would allow the park to better manage this use and provide for a safer visitor experience.

OPTIONS FOR MANAGEMENT OF COLTER PASS TO THE EAST OF COOKE CITY, MONTANA (US-212)

The road between Colter Pass and Cooke City, Montana, is outside of Yellowstone. Because the NPS does not own the roadbed, the park does not have management authority over its operation. Therefore, this alternative is outside of the scope of this draft plan/EIS, which is to manage winter use within Yellowstone.

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) (url: http://www.nps.gov/yell/planyourvisit/upload/supt_compendium.pdf). 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 draft plan/EIS. These uses may also create potential conflict with park resources, 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. Additionally, this alternative is outside the scope of this draft plan/EIS as it does not meet the purpose of managing motorized use. Similarly, due to impacts on park resources and safety concerns, dog sledding, ski-joring, and snowplanes are prohibited and outside the scope of this draft plan/EIS.

REMOVE LIMITS TO OSV USE AND ELIMINATE BAT REQUIREMENTS (RETURN TO 1983 REGULATIONS/"PRE-MANAGED ERA")

The 1983 regulations describe a type and amount of snowmobile use that was analyzed in the 2000 winter use plan and found to constitute impairment of park resources and values in the 2000 Record of Decision and the 2003 SEIS. Specifically, as stated in the record of decision for the 2003 SEIS, snowmobile use at 1983 levels would result in impairment from the "impacts from snowmobile use on air quality, wildlife, the natural soundscape, and opportunities for enjoyment of the park by visitors" (NPS 2003c, 2003d). The potential impairment under this level and type of use would result in the park not meeting the objectives for this draft plan/EIS related to resources (wildlife, sound, air quality, wilderness), may not be legally permissible and thus does not meet the purpose, need, and objective's criteria for in this draft plan/EIS. This alternative would not meet park mandates or objectives for management; therefore, this alternative was dismissed from further analysis.

OPEN THE PARK DURING SPRING/FALL SEASONS

Although Yellowstone is open year round, access is restricted to certain parts of the park for portions of the year, such as the interior. The current winter season dates to access the interior of the park are December 15 to March 15. The park temporarily closes the west, east, and south entrances from early-November through December 15, and March 15 through mid-April. The road from Mammoth to Cooke City remains open all year round. During the spring and fall seasons, park staff plows and clears snow from the roads to make them accessible for private vehicle use. Opening the park during the spring and fall seasons would not allow for an adequate transition time between seasons for snow removal and therefore was dismissed because this alternative would not be able to be implemented due to logistical constraints. Additionally, this element is outside the scope of this draft plan/EIS, which is for the "winter" season: mid-December to mid-March.

DESIGNATE AN AREA FOR OFF-TRAIL OR EXTREME SNOWMOBILING

Off-road vehicle use in national parks, including the use of OSVs, is permitted under Executive Order 11644 (including the amendments in Executive Order 11989), and its implementing regulations. This Executive Order states that in order to have off-road vehicle use, parks must designate specific areas and trails on which the use of off-road vehicles may be permitted, and areas in which the use of off-road vehicles may not be permitted. Designation of such areas and trails will be based upon the protection of the resources of the public lands, promotion of the safety of all users of those lands, and minimization of conflicts among the various uses of those lands. Trails for off-road use are not designated in Yellowstone, and therefore this use (OSV use outside of the existing roadway) would not be permissible. Because this element is not legally permissible, it does not meet the purpose of this draft plan/EIS. The NPS does not have management authority outside of national parks and many off-trail areas already exist in other areas near national parks. Additionally, use of an OSV that is off-trail or unguided would result in greater disturbance to park wildlife. 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). Implementation of mandatory guiding has substantially reduced wildlife/visitor

conflicts. Areas where use is not guided, such as an extreme snowmobiling of off-trail area, would therefore result in greater disturbances to wildlife. Because of the factors above, and following CEQ guidance on reasonable alternatives, the concept of designating an area for off-trail or extreme snowmobiling was not carried forward in this winter use plan because it does not meet the purpose of the plan. Creating such an area would not meet park mandates to protect wildlife (which would also be inconsistent with park statements of purpose and significance), and operation of such an area could impact park resources.

MANAGE/LIMIT OSV USE ON A DAILY BASIS, BASED ON WEATHER AND OTHER RESOURCE CONDITIONS

Managing or limiting OSV use on a daily basis, according to weather and other resource conditions, could cause a high level of uncertainty for visitors, park staff, and concessioners and would make this alternative difficult to implement logistically. Due to the high level of uncertainty of daily decisions of park opening/closing and the logistical challenges, this element was not carried through for this draft plan/EIS. However, the idea of flexible management was considered in alternatives 6 and 7, which would provide variation based on a schedule set one full year in advance.

CLOSURE OR OTHER ADDITIONAL MANAGEMENT FOR THE NORTH TO NORTHEAST ENTRANCE ROAD

Winter use activities occur throughout the park, including along the north to northeast entrance road. Visitors can traverse this road to access Cooke City, or to experience the park resources, including wildlife viewing in Lamar Valley. During public scoping, the winter management of this road, specifically if the road was open or closed, was not raised as an issue of concern. Commenters noted that the current policy that allows private vehicles on the road between Mammoth and the northeast entrance could be reconsidered, and suggested a scenario where commercial busses only would be allowed on this road (with only legal residents of Silver Gate and Cooke City allowed private vehicle access). How the north to northeast entrance road functions in the winter is beyond the scope of this plan, as it relates to the regional transportation network, rather than winter use in the interior of the park. The purpose of the winter use plan is to assess management of use in the interior of the park. The interior is defined as is those areas in Yellowstone that have been traditionally accessible via OSVs only in the winter. It includes developed areas such as Old Faithful, Madison, Canyon, Lake, Grant Village, and the entrance and connecting roads. Management of the north to northeast entrance road is outside the scope of this planning effort.

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 sound emissions, as well as disturbance to wildlife. Alternative 1 would 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, 4, 5 and 7 would allow OSV use in the park, but at levels that are near or below current use levels. Wildlife, air, and sound monitoring, as well as modeling conducted for this draft plan/EIS, has shown that although impacts to these resources would occur, they would be well below any regulatory standard and within NPS Management Policies. Monitoring and modeling has also shown that these OSV use levels could occur, and the resources would be preserved for succeeding generations. These alternatives, as well as all of the action 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 7 would include the additional requirement for the BAT standard for NO_x. Therefore, alternatives 2, 4, 5, and 7 would meet this purpose to a large degree but not fully because of greater potential for impacts to park resources during the winter, because some level of OSV use would be allowed.

Alternatives 3 and 6, which would allow use levels higher than current conditions, have the greatest potential to create impact to park resources and would only meet this purpose to a moderate degree. Although OSV management protections would be in place, the higher level of OSV use would have a greater potential to disturb wildlife during a time when they are most susceptible to disturbance, and would have greater impacts on the soundscape. Further, the provision for unguided or non-commercially guided use under alternative 6 could result in a higher level of noncompliance with OSV management measures, because there would not be a commercial guide with the group to ensure all management measures are being followed. The potential for a higher level of noncompliance could also result in a higher level of disturbance to park resources and impact the ability for enjoyment by future generations.

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, 4, 5, 6, and 7) 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, who has the equipment to quickly communicate with the park and others in case of an emergency, and who is required to carry emergency equipment. 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. However, for alternatives 2, 3, 5, 6, and 7, 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 4 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 4 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 risks from the absence of OSV or other park facilities to assist in case of emergency. Although there would be some risks to non-motorized

users, this use, 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 could be phased out under alternative 5) and snowcoach use. However, the type and diversity of winter use allowed under a particular alternative could provide for a different way for visitors to experience the park, or lead to resource degradation or risks to health and safety with higher levels of use. Alternative 2 allows for levels of use that are similar to current levels, which would provide for a variety of uses and resource protection. Based on monitoring results of current use levels, visitors would have various opportunities for use and resources would still be offered protection. Alternative 3 would allow for the same types of use as alternative 2, but at higher use levels. Due to the potential for higher use levels to impact park resources, this alternative would meet this purpose to a moderate degree. Alternative 4 would introduce commercially guided wheeled vehicles into the interior of the park while still allowing for OSV use. This new use would allow for a different visitor experience and, due to its expected lower cost than OSV use, may open up the winter experience at Yellowstone to more and different users. Because this alternative would provide a wider range of visitor experiences and protect park resources, it would meet this purpose to a large degree. Alternative 5 could reduce overall OSV use to 120 snowcoaches by the end of the five-year transition period. The lower level of OSV use would result in less disturbance to resources, but because alternative 5 would remove existing visitor use opportunities, it would only meet this purpose to a moderate degree. Alternative 6 would allow for variable use levels to accommodate high demand times, as well as providing for different use experiences (OSV or non-motorized) throughout the winter season. This alternative would also provide for up to 25% unguided or non-commercially guided use, a visitor experience that has been mentioned by the public during public scoping for this winter use planning process and during past winter use planning processes. Although there would be a greater potential to disturb resources on high use days, this alternative would include low use days (which could be zero), which would offer times of less disturbance. Because of the range of experiences offered under alternative 6, this alternative meets the purpose to a large degree. Alternative 7, like alternative 6, would allow for variable use levels to accommodate high demand times, as well as providing for different use experiences (OSV or non-motorized) throughout the winter season. However, use levels would be lower than alternative 6 and would be similar to or lower than alternative 2. Although there may be fewer winter use opportunities under alternative 7, it is expected that this level would meet user demand and better preserve the resources that make up the visitor experience, and therefore fully meet this purpose.

   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 the alternatives would result in impacts to cultural or historic resources that would exceed minor, these topics were dismissed from further analysis in this draft plan/EIS. 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. Alternatives that provide for lower OSV

use levels (alternatives 1, 2, 4, 5, and 7) would meet this purpose for natural resources to a larger degree than alternatives 3 and 6, as discussed under criteria 1 and 2. As discussed under criteria 3, alternatives 4, 6, and 7 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. Alternatives 2, 3, and 5 (meeting the purpose to a moderate degree) would provide some access to the park, including OSV access, but would not offer as great a variety of uses as alternatives 4, 6, and 7. 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 draft plan/EIS 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. Congress, recognizing that the enjoyment by future generations of the national parks can be ensured only if the superb quality of park resources and values is left unimpaired, has provided that when there is a conflict between conserving resources and values and providing for enjoyment of them, conservation is to be predominant. For all alternatives, except alternative 1, 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 on-line. Under alternative 1, the extremely limited staff at Old Faithful would not be maintaining equipment such as the webcam in the winter. As discussed above, alternatives 2, 4, 5, and 7 would provide for OSV use in the park, with management measures (BAT for all OSV and guiding requirements) and use levels (at or below current 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. Alternatives 1, 2, 4, 5, and 7 would fully meet this purpose. Alternatives 3 and 6, which allow for a higher level of OSV use, would meet the purpose to a large degree as the public would be provided access to the amenities in the park, including OSV use, but with higher use levels that may not offer the same level of protection to natural resources as the other alternatives.

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

   For reasons discussed above, in varying degrees the action alternatives (alternatives 2, 3, 4, 5, 6, and 7) would promote enhancing renewable resources because all alternatives require the use of BAT for snowmobiles and the development and implementation of BAT for snowcoaches. Alternative 6 also provides a greater level of encouragement than the other action alternatives. By using cleaner, more sustainable technologies OSV operators could obtain more use permits, and alternative 7 provides additional BAT requirements for NO_x. 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 alternative, except alternative 4, so this purpose would not apply. Alternative 4 would involve the construction of support buildings for vehicle staging and equipment associated with road plowing. These buildings would be designed following all federal guidelines for sustainability.

As discussed in chapter 1 of this document, each of the alternatives would require the park to continue to operate under the wise 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 Part 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 (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 being limited to minimal administrative use of OSV, there would be the least amount of impact on the biological and physical environment within the park. As noted in table 11, 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

To identify the preferred alternative, each alternative was evaluated based on its ability to meet the plan objectives (see table 11) and their potential impacts on the environment (see chapter 4 of this document). An initial screening of the alternatives was accomplished by the project team through the Choosing By Advantages (CBA) process held November 8–10, 2010. The CBA process considered the advantages of the six alternatives that were presented to the public in August 2010, which are the same as alternatives 1–6 presented above. Each of the six alternatives were evaluated against three factors: resource protection, visitor use, and park operations and management. After the CBA process on these initial alternatives was complete, the project team took elements from each alternative that were found to have a high advantage, to create alternative 7. The discussion below evaluates all of the proposed alternatives against the objectives of this plan and details why alternative 7 was identified as the NPS preferred alternative.

Alternatives 2, 3, and 5 would meet the objectives on the whole, from a moderate to large degree, with some objectives being fully met. However, these alternatives would not meet the objectives as well as alternatives 4, 6, and 7 because they do not provide the same amount of variety in visitor experiences, due to the fact that daily use levels would be constant throughout the winter season. Alternative 3 would allow for higher use levels that would have greater impacts on winter resources, as described in chapter 4, and would therefore meet those resource-specific objectives to a lesser degree. Alternative 5 would meet

objectives related to resources similar to other alternatives evaluated, but limiting the mode and number of visitors able to access the park during the winter season. Alternatives 2, 3, and 5 would not include additional BAT requirements that would promote advances in technology; however, alternatives 6 and 7 include these additional BAT requirements. Because alternatives 2, 3, and 5 would not meet the plan's objectives as well as other alternatives, they were not identified as the NPS preferred alternative.

Alternative 1 would meet the objectives, on the whole, to a moderate degree, but many objectives would be met to a small degree. By restricting access to the interior of the park in the winter to only administrative access, this alternative would not meet key objectives related to visitor use or providing critical visitor services. However, because of this limited use, alternative 1 would meet all resource related objectives to a large degree, better than any of the action alternatives evaluated. Also, similar to alternative 4, alternative 1 would meet objectives related to health and safety to a large degree due to the closure of Sylvan Pass and the reduction in risk to employees who would not work in that location during the winter. Other park operations objectives would not be met (related to encouraging improvements in technology) because visitor OSV use would not be permitted in the interior of the park. These objectives may be met to some degree (related to providing critical visitor services at core locations) because the interior of the park would not be accessible to the majority of visitors without motorized access. Because alternative 1 would not meet many objectives to the same degree as the action alternatives, it was not identified as the NPS preferred alternative.

Due to their similarity in providing additional modes of access or providing for flexible use days, alternatives 4, 6, and 7 meet the objectives, on the whole, to a moderate degree, with many objectives fully being met. In terms of visitor use, these three alternatives would provide the opportunity for visitors to experience and be inspired by Yellowstone's unique winter resources and values and would increase visitor understanding and appreciation of winter resources by allowing access into the park's interior by motorized means. These three alternatives meet visitor use objectives to a higher degree than the other alternatives that provide motorized winter access to visitors (alternatives 2, 3, and 5). Alternatives 4, 6, and 7 offer additional choices for accessing the park (such as the provision for wheeled vehicle access under alternative 4) or for a greater variety of winter experiences by varying the levels of OSV use and OSV free days throughout the winter season (alternatives 6 and 7), as well as providing for additional non-motorized use opportunities. Alternative 4 provides more opportunities for visitors with mobility challenges compared to all other alternatives evaluated, due to the addition of commercially guided wheeled vehicle access.

For all resource related objectives, alternatives 4 and 7 provide for a level of use that would result in minimal impacts to wildlife and allow for times of natural quiet. Under alternatives 4 and 7, air quality would be maintained below all regulatory standards, and these alternatives would have minimal impacts (specifically intrusion of noise) on adjacent wilderness areas as shown in the impact analysis in chapter 4. Alternative 6 would also meet air quality and wilderness objectives to a moderate degree. However, alternative 6 would not meet the objectives related to wildlife and sound (meeting both objectives to some degree) to the same degree as alternatives 4 and 7 because the higher levels of use permitted could result in more disruption to wildlife and would reduce the times of natural quiet in the park. Alternative 4 meets health and safety related objectives to a large degree due to the closure of Sylvan Pass which would eliminate the need for staff to work in this known avalanche area. Alternatives 6 and 7 meet this objective only to some degree, because operations at Sylvan Pass would continue. Alternatives 4, 6, and 7 (as well as all the other action alternatives) fully meet the objectives for coordination and cooperation and for development of an adaptive management plan. Because alternatives 4, 6, and 7 allow for motorized access into the park in the winter, they all meet the objective to provide critical visitor services at core locations to a large degree. Alternatives 6 and 7 meet objectives related to promoting advances of technology to a large degree because alternatives 6 and 7 include elements that either promote the development of new technologies through incentives to OSV providers (alternative 6) or require the development of new BAT

standards for NO_x (alternative 7). Alternative 4 includes the same BAT requirements as all of the action alternatives, but does not include additional standards that promote technology, thus meeting this objective to only a moderate degree.

Because alternative 7 provides for a range of visitor experience opportunities through variable use days while maintaining OSV levels that would have minimal impacts on the park's winter resources, and provides for additional BAT development, the NPS determined that this alternative, on the whole, best meets the objectives of this plan. Although alternative 4 better meets health and safety objectives due to the closure of Sylvan Pass, current operational practices (described in chapters 3 and 4) would ensure that the pass would continue to operate in a manner that would minimize risk to NPS staff. Alternative 6 would offer many of the same benefits as alternative 7, but the higher use levels would have greater impacts to wildlife and soundscapes, and therefore it was not identified as the preferred alternative.

NPS will consider comments on this draft plan/EIS and may modify or adjust the preferred alternative accordingly. Any modifications or adjustments will be disclosed in the published final EIS. A Record of Decision will follow the final EIS and will be made available to the public.

TABLE 10: SUMMARY OF ALTERNATIVE ELEMENTS

	Alternative 1: No Action - No Snowmobile / Snowcoach Use	Alternative 2: Continue Snowmobile / Snowcoach Use at 2008 Plan Limits	Alternative 3: Return Snowmobile / Snowcoach use to 2004 Plan Limits	Alternative 4: Mixed Use: Snowcoaches, Snowmobiles, and Road Plowing for Wheeled Vehicles	Alternative 5: Transition to BAT Snowcoaches Only Based on User Demand	Alternative 6: Implement Variable Management	Alternative 7: Provide a Variety of Use Levels and Experiences for Visitors
General Description	Once the 2009 interim rule expired (after the 2010/2011 season) there would be no rule in 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 interim rule – up to 318 snowmobiles and up to 78 snowcoaches per day.	OSV levels in the park would return to the 2004 plan limits – up to 720 snowmobiles and 78 snowcoaches a day.	Access to the park would be by commercial wheeled vehicles (north and west entrances) and snowmobiles and snowcoach (south entrance) only. No private vehicles would be permitted. The east entrance would be closed to through travel for OSVs, but open for non-motorized use.	OSV access into the park could transition towards snowcoaches meeting BAT requirements. Snowcoaches could replace snowmobiles beginning in the 2014/2015 winter season, when all snowcoaches must meet BAT requirements. Snowcoaches could replace snowmobiles within a five-year period, depending on snowcoach use demand.	Management of winter use would be structured to increase the variety of winter experiences. OSV levels would vary by creating times and places for higher and lower levels of use. Additional opportunities for undisturbed skiing and snowshoeing would also be created.	Various use levels would establish a maximum number of snowmobiles and snowcoaches permitted in the park for specific days throughout the winter season. Four different use levels for each OSV type would be implemented; the combination of which may vary by day. Snowmobile use would range from 110 to 330 per day and snowcoach use would range from 30 to 80 per day.
Elements Related to Snowmobile Use							
Daily Snowmobile Limits (with allocations by entrance)	n/a	Up to 318 snowmobiles per day (Actual current average is about 187 per day). Entrance allocations: • West – 160 • South – 114 • East – 20 • North – 12 • Old Faithful – 12	Up to 720 snowmobiles per day. Entrance allocations: • West – 414 • South – 246 • East – 20 • North – 20 • Old Faithful – 20	Up to 110 snowmobiles per day. Entrance allocations: • South – 66 • Old Faithful – 22 • Norris – 22	Up to 318 snowmobiles per day through 2014/2015 winter season. Initial entrance allocations are the same as alternative 2. Gradual reduction to zero snowmobiles would occur after the 2014/2015 season, as BAT snowcoach numbers increase (see “Elements Related to Snowcoaches,” below). As parkwide snowmobile numbers are reduced, entrance allocations would be reduced proportionally.	32,000 snowmobiles would be permitted each season. Daily numbers could vary between 0 and 540.	Up to 330 snowmobiles per day maximum for one-half of the winter season (45 days) Entrance allocations: • West: 176 • South: 110 • East: 22 • North: 11 • Old Faithful: 11 Up to 220 per day maximum for one-third of winter season (30 days) Entrance allocations: • West: 110 • South: 66 • East: 0 to 22 (East closed Dec. 15–21 and March 2–15) • North: 11 (1 group) • Old Faithful: 11 (1 group) Between 110 and 143 per day maximum for one-sixth of winter season (16 days) Entrance allocations: • West: 66 • South: 44 • East: 0–11 (East closed Dec. 15–21 and March 2-15) • North: 0 – 11 (North closed early for spring plowing) • Old Faithful: 0 – 11
Variable snowmobile numbers	n/a	Daily snowmobile levels would be fixed for the season. No variation would occur.	Daily snowmobile levels would be fixed for the season, with no variation.	Daily snowmobile levels would be fixed for the season, with no variation.	Daily snowmobile levels would be fixed for the season, with no variation.	Snowmobile levels would vary (daily, weekly or monthly) based on a pre-determined seasonal schedule.	Snowmobile levels would vary (daily, weekly, or monthly) based on a pre-determined seasonal schedule. The schedule would provide low and high use opportunities during holiday and non-holiday periods.

	Alternative 1: No Action - No Snowmobile / Snowcoach Use	Alternative 2: Continue Snowmobile / Snowcoach Use at 2008 Plan Limits	Alternative 3: Return Snowmobile / Snowcoach use to 2004 Plan Limits	Alternative 4: Mixed Use: Snowcoaches, Snowmobiles, and Road Plowing for Wheeled Vehicles	Alternative 5: Transition to BAT Snowcoaches Only Based on User Demand	Alternative 6: Implement Variable Management	Alternative 7: Provide a Variety of Use Levels and Experiences for Visitors
Variable entrance allocations	n/a	Entrance allocations would be fixed (may not be shared between entrances).	Entrance allocations would be fixed (no sharing between entrances).	Entrance allocation could be flexible, based on the demand at the three snowmobile entrance locations (sharing allowable among South, Norris, and Old Faithful).	Allocation of snowmobiles by entrance could be flexible, based on demand (i.e., sharing among West, South, East, North, and Old Faithful).	Daily entrance allocation for commercially guided groups could be flexible, to provide and accommodate a variety of winter experiences. For example, daily allocations not used at one gate could be used at another gate that same day.	Allocation of snowmobiles by entrance could be flexible, based on demand (i.e., sharing among West, South, East, North, and Old Faithful).
Snowmobile Guide Requirements, including maximum group size (if applicable)	n/a	100 percent commercially guided. Group size (including guide):11	100 percent commercially guided. Group size (including guide):11	100 percent commercially guided. Group size (including guide):11	100 percent commercially guided. Group size (including guide):11	Mostly guided, with up to 25 percent of snowmobile use unguided or non-commercially guided. Group size (including guides): Maximum group sizes may vary between 11 and 22 snowmobiles. Groups up to 11 would have one guide, between 12 and 22 would have two guides.	100 percent commercially guided. Group size (including guide):11
BAT Requirements for Snowmobiles	n/a	BAT required for snowmobiles.	BAT required for snowmobiles.	BAT required for snowmobiles.	BAT required for snowmobiles.	BAT required for snowmobiles. As this technology improves (hybrid, electric, etc.), consider additional permits for those companies that use them.	Develop additional BAT standard for NO_x, to be implemented by 2014/2015 winter. Proposal: Sum of NO_x and HC not to exceed 15 g/kW-hr. Adopt updated SAE sound testing methodology by 2014/2015 (the barometric pressure variance would no longer apply). As technology improves (hybrid, electric, etc.), consider additional permits for those companies that use them.
Fee for snowmobile use	n/a	Yes	Yes	Yes	Yes	Current fees for snowmobile use and commercial operators would continue. A comparable special use fee may be charged for non-guided/non-commercially guided snowmobile use to manage that use.	Yes

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Elements Related to Snowcoach Use							
Daily Snowcoach Limits (with allocations by entrance)	n/a	Up to 78 snowcoaches per day. Entrance allocations: • West – 34 • South – 13 • North – 13 • East – 2 • Old Faithful – 16	Up to 78 snowcoaches per day through 2014. Entrance allocations: • West – 34 • South – 13 • North – 13 • East – 2 • Old Faithful – 16	Up to 30 snowcoaches per day. Entrance allocations: • South – 20 • Old Faithful – 8 • Norris – 2	Up to 78 snowcoaches per day initially, allocated by entrance the same as in alternative 2. As of 2014/1015, increase to up to 120 BAT snowcoaches per day (with a corresponding decrease in snowmobiles over a five-year period as snowcoach numbers increase). As the number of snowcoaches throughout the park increases, their allocation by entrance would rise proportionally.	4,600 snowcoaches would be permitted per season. Daily use limits would vary between 0 and 78.	Up to 80 snowcoaches per day maximum for one-half of winter season (45 days) Entrance allocations: • West: 36 • South: 14 • East: 2 • North: 12 • Old Faithful: 16 Up to 50 snowcoaches per day maximum for one-third of winter season (30 days) Entrance allocations: • West: 22 • South: 8 • East: 0 to 2 (East closed Dec. 15–21 and March 2–15) • North: 8 • Old Faithful: 10 Between 30 and 80 snowcoaches per day maximum for one-sixth of winter season (16 days) under one of two entrance allocations Allocation 1: • West: 12 • South: 6 • East: 0 (East closed Dec. 15–21 and March 2–15) • North: 6 (North closed early for spring plowing) • Old Faithful: 6 Allocation 2: • West: 36 • South: 14 • East: 2 • North: 12 • Old Faithful: 16
Variable snowcoach numbers	n/a	Daily snowcoach levels would be fixed for the season. No variation would occur.	Daily snowcoach levels would be fixed for the season. No variation would occur.	Daily snowcoach levels would be fixed for the season. No variation would occur.	Daily snowcoach levels would be fixed for the season. No variation would occur.	Snowcoach levels would vary (daily, weekly or monthly) based on a pre-determined seasonal schedule.	Snowcoach levels would vary (daily, weekly or monthly) based on a pre-determined seasonal schedule.

	Alternative 1: No Action - No Snowmobile / Snowcoach Use	Alternative 2: Continue Snowmobile / Snowcoach Use at 2008 Plan Limits	Alternative 3: Return Snowmobile / Snowcoach use to 2004 Plan Limits	Alternative 4: Mixed Use: Snowcoaches, Snowmobiles, and Road Plowing for Wheeled Vehicles	Alternative 5: Transition to BAT Snowcoaches Only Based on User Demand	Alternative 6: Implement Variable Management	Alternative 7: Provide a Variety of Use Levels and Experiences for Visitors
Variable entrance allocations	n/a	Entrance allocations would be fixed (may not be shared between entrances).	Entrance allocations would be fixed (may not be shared between entrances).	Entrance allocation would be flexible, based on the demand at the three snowcoach entry locations (i.e., sharing among South, Norris, and Old Faithful).	Entrance allocation would be flexible, based on the demand at the three snowcoach entry locations (i.e., sharing among West, South, East, North, and Old Faithful).	Daily entrance allocation for snowcoaches would be flexible, to provide and accommodate a variety of winter experiences. For example, daily allocations not used at one gate could be used at another gate that same day.	Daily entrance allocation for snowcoaches would be flexible, to provide and accommodate a variety of winter experiences. For example, daily allocations not used at one gate could be used at another gate that same day.
Snowcoach Guide Requirements	n/a	Common to all action alternatives: snowcoach entry by commercial guide only.					
Snowcoach BAT requirements	n/a	Common to all action alternatives: BAT would be developed and implemented for snowcoaches by the 2014/2015 season. Draft proposal: Require vehicles meet Model Year 2010 EPA emission standards. Not to exceed 73 dBA when operating at or near full speed.					
Wheeled Vehicle Access							
	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.	Wheeled vehicle access would continue along the road from Mammoth Hot Springs to Cooke City. No other roads would be plowed for wheeled vehicle use.	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.	Wheeled vehicle access would continue along the road between Mammoth Hot Springs and Cooke City. In addition, the north (Mammoth) and west (West Yellowstone) entrance roads would be plowed to Old Faithful to accommodate multi- passenger commercial vehicles (e.g., vans, buses, etc.). No private vehicles would be permitted. Daily limit of up to 100 Tier 2 (EPA standard) vehicles.	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.	Wheeled vehicle access would continue along the Mammoth to Cooke City Road. No other roads would be plowed for wheeled vehicle use.	Wheeled vehicle access would continue along the road from Mammoth Hot Springs to Cooke City. No other roads would be plowed for wheeled vehicle use.
Other/General Elements							
Road Grooming	Minimal road grooming needed to maintain administrative access. Sylvan Pass management would not be maintained.	Continue road grooming. Manage Sylvan Pass in accordance with the Sylvan Pass Working Group agreement.	Continue road grooming. Manage Sylvan Pass in accordance with the Sylvan Pass Working Group agreement.	Continued road grooming needed to maintain snowcoach and administrative access. Sylvan Pass would be closed to vehicle traffic and not be maintained.	Continue road grooming. Manage Sylvan Pass in accordance with the Sylvan Pass Working Group agreement.	Continue road grooming. Manage Sylvan Pass in accordance with the Sylvan Pass Working Group agreement. Certain side roads would be groomed for non-motorized uses only during certain times/days of the season.	Continue road grooming. Manage Sylvan Pass in accordance with the Sylvan Pass Working Group agreement.

	Alternative 1: No Action - No Snowmobile / Snowcoach Use	Alternative 2: Continue Snowmobile / Snowcoach Use at 2008 Plan Limits	Alternative 3: Return Snowmobile / Snowcoach use to 2004 Plan Limits	Alternative 4: Mixed Use: Snowcoaches, Snowmobiles, and Road Plowing for Wheeled Vehicles	Alternative 5: Transition to BAT Snowcoaches Only Based on User Demand	Alternative 6: Implement Variable Management	Alternative 7: Provide a Variety of Use Levels and Experiences for Visitors
Zoning – Temporal and Spatial	n/a	Continued temporal and spatial zoning of some side roads (e.g., snowcoaches only in the morning, snowmobiles and snowcoaches in the afternoons).	Continued temporal and spatial zoning of some side roads (e.g., snowcoaches only in the morning, snowmobiles and snowcoaches in the afternoons).	Most side roads would become cross-country ski and snowshoe routes.	Most side roads would become cross-country ski and snowshoe routes.	Side roads would become ski and snowshoe routes at certain times of the season. OSV use would end at West Thumb Junction and at the Canyon developed area for the last two weeks of the season to accommodate more non-motorized snow recreation on the east side of the park. OSV permits would be allocated in ways that allow for zoning by space and time to accommodate a variety of visitor uses and to protect park resources.	Side roads would become ski and snowshoe routes throughout the season. These roads would be groomed. OSV use would end at West Thumb Parking Area Junction and at the South Canyon Rim Drive for the last two weeks of the season to accommodate more non-motorized snow recreation on the east side of the park. All OSVs must enter the park by 10:30 a.m.
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.	Continue to groom 35 miles of secondary roads for cross-country skiers and snowshoers. Use will be permitted subject to Winter Severity Index.	Use would be permitted subject to Winter Severity Index. Use on South and East entrance roads could increase during the park’s spring “shoulder” season. Continue to groom 35 miles of secondary roads for cross-country skiers and snowshoers. Additional secondary roads (approximately 10 miles) would be groomed for non-motorized use access at stopping points along plowed roads (primarily West to Old Faithful). Backcountry experience on east side of park would be available for non-motorized users.	Non-motorized use would be permitted subject to a Winter Severity Index for temperature and weather. Use along the South and East entrance roads could increase during the park’s spring “shoulder” season. Continue to groom 35 miles of secondary roads for cross-country skiers and snowshoers. Additional secondary roads (approximately 10 miles) would be groomed for non-motorized use access at stopping points along plowed roads (primarily from West Yellowstone to Old Faithful).	Allowed subject to Winter Severity Index. Manage non-motorized use in time and space to provide for a variety of visitor uses (see Zoning).	In addition to the roads and areas described above in Zoning – Temporal and Spatial, continue to groom 35 miles of secondary park roads for cross-country skiers and snowshoers. Use would 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).	No change in current dates for motorized and non-motorized winter use in the park.	No change in current dates for motorized and non-motorized winter use in the park.	No change in current dates for motorized and non-motorized winter use in the park.	No change in current dates for motorized and non-motorized winter use in the park.	Opening and closing dates could vary to accommodate a variety of visitor experiences and needs. The schedule would be determined no later than Dec. 1 of the previous year.	No change in current dates for motorized and non-motorized winter use in the park; however, OSV use would not start before snow conditions permit.

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Estimated number of daily vehicle passengers (excludes Mammoth to Cooke City)	Zero OSVs or wheeled vehicles	Snowmobile = 413 Snowcoach = 624 Total = 1,037	Snowmobile passengers = 936 Snowcoach passengers = 624 Total = 1,560	Snowmobile passengers = 143 Snowcoach passengers = 240 Wheeled vehicle passengers = 2000 Total = 2,383	Snowmobile passengers = 413 (potentially 0 after phase out) Snowcoach passengers = 624 (potentially 960 after phase out) Total = 1,037 (potentially 960 after phase out)	Snowmobile passengers = 408 Snowcoach passengers = 361 Total = 769	Days with 330 snowmobiles and 80 coaches: • Snowmobile passengers = 429 • Snowcoach passengers = 640 • Total = 1,069 Days with 220 snowmobiles and 50 coaches: • Snowmobile passengers = 286 • Snowcoach passengers = 400 • Total = 686 Days with 110 snowmobiles and 30 coaches: • Snowmobile passengers = 143 • Snowcoach passengers = 240 • Total = 383 Days with 143 snowmobiles and 80 coaches: • Snowmobile passengers = 186 • Snowcoach passengers = 640 • Total = 886
Transition Period	The 2009 interim rule expired. No transition period.	The 2009 interim rule would continue. No transition period.	There would be a one-season transition period to prepare for implementation of the new winter use plan. Provisions of the 2009 interim rule would continue during this transition.		Because the 2009 interim rule provisions are the starting point for alternative 5, there would not be a transition year.	There would be a one-season transition period to prepare for implementation of the new winter use plan. Provisions of the 2009 interim rule would continue during this transition.	
Adaptive Management Program	No adaptive management program would be implemented.	Common to all action alternatives: Adaptive management planning would be standard procedure, but elements and emphases of its use could differ from one alternative to another.					

TABLE 11: HOW ALTERNATIVES MEET OBJECTIVES

Objective	Alternative 1: No Action - No Snowmobile / Snowcoach Use	Alternative 2: Continue Snowmobile / Snowcoach Use at 2008 Plan Limits	Alternative 3: Return Snowmobile / Snowcoach use to 2004 Plan Limits	Alternative 4: Mixed Use: Snowcoaches, Snowmobiles, and Road Plowing for Wheeled Vehicles	Alternative 5: Transition to BAT Snowcoaches Only Based on User Demand	Alternative 6: Implement Variable Management	Alternative 7: Provide a Variety of Use Levels and Experiences for Visitors (Preferred Alternative)
Visitor Use							
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 accessible only by non-motorized users and difficult to access by most visitors. Visitors could also 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 wheeled vehicles and OSVs from all entrances. Daily use limits of 318 snowmobiles and 78 snowcoaches would be similar to current use levels, which monitoring has shown allow for resource protection. Visitors could also 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 able to experience the interior of the park with wheeled vehicles and OSVs from all entrances. The increase in visitation over the current condition may lead to challenges in ensuring resource protection. Visitors could also continue to experience the park virtually through the park's website and webcam at Old Faithful.	Fully meets objective because visitors would have a wide variety of choice in how to access the interior of the park, with these choices likely being more economical. With the addition of plowed roads, it is likely more visitors would be able to visit the park and see Yellowstone's unique winter resources. Use levels, and mix of use, would be expected to ensure resource protection. Visitors could also 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, it is likely that the mode in which one can enter would be limited to snowcoaches. This alternative would reduce overall OSV traffic, below current levels, and would ensure resource protection. Visitors could also continue to experience the park virtually through the park's website and webcam at Old Faithful.	Meets objective to a large degree because the variety of winter experiences would increase by creating times and places for higher and lower levels of use and opportunities for undisturbed skiing and snowshoeing. Although there would be the potential for days with higher use than the current condition, there would also be lower use days, and overall this alternative would ensure resource protection. Visitors would be able to experience the interior of the park with OSVs from all entrances. Visitors could also continue to experience the park virtually through the park's website and webcam at Old Faithful.	Fully meets objective because the variety of winter experiences would increase by creating times and places for higher and lower levels of use and opportunities for undisturbed skiing and snowshoeing. Although use would have higher and lower use days, the maximum use days would be at levels that are similar to those currently permitted. With levels of use that those levels or less, this alternative would ensure resource protection. Visitors would be able to experience the interior of the park with OSVs from all entrances. Visitors could also 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. 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.	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 objectives 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 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.	Fully meets objective 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 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 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 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.

Objective	Alternative 1: No Action - No Snowmobile / Snowcoach Use	Alternative 2: Continue Snowmobile / Snowcoach Use at 2008 Plan Limits	Alternative 3: Return Snowmobile / Snowcoach use to 2004 Plan Limits	Alternative 4: Mixed Use: Snowcoaches, Snowmobiles, and Road Plowing for Wheeled Vehicles	Alternative 5: Transition to BAT Snowcoaches Only Based on User Demand	Alternative 6: Implement Variable Management	Alternative 7: Provide a Variety of Use Levels and Experiences for Visitors (Preferred Alternative)
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, including sensitive species, in the interior of the park would no longer have interactions with recreational OSV. Interactions with non-motorized users would continue to occur, 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 similar to those currently occurring, which monitoring has shown disrupts wildlife minimally.	Meets objective some 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 greater than those currently occurring, which could result in more disruption to wildlife.	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 wheeled vehicles and OSVs. Winter use levels would be similar or less than to those currently occurring, which monitoring has shown disrupts wildlife minimally.	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 less than to those currently occurring once the transition to snowcoaches only is complete, which monitoring has shown disrupts wildlife minimally.	Meets objective some 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 greater than those currently occurring, which could result in more disruption to wildlife.	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 similar to those currently occurring, which monitoring has shown disrupts wildlife minimally. Lower use days below the levels that are currently occurring would result in less disruption to wildlife.
Sound: Manage winter use to protect naturally occurring background sound levels and to minimize loud noises.	Meets objectives 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 some degree because OSV use would occur in the interior of the park, at levels that would reduce times of natural quiet compared to current use levels.	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 objectives to some degree because OSV use would occur in the interior of the park, at levels that would reduce times of natural quiet compared to current use levels.	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.
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 similar to current use levels, which monitoring has shown 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. Levels of use would be similar to current use levels, which monitoring has shown 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. Levels of use would be similar to current use levels, which monitoring has shown 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. Levels of use would be similar to current use levels, which monitoring has shown 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. Levels of use would be similar to current use levels, which monitoring has shown 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. Levels of use would be similar to or less than current use levels, which monitoring has shown to be below all regulatory standards.
Wilderness: Manage winter use to protect wilderness character and values.	Meets objective to a large degree because minimal OSV use (administrative use only) would not 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 has 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.	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.	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.	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.	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.

Objective	Alternative 1: No Action - No Snowmobile / Snowcoach Use	Alternative 2: Continue Snowmobile / Snowcoach Use at 2008 Plan Limits	Alternative 3: Return Snowmobile / Snowcoach use to 2004 Plan Limits	Alternative 4: Mixed Use: Snowcoaches, Snowmobiles, and Road Plowing for Wheeled Vehicles	Alternative 5: Transition to BAT Snowcoaches Only Based on User Demand	Alternative 6: Implement Variable Management	Alternative 7: Provide a Variety of Use Levels and Experiences for Visitors (Preferred Alternative)
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; 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 over the health and safety of visitors such as hour 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 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 hour 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 the objectives to a large degree because wheeled vehicle, 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 hour of operation, BAT and guiding requirements. The requirement for all wheeled vehicles to be commercially guided would further promote the health and safety of visitors. 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 because 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 hour 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 some degree because 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 hour 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 some degree because 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 hour 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 objectives because the park would continue to coordinate and communicate with park partners, gateway communities, and other stakeholders.	Fully meets objectives because the park would continue to coordinate and communicate with park partners, gateway communities, and other stakeholders.	Fully meets objectives because the park would continue to coordinate and communicate with park partners, gateway communities, and other stakeholders.	Fully meets objectives because the park would continue to coordinate and communicate with park partners, gateway communities, and other stakeholders.	Fully meets objectives because the park would continue to coordinate and communicate with park partners, gateway communities, and other stakeholders.	Fully meets objectives because the park would continue to coordinate and communicate with park partners, gateway communities, and other stakeholders.	Fully meets objectives because the park would continue to coordinate and communicate with park partners, 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 this alternative.	Fully meets objective because adaptive management would occur under this alternative.	Fully meets objective because adaptive management would occur under this alternative.	Fully meets objective because adaptive management would occur under this alternative.	Fully meets objective because adaptive management would occur under this alternative.	Fully meets objective because adaptive management would occur under this alternative.

Objective	Alternative 1: No Action - No Snowmobile / Snowcoach Use	Alternative 2: Continue Snowmobile / Snowcoach Use at 2008 Plan Limits	Alternative 3: Return Snowmobile / Snowcoach use to 2004 Plan Limits	Alternative 4: Mixed Use: Snowcoaches, Snowmobiles, and Road Plowing for Wheeled Vehicles	Alternative 5: Transition to BAT Snowcoaches Only Based on User Demand	Alternative 6: Implement Variable Management	Alternative 7: Provide a Variety of Use Levels and Experiences for Visitors (Preferred Alternative)
Promote advances of vehicle technology (OSVs and commercial wheeled vehicles) 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. 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. No additional steps would be taken to promote technology.	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. Further incentives for the advancement of snowcoaches would be provided as more snowcoaches would be permitted as BAT becomes available. In addition, as new technologies come on line (electric for example) snowmobile operators would have the potential to replace BAT coaches.	Fully meets objective because BAT requirements would continue to be implemented for snowmobiles and would further be developed and implemented for snowcoaches. In addition, as new technologies come on line (electric for example) operators would have the potential to increase their daily limits if they include newer, and cleaner, technologies in their fleets.	Fully meets objective because BAT requirements would continue to be implemented for snowmobiles and would further be developed and implemented for snowcoaches. In addition, new BAT requirements for NO_x would also be developed, which would also promote advances in technology and operators could have the potential to increase their daily limits if they include newer, and cleaner, technologies in their fleets.
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.	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.	Meets objective to a large degree because services in the northern area of the park (Mammoth) would continue to be provided and OSV and wheeled vehicle use would allow for the continuation of services in the interior of the park in the winter.	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.	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.	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 12: IMPACT SUMMARY

	Alternative 1: No Action - No Snowmobile / Snowcoach Use	Alternative 2: Continue Snowmobile / Snowcoach Use at 2008 Plan Limits	Alternative 3: Return Snowmobile / Snowcoach use to 2004 Plan Limits	Alternative 4: Mixed Use: Snowcoaches, Snowmobiles, and Road Plowing for Wheeled Vehicles	Alternative 5: Transition to BAT Snowcoaches Only Based on User Demand	Alternative 6: Implement Variable Management	Alternative 7: Provide a Variety of Use Levels and Experiences for Visitors (Preferred Alternative)
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 and any beneficial wildlife impacts would likely only be apparent over several decades of minimal OSV traffic in the park. 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 interim rule, with BAT requirements, guiding regulations, speed limits, and restrictions on OSV access to park roads only. Continued monitoring and adaptive management would allow for additional restrictions to be established should negative impacts on wildlife begin to occur. Thus, overall impacts under alternative 2 would be short and long-term minor to moderate adverse. Cumulative impacts would be long-term minor to major adverse, of which alternative 2 would contribute minimally.	Under alternative 3, daily use limits of up to 720 snowmobiles and 78 snowcoaches along with BAT requirements, guiding regulations, speed limits, and restrictions on OSV access to park roads only would result in short and long-term minor to moderate adverse impacts. Continued monitoring and adaptive management would allow for additional restrictions to be established should negative impacts on wildlife begin to occur. Cumulative impacts on bison and elk under alternative 3 would be long-term minor to major adverse.	Under alternative 4, daily use limits of up to 110 snowmobiles, 100 guided wheeled vehicles, and 30 snowcoaches, along with BAT requirements, guiding regulations, speed limits, plowing design, and restrictions on OSV access to park roads only, would result in short- and long-term, negligible to minor adverse impacts. Continued monitoring and adaptive management would allow for additional restrictions to be established should negative impacts on wildlife begin to occur. Cumulative impacts would be long-term minor to major adverse, of which alternative 4 would be a small part.	The existing data suggest that the higher visual profile of a snowcoach may elicit stronger bison and elk behavioral responses than snowmobiles. 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 numbers and associated recreation reduce vehicle-caused mortality, wildlife displacement, behavior or physiology-related energy costs, and the potential for adverse demographic impacts, resulting in short and long-term minor adverse impacts. Cumulative impacts on bison and elk under alternative 5 would be long-term minor to major adverse, to which alternative 5 would contribute a small amount.	The variable number of OSVs allowed per day under this alternative would likely increase the behavioral responses of bison and elk due to daily unpredictability and reduced potential for habituation. These increased responses are due in part to the larger snowmobile group sizes (22 individual vehicles rather than 11) allowed under this alternative, which have been found to increase the probability of strong behavioral and associated physiological responses, leading to possible displacement of bison and elk and resulting in long-term moderate adverse impacts. Additionally, the unguided/non-commercially guided provision, variable daily OSV numbers, and high use limits may result in decreased habituation and increased behavioral, physiological and displacement responses by bison and elk. Measures under this alternative, including BAT snowmobiles, variable use limits, closing of certain roads to motorized traffic two weeks prior to the end of the season, and setting limits on seasonal numbers of snowmobiles and snowcoaches in the park, would help limit wildlife impacts. Impacts under alternative 6 would be long-term minor to moderate adverse, due to unguided provision, variable limits, and increased group size. Cumulative impacts on bison and elk under alternative 6 would be long-term minor to major adverse, to which alternative 6 would contribute a noticeable amount.	Alternative 7 would allow use levels similar to the 2009 interim rule, with BAT requirements, guiding regulations, speed limits, and restrictions on OSV access to park roads only. Variable use levels allow for continued monitoring and adaptive management to establish additional restrictions to be established should negative impacts on wildlife begin to occur. Thus, overall impacts under alternative 7 would be short- and long-term minor to moderate adverse. Cumulative impacts would be long-term minor to major adverse, to which alternative 7 would contribute a small amount.

	Alternative 1: No Action - No Snowmobile / Snowcoach Use	Alternative 2: Continue Snowmobile / Snowcoach Use at 2008 Plan Limits	Alternative 3: Return Snowmobile / Snowcoach use to 2004 Plan Limits	Alternative 4: Mixed Use: Snowcoaches, Snowmobiles, and Road Plowing for Wheeled Vehicles	Alternative 5: Transition to BAT Snowcoaches Only Based on User Demand	Alternative 6: Implement Variable Management	Alternative 7: Provide a Variety of Use Levels and Experiences for Visitors (Preferred Alternative)
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, of which alternative 1 would contribute minimally.	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 restrict the east entrance to just 20 snowmobiles and two snowcoaches per day, (five groups of OSVs), 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 long-term minor adverse, with the potential for moderate adverse impacts if lynx and wolverines travel outside the eastern area of the park. Cumulative impacts to lynx and wolverines under alternative 2 would be long-term minor to major adverse, of which alternative 2 would contribute a minimal amount.	This alternative continues to maintain and allow OSV use in Sylvan Pass, the area of the park where human-wolverine interactions are most likely to occur. Restrictions to movements of lynx or wolverines during the winter months due to the presence and high levels of use of OSV routes under alternative 3 (up to 720 snowmobiles and 78 snowcoaches) may also limit reproductive success, dispersal, and overall genetic sustainability of the species due to increased frequency of exposure and duration of exposure to the sights and sounds of human activity. Therefore, impacts predicted under this alternative would be long-term moderate adverse. Cumulative impacts to lynx and wolverines under alternative 3 would be long-term minor to major adverse, of which alternative 3 would contribute a minimal amount.	Under this alternative Sylvan Pass would be closed to OSVs and maintenance activities would cease in the area of the park where human-wolverine interactions are most likely to occur. Restrictions to movements of lynx or wolverines during the winter months due to the presence and relatively low levels of use of OSV routes under alternative 4 (up to 110 snowmobiles, 100 wheeled buses, and 30 snowcoaches) would have few impacts on the reproductive success, dispersal, and overall genetic sustainability of the species due to decreased frequency and duration of exposure to the sights and sounds of human activity. Therefore, impacts under alternative 4 would be short and long-term minor adverse, with long-term beneficial impacts from the removal of human presence at Sylvan Pass. Cumulative impacts under alternative 4 would be long-term minor to major adverse, of which alternative 4 would contribute a minimal amount.	Restrictions to movements of lynx or wolverines during the winter months due to the presence and relatively low levels of use of OSV routes under alternative 5 (up to 120 snowcoaches) and the low levels of OSV entry limits at the east entrance would have few impacts on reproductive success, dispersal, and overall genetic sustainability of the species due to decreased frequency and duration of exposure to the sights and sounds of human activity. Therefore, impacts predicted under alternative 5 would be short and long-term negligible to minor, adverse. Cumulative impacts to lynx and wolverines under alternative 5 would be long-term minor to major adverse, to which alternative 5 would contribute minimally.	Restrictions to movements of lynx or wolverines during the winter months due to the presence and relatively high levels of use of OSV routes under alternative 6 (up to 540 snowmobiles and 78 snowcoaches), and the potential for higher OSV entry limits at the east entrance would have increased impacts on reproductive success, dispersal, and overall genetic sustainability of the species due to the increased frequency and duration of exposure to the sights and sounds of human activity. Therefore, impacts predicted under alternative 6 would be short and long-term moderate adverse. Cumulative impacts to lynx and wolverines under alternative 6 would be long-term minor to major adverse, of which alternative 6 would contribute a noticeable amount.	This alternative would maintain and allow OSV use in Sylvan Pass, the area of the park where human-wolverine interactions would be most likely to occur. However, daily entrance limits restrict the east entrance to just 22 snowmobiles and 2 snowcoaches per day, (five groups of OSVs), 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 the 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 area of the park. Cumulative impacts to lynx and wolverines under alternative 7 would be long-term minor to major adverse, to which alternative 7 would contribute a small amount.

	Alternative 1: No Action - No Snowmobile / Snowcoach Use	Alternative 2: Continue Snowmobile / Snowcoach Use at 2008 Plan Limits	Alternative 3: Return Snowmobile / Snowcoach use to 2004 Plan Limits	Alternative 4: Mixed Use: Snowcoaches, Snowmobiles, and Road Plowing for Wheeled Vehicles	Alternative 5: Transition to BAT Snowcoaches Only Based on User Demand	Alternative 6: Implement Variable Management	Alternative 7: Provide a Variety of Use Levels and Experiences for Visitors (Preferred Alternative)
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 minor adverse, and alternative 1 would contribute a minimally to the overall cumulative impacts to eagles and swans.	Alternative 2 would limit impacts to 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 to eagles and swans under alternative 2 would be localized short- to long-term negligible to minor adverse. 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 limit impacts to swans and eagles as described in alternative 2, but would allow for a greater number of OSVs in the park on a daily basis and would result in short and long-term minor adverse impacts. Cumulative impacts would be long-term minor adverse, and alternative 3 would contribute a noticeable amount to the overall adverse cumulative impact.	Alternative 4 would limit impacts to swans and eagles due to low use limits, reduction in overall motorized vehicle use in the winter within the park, guiding requirements, and little overlap with active swan nesting season. The low use levels and guiding requirements would result in localized short and long-term negligible adverse impacts to eagles and swans under alternative 4. Cumulative impacts would be long-term minor adverse, and alternative 4 would contribute a small amount to the overall adverse cumulative impacts.	Alternative 5 would limit the impacts to swans and eagles through low use limits, guiding requirements, and little overlap between OSV use and the active swan nesting season. The low use levels and guiding requirements would limit impacts to eagles and swans under alternative 5 and result in localized short and long-term, negligible, adverse impacts. Cumulative impacts would be long-term minor adverse, and alternative 5 would contribute a small amount to the overall adverse cumulative impacts.	Alternative 6 would limit impacts to swans and eagles due to use-limits, guiding requirements, and little overlap between OSV use and the active swan nesting season, but would increase OSV use levels on some days beyond current use levels. Impacts to eagles or swans under alternative 6 would be short- and long-term minor to moderate adverse because use levels would increase and up to 25% unguided/non-commercially guided snowmobile use would be permitted. Cumulative impacts would be long-term minor to moderate adverse, and alternative 6 would contribute a noticeable amount to the overall adverse cumulative impacts.	Alternative 7 would limit impacts to 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 to eagles and swans under alternative 7 would be localized short- to long-term negligible to minor adverse. Cumulative impacts would be long-term minor to moderate adverse, and alternative 7 would contribute minimally to the overall adverse cumulative impacts.
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 would be limited to current use levels, which would reduce the frequency of OSV encounters, and limit the duration of interaction and the approach distance of OSV users due to guiding requirements. 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 minor adverse impacts on wolves in the park because OSV use would increase the frequency and duration of OSV exposure. The guiding requirement regulates the interaction time and approach distance of OSV users, limiting adverse impacts from direct interaction. Cumulative impacts would be long-term minor adverse, and alternative 3 would contribute a noticeable 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 because motorized vehicle use would be limited to low use levels, which would reduce the frequency of motorized vehicle encounters with wolves, and limits duration and approach distance of OSV users when encountering wolves due to guiding requirements. Cumulative impacts would be long-term minor adverse, and alternative 4 would contribute a small amount to the overall adverse cumulative impacts.	Alternative 5 would result in short- and long-term negligible to minor adverse impacts on wolves in the park because OSV use would be limited to low use levels which reduces the frequency of motorized vehicle encounters with wolves, and limits duration and approach distance of OSV users when encountering wolves due to guiding requirements. Cumulative impacts would be long-term minor adverse, and alternative 5 would contribute a small amount to the overall adverse cumulative impacts.	Alternative 6 would result in long-term minor to moderate adverse impacts on wolves in the park because OSV use would increase to relatively high use levels, which would increase the frequency of OSV encounters with wolves and the duration of OSV presence. The unguided snowmobile provision may result in improper behavior and decreased approach distance of OSV users when encountering wolves. Cumulative impacts would be long-term minor to moderate adverse and alternative 6 would contribute a noticeable amount to the overall adverse cumulative.	Alternative 7 would result in short- and long-term negligible to minor adverse impacts on wolves in the park because OSV use would be limited to current use levels, which would reduce the frequency of OSV encounters and limit the duration and approach distance of OSV users due to guiding requirements. Cumulative impacts would be long-term minor adverse, and alternative 7 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 negligible adverse. Cumulative impacts would result in long-term minor adverse impacts on air quality.	The effect of alternative 2 on air quality would be long-term minor adverse. The effect of alternative 2 on visibility would be long-term negligible adverse. Cumulative impacts to air quality and visibility would be long-term minor adverse.	The effect 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 to air quality and visibility would be long-term minor adverse.	The effect of alternative 4 on air quality would be long-term minor adverse. The effect of alternative 4 on visibility would be long-term minor adverse. Cumulative impacts to air quality and visibility would be long-term, minor adverse.	The effects of alternative 5 on air quality would be long-term minor adverse. The effect of alternative 5 on visibility would be long-term negligible adverse. Cumulative impacts to air quality and visibility would be long-term minor adverse.	The effect of alternative 6 on air quality would be long-term minor adverse. The effect of alternative 6 on visibility would be long-term negligible adverse. Cumulative impacts to air quality and visibility would be long-term minor adverse.	The effect of alternative 7 on air quality would be long-term minor adverse. The effect of alternative 7 on visibility would be long-term negligible adverse. Cumulative impacts to air quality and visibility would be long-term minor adverse.

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Soundscapes	The effects of alternative 1 on soundscapes would be long-term, minor to moderate, and adverse due to administrative OSV use. Moderate impacts would be limited to travel corridors. Cumulative impacts to soundscapes would be long-term, minor and adverse.	The effects of alternative 2 on soundscapes would be long-term, moderate and adverse due to the level of OSV use permitted. Cumulative impacts to soundscapes would be long-term, moderate and adverse.	The effects of alternative 3 on soundscapes would be long-term, moderate to major and adverse. Major impacts would be limited to the travel corridor, due to the increased level of OSV use. Cumulative impacts to soundscapes would be long-term, moderate to major and adverse.	The effects of alternative 4 on soundscapes would be long-term, moderate and adverse, due to the permitted level of OSV use. Cumulative impacts to soundscapes would be long-term, moderate and adverse.	The effects of alternative 5 on soundscapes would be long-term, moderate and adverse, both before and after the phase out to snowmobiles only. Cumulative impacts to soundscapes would be long-term, moderate and adverse.	The effects of alternative 6 on soundscapes would be long-term, moderate to major, adverse representing the range between low and high use days under alternative 6. Cumulative impacts to soundscapes would be long-term, moderate to major and adverse.	The effect of alternative 7 on soundscapes would be long-term, moderate adverse. Cumulative impacts to soundscapes would be long-term, moderate and adverse.
Visitor Use and Experience	Restricting winter access to the interior of the park by non-motorized means would result in long-term major adverse impacts on the visitor use and experience. 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 in accordance with the 2009 interim rule limits would meet recent demand for winter visitation and provide limited opportunities for growth. Both motorized and non-motorized winter users would experience the benefits of continued access to the park's interior. Resource conditions (i.e., wildlife, soundscapes, and air quality), which support a quality visitor experience, would experience long-term negligible to moderate adverse effects. Therefore, alternative 2 would result in long-term benefits to visitor use and experience. Cumulative impacts to visitor use and experience under alternative 2 would be long-term and beneficial.	Under alternative 3, increasing OSV numbers and allowing access in accordance with the 2004 plan limits would provide opportunities for OSV users to experience Yellowstone in the winter, and would allow for some growth in OSV use as compared to what was observed between 2004 and 2009. Both motorized and non-motorized winter users would experience the benefits of continued access to the park's interior, but all users could experience a decrease in satisfaction because resources could be impacted by increased OSV use. Resource conditions (i.e., wildlife and soundscapes) would be affected to a greater extent than in recent years and may affect the ability to view wildlife and experience natural sounds. Overall, alternative 3 would result in long-term benefits to visitor experience and access, with long-term minor adverse impacts occurring from any decrease in visitor satisfaction. Cumulative impacts to visitor use and experience under alternative 3 would be long-term and beneficial.	Under alternative 4, changes in visitor access and experience created by introducing wheeled vehicles access and limiting OSV access would result in a distinctively different winter visitor experience. Parkwide, long-term beneficial impacts would result compared with alternative 1. Both motorized and non-motorized winter users would experience the benefits of continued access to the park's interior. However, expectations for OSV access and experience would not likely be met because of the decrease in the number of snowmobiles and snowcoaches permitted in the park on any given day, resulting in long-term moderate adverse impacts for this user group. Overall, alternative 4 would result in long-term beneficial impact and long-term minor to moderate adverse impacts to visitor experience and access. Cumulative impacts to visitor use and experience would be long-term minor to moderate adverse and long-term beneficial.	Under alternative 5, changes in visitor experience created by the potential 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 a specific, individual snowmobile experience as offered in the past would be lost. This would result in the potential for visitors' expectations not to be met. Overall, alternative 5 would result in long-term beneficial impacts to visitor experience and access, with long-term moderate adverse impacts to those wishing to engage in snowmobile use. Cumulative impacts to visitor use and experience would be long-term beneficial and long-term moderate adverse.	Under alternative 6, increases in OSV allocations and flexibility in daily use would result in parkwide, long-term beneficial impacts 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, and visitors could plan their trip around the use level for that day and their desired experience. Resource conditions (e.g., wildlife and soundscapes) would be affected to a greater extent than in recent years, somewhat affecting the visitors' ability to view wildlife and experience natural sounds. Overall, alternative 6 would result in long-term benefits to visitor experience and access, with potential negligible to minor impacts for visitors that cannot accommodate their desired experience. Cumulative impacts would be long-term minor adverse as well as long-term beneficial.	Under alternative 7, varying OSV allocations and flexibility in daily use would result in parkwide, long-term beneficial impacts compared to the no-action alternative. Visitors could plan their trip around desired use and experiences, but limited OSV availability early and later in the winter season may result in unmet expectations for OSV visitors. Resource conditions (soundscapes and wildlife) would be affected to a lesser extent than in recent years, somewhat improving visitors' ability to view experience natural sounds and view wildlife. Overall, alternative 7 would result in long-term benefits to visitor experience and access, with potential minor to moderate adverse impacts for visitors that cannot obtain their desired experience. Cumulative impacts would be long-term, minor to moderate, adverse, as well as long-term beneficial.

	Alternative 1: No Action - No Snowmobile / Snowcoach Use	Alternative 2: Continue Snowmobile / Snowcoach Use at 2008 Plan Limits	Alternative 3: Return Snowmobile / Snowcoach use to 2004 Plan Limits	Alternative 4: Mixed Use: Snowcoaches, Snowmobiles, and Road Plowing for Wheeled Vehicles	Alternative 5: Transition to BAT Snowcoaches Only Based on User Demand	Alternative 6: Implement Variable Management	Alternative 7: Provide a Variety of Use Levels and Experiences for Visitors (Preferred Alternative)
Visitor Accessibility	Restricting winter access to the interior of the park to non-motorized methods would result in long-term major adverse impacts to visitor accessibility; including the very young, the elderly, and the mobility-impaired visitors. Accessible regional opportunities for winter recreation would offset these adverse impacts somewhat. Cumulative impacts to visitor accessibility would be long-term major adverse, to which alternative 1 would contribute a large part.	Under alternative 2, continuing OSV numbers and routes in accordance with the 2009 interim rule limits would meet demand (based on use levels for the 2009/2010 winter season) for accessible winter visitation for the very young, the elderly, and the mobility impaired. Opportunities for increased visitation for those with mobility needs would also be accommodated. Thus, alternative 2 would result in long-term beneficial impacts to visitor accessibility. Cumulative impacts under alternative 2 would be long-term and beneficial.	Under alternative 3, OSV numbers and routes in accordance with the 2004 Winter Use Plan limits would meet the demand (based on use levels for the 2009/2010 winter season) for a winter experience that can be enjoyed by the very young, the elderly, and the mobility impaired. Opportunities for increased accessible visitation would also be accommodated. Therefore, alternative 3 would result in long-term benefits to visitor accessibility. Cumulative impacts under alternative 3 would be long-term and beneficial.	Under alternative 4, distinct accessibility options of snowcoaches, snowmobiles, and wheeled vehicles would be available for exploring Yellowstone in winter. However, accessible snowcoach experiences may not be available to all seeking them. Nonetheless, the availability of wheeled, accessible vehicles would potentially provide the greatest degree of accessibility of the proposed alternatives. This would result in parkwide, long-term beneficial impacts to accessibility when compared to the no-action alternative, with the potential for long-term minor adverse impacts due to the limited availability of snowcoach access. Cumulative impacts would be long-term beneficial.	Under alternative 5, changes in visitor experience created by the potential transition to snowcoach access only would result in parkwide, long-term beneficial impacts compared to the no-action alternative. For those seeking snowmobile experiences, impacts would be long-term, minor to moderate adverse. Cumulative impacts would be long-term and beneficial.	Under alternative 6, total snowcoach allocations would be similar to those in the 2009/2010 winter season. Flexibility in routes and gate entry numbers would potentially increase accessible snowcoach use. This would result in parkwide, long-term beneficial impacts to accessibility compared to the no-action alternative. Cumulative impacts would be long-term and beneficial.	Under alternative 7, OSV allocations would vary within the winter use season, and would be expected to support current and future accessibility demands. This would result in parkwide, long-term beneficial impacts to accessibility compared to the no-action alternative. Cumulative impacts would be long-term and 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 to health and safety would be long-term negligible adverse and long-term beneficial to health and safety, 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 to 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 to 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.	Under alternative 4, impacts to 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. Cumulative impacts would be long-term negligible adverse.	Under alternative 5, impacts to 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, both before and after the transition to snowcoach only. Cumulative impacts would be long-term minor adverse.	Under alternative 6, impacts to 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 to moderate adverse from user conflicts and exposure to the elements. Cumulative impacts would be long-term minor adverse.	Under alternative 7, impacts to 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 2008 Plan Limits	Alternative 3: Return Snowmobile / Snowcoach use to 2004 Plan Limits	Alternative 4: Mixed Use: Snowcoaches, Snowmobiles, and Road Plowing for Wheeled Vehicles	Alternative 5: Transition to BAT Snowcoaches Only Based on User Demand	Alternative 6: Implement Variable Management	Alternative 7: Provide a Variety of Use Levels and Experiences for Visitors (Preferred Alternative)
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. 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 continues current 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 result in negligible to beneficial, long-term impacts for the states, counties and communities surrounding Yellowstone. West Yellowstone could experience larger beneficial, long-term impacts compared to the other communities. Alternative 3 has higher daily limits on snowmobile and snowcoach use, and so the alternative could accommodate higher growth in visitation than all the alternatives, except alternative 4. If demand for snowmobile and snowcoach tours grew beyond the current limits, alternative 3 would allow for a larger increase in visitation by out-of-region visitors. However, the lower estimate of visitation is equal to alternative 2 because the snowmobiles must still be part of a guided tour and must meet BAT restrictions. Cumulative impacts would be long-term beneficial.	Compared to alternative 1, all the communities are expected to experience beneficial, long-term impacts and West Yellowstone is expected to experience the largest beneficial impacts. The impacts of these past, present, and reasonably foreseeable future actions, combined with the long-term beneficial impacts of alternative 4 would result in long-term beneficial cumulative impacts on the socioeconomic environment. The size of the impacts would depend on demand for commercial, wheeled vehicle tours out of the west and north entrances, which would represent a new winter experience for visitors. Cumulative impacts would be long-term beneficial.	Compared to alternative 1, alternative 5 is expected to have on average beneficial, long-term impacts for all the communities, as seen in tables 65, 66 and 67. In order to generate larger beneficial impacts under this alternative, demand for snowcoach tours must increase to more than make up for the eventual phase-out of snowmobiles. Cumulative impacts would be long-term beneficial.	Compared to alternative 1, alternative 6 could provide beneficial, long-term impacts for all the communities, the three-state area, and the five-county area. West Yellowstone could experience larger, beneficial long-term impacts, on average, as reported in tables 65, 66 and 67. The larger beneficial impacts are more likely under this alternative compared to others because of the provision for unguided snowmobile trips, which were historically more popular. Cumulative impacts would be long-term beneficial.	Compared to alternative 1, alternative 7 could provide beneficial, long-term impacts for the three-state area, the five-county area, and the three communities. West Yellowstone could reach larger, beneficial, long term impacts, on average, as reported in tables 65, 66 and 67. Cumulative impacts would be long-term beneficial.

	Alternative 1: No Action - No Snowmobile / Snowcoach Use	Alternative 2: Continue Snowmobile / Snowcoach Use at 2008 Plan Limits	Alternative 3: Return Snowmobile / Snowcoach use to 2004 Plan Limits	Alternative 4: Mixed Use: Snowcoaches, Snowmobiles, and Road Plowing for Wheeled Vehicles	Alternative 5: Transition to BAT Snowcoaches Only Based on User Demand	Alternative 6: Implement Variable Management	Alternative 7: Provide a Variety of Use Levels and Experiences for Visitors (Preferred Alternative)
Park Operations and Management	Alternative 1 would have long-term negligible adverse impacts to 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 green house gas emissions would be reduced from current levels because the number of staff needed in the interior of the park, and therefore OSV use, would be reduced. Cumulative impacts under alternative 1 would be long-term, negligible to minor 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 would be similar to those currently funded, and this level of funding would be expected to continue. 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, of which alternative 2 would constitute a large part.	Alternative 3 would result in long-term minor to moderate adverse impacts because the staffing and resource requirements would require additional funding that may or may not be available in the park's annual budget. Any additional resources required may impact park operations and could be slightly noticeable to park staff and visitors when resources are allocated from one part of the park to another. Cumulative impacts under alternative 3 would be long-term minor to moderate adverse, of which alternative 3 would constitute a large part.	Alternative 4 would result in long-term negligible to minor adverse impacts to park operations and management because the staffing and resource requirements for implementation of the alternative would likely be met with existing funding sources. Additional requirements (one-time costs) of this alternative 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 4 would be long-term negligible to minor adverse, of which alternative 4 would constitute a large part.	Alternative 5 would result in long-term negligible to minor adverse impacts to park operations and management because the staffing and resource requirements for implementation of the alternative would likely be met with existing funding sources. Additional requirements (one-time costs) of this alternative as well as the slight increase in funding required over current conditions 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 5 would be long-term negligible to minor adverse, of which alternative 5 would constitute a large part.	Alternative 6 would result in long-term negligible to minor adverse impacts because the staffing and resource requirements would be similar to those currently funded (if not slightly lower), and this level of funding expected to continue. 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 6 would be long-term negligible to minor adverse, of which alternative 6 would constitute a large part.	Alternative 7 would result in long-term negligible to minor adverse impacts because the staffing and resource requirements would be similar to current funding (if not slightly lower), and this level of funding would be expected to continue. 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 7 would be long-term negligible to minor adverse, of which alternative 7 would constitute a large part.

CHAPTER 3

Affected Environment

CHAPTER 3: AFFECTED ENVIRONMENT

The "Affected Environment" describes 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 value 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

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

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 et al. 1999). Species, such as 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 wildlife that are active during the winter months. Many species of wildlife that spend the winter in the park would be adversely impacted to a negligible to minor level by OSV use. Some of these species have winter ranges primarily outside of park boundaries, or in areas of the park not subject to OSV use, are rarely exposed to OSVs, and 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 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 has conducted annual winter wildlife monitoring observation studies along motorized OSV routes from winter 1999 to winter 2009. The studies focused on 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 et al. 1992). Many studies also looked at the relation of groomed roads to the movement of bison.

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, behavioral, displacement, and population-level responses to OSVs by lynx and wolverines are based on research observations in available literature regarding the amount of human disturbance, roads, and motorized vehicle use tolerated in habitat used by these species. 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. This winter plan focuses primarily on OSV use in the park, and OSV related disturbance on

wildlife is of primary concern in this analysis. The following overview is supplemented by the Scientific Assessment of Yellowstone National Park Winter Use Report.

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 OSVs passing by or stopping on groomed roads. 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 (White et al. 2008; Borkowski et al. 2006; Bruggeman et al. 2007; Bruggeman et al. 2006; White et al. 2006). Four of these studies (Borkowski et al. 2006; Bruggeman et al. 2007; Bruggeman et al. 2006; White et al. 2006) 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. (2008) included 5,688 observations of wildlife/OSV and OSV user encounters between 2002 and 2006.

In ascertaining the effects of winter recreation on wildlife, understanding whether an individual animal has habituated to human disturbance compared to being 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 energetic 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 energetically to respond, need to remain in an area to avoid predation risks or competition, or if there are no suitable habitats nearby in which to move (Gill et al. 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 et al. 2009). Further, many factors condition an animal's responses to disturbance, often obscuring the distinction between habituation and tolerance. The decision of an animal to move from a disturbed area is based on a number of factors including the quality of the site occupied, distance to and quality of other sites, relative risk of predation or competition, dominance rank, and investment a given individual has made in its current site (Gill et al. 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 rarely demonstrated active responses to OSV and associated human presence (table 13). 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. 2008). Bison have been documented to be least likely to react to OSV-related disturbances during winters with greatest visitation, possibly suggesting habituation to high-intensity winter use (White et al. 2008). In contrast, elk did not appear to habituate to the repeated presence of skiers (Cassirer et al. 1992).

TABLE 13: OBSERVED RESPONSES OF WILDLIFE TO OSV USE

	Bison		Elk		Trumpeter Swans	Bald Eagles
Observed Response	Borkowski et al. 2006	White et al. 2008	Borkowski et al. 2006	White et al. 2008	White et al. 2008	White et al. 2008
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%

Studies suggest that most of the individual wildlife observed in Yellowstone, including bison, elk, trumpeter swans, bald eagles, and coyotes, respond to OSV activities 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. 2008). 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. 2006; White et al. 2008). In most cases, more active responses require greater energy, reducing the amount of energy available to an animal for winter survival (Parker et al. 1984; Cassirer et al. 1992).

Collectively, all species observed in Yellowstone exhibited non-travel responses (no response, look-resume, alert response) to human activities at least 90% of the time (table 13). All species demonstrated active responses (travel, flight, defensive) less than 10% of the time. Defensive responses (charging) to OSV-related human activities were rare (Borkowski et al. 2006; McClure et al. 2009; White et al. 2008).

White et al. (2008) assessed the relationship between wildlife behavioral responses and factors including wildlife group size or distance from road, interaction time, number of snowmobiles or snowcoaches, type of habitat, and cumulative winter OSV traffic. For bison, elk, swans, and bald eagles, 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. The odds of a movement response by wildlife increased with larger OSV group size, longer interaction time, direct approaches by OSV users, or specific habitat-species combinations (White et al. 2008).

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. Creel's analysis from one season showed that GC levels in elk were significantly higher during the snowmobile season than during wheeled vehicle season, after controlling for the effects of age and snow depth (Creel 2002). Based on the data used in the Creel study, Hardy (2001) found that data from winter

2000 showed no obvious trends between daily OSV traffic and GC levels in elk (Hardy 2001; Borkowski eat al. 2006). 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 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 2006). Also, this study took place prior to OSV guiding requirements and the introduction of wolves in Yellowstone, both of which may have affected GC levels.

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. 2008; Plumb et al. 2009).

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 et al. 2007; Wagner 2006; Bruggeman et al. 2007; White et al. 2008). The data from these studies provides no evidence that OSV use has adversely affected the demography or population dynamics of the wildlife studied relative to other, more important factors including the reintroduction of wolves, vegetation succession following the 1988 fires, and annual variation in snow pack and winter weather (Garrott et al. 2009; also see the Scientific Assessment of Yellowstone National Park Winter Use).

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 large herds of females and calves, with bulls lingering on the outside of the group. A healthy bull bison stands 6 feet at the withers and weighs about 2,000 pounds (one 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, 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 et al. 2009).

The Yellowstone bison population generally consists of a central herd and a northern herd, but the herds do intermingle. The ranges for both bison and elk are shown in figure 7. The central herd is generally found either in the Lamar or Hayden valleys during summer and moves to the Firehole River drainage, Madison headwaters, or Madison Valley meadow complexes during the winter. Alternatively, the herd may also travel north to meadow complexes historically used by the northern herd. The central herd's range experiences harsh winter conditions, with temperatures down to -42°C and heavy snows, and winter foraging habitat is shared with 100 to 600 elk. Bison from the northern herd are found almost exclusively in the Lamar Valley during summer, and move down an elevation gradient to the Blacktail Deer Plateau and Gardiner Basin meadow complexes as winter progresses. The northern herd's range is generally lower, warmer, and drier than the central herd's range and is shared with about 6,070 elk, as counted during winter aerial surveys in 2010. Currently about 60% of Yellowstone's winter bison population inhabits the northern range, and the remainder winters in the central range (NPS 2010e; Plumb et al. 2009).

FIGURE 7: RANGES FOR BISON AND ELK

Winter is a difficult time for many species, and historically 9% to 10% of bison die due to increased stress under winter conditions. 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 et al. 1986; Green et al. 1997; Smith et al. 1998).

Historical and Current Park Management of Bison

Bison

Bison management practices in the greater Yellowstone area have progressed through several phases since the park's inception, including intensive husbandry operations, herd control, "natural regulation" policy, 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 report (2005), available at http://www.nps.gov/yell/naturescience/gatesbison.htm. Long-term data indicate that the population of bison in the park has steadily 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 (Gates et al. 2005; Wallen 2008). A recent aerial survey of Yellowstone bison, conducted in summer 2010, estimated a total population of about 3,900 animals (NPS 2010e). 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 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 and severe winters have been the primary causes of bison mortality in the park. The risk of brucellosis (a contagious bacterial disease associated with spontaneous abortion in cattle) 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 Adaptive Adjustments to the Interagency Bison Management Plan (IBMP) in 2008, providing adjustments to the 2000 Final Environmental Impact Statement/plan for bison management. Management measures from the 2000 IBMP included hazing bison back into the park; capture, brucellosis testing, and 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 the Flats each winter and during spring calving season. Controls include hazing bison back into the park in 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 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. The Adaptive Adjustments to the IBMP (NPS 2008a) calls for an increase in bison vaccinations via National Environmental Policy Act processes resulting in completion of the Brucellosis Remote Vaccination Program for Bison Environmental Impact Statement (EIS). The EIS and National Environmental Policy Act process will be used to determine active management practices used during implementation of the Brucellosis Remote Vaccination Program for Bison EIS. The proposed Brucellosis Remote Vaccination Program for Bison is designed to protect Yellowstone bison by reducing brucellosis infections and, ultimately, to further reduce risk of transmission to cattle outside the park. The purpose of remote delivery vaccination is to deliver a low risk, effective vaccine to eligible bison inside the park to (1) decrease the probability of bison shedding *Brucella abortus,* (2) lower the brucellosis infection rate, and (3) increase public tolerance for bison on essential winter ranges in Montana.

Behavioral Reponses of Bison to Winter 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

Implementation of mandatory guiding has substantially reduced wildlife-visitor conflicts. Trained 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).

Studies have examined the reactions of bison to OSV users in the park over recent years. White et al. (2008) and Borkowski et al. (2006) reported that OSV use caused active movement responses in less than 10% of individual bison observed; 80% showed no apparent response. Behavioral monitoring from winter 1999 to winter 2009 indicates that bison demonstrated no visible response to OSVs 85% of the time, with active responses, including travel, alarm-attention, and flight, observed during about 3% of interactions. “Look-resume” vigilance responses composed the remaining 11% 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.

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. (2008) report that human disturbance associated with OSVs did not appear to be the 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 lasting influence on the pattern of bison distribution. The data suggest that individual bison are sometimes disturbed by winter use in the park as indicated by movement responses 8% to 10% of the time, and look-resume response behavior. Based on monitoring, these individual-level disturbances have not affected natural abundances, diversities, dynamics, distributions, or behaviors of populations (Bruggeman et al. 2006; Borkowski et al. 2006; White et al. 2006; White et al. 2008; Plumb et al. 2009).

Bison Use of Groomed Roads on 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 oversnow travel by winter visitors is concentrated.

Historically, the bison winter range included the Lamar Valley, Pelican Valley and Mary Mountain (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 suggested that groomed roads directly contribute to an increased bison population and observed changes in bison range distribution by providing energy-efficient travel corridors. Meagher asserts 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. Meagher hypothesizes 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. Meager argues that road use by bison is particularly important during stress-induced, exploratory dispersal. Based on research observation, Meagher believes that the availability of groomed routes may influence whether bison travel and may direct bison movements by providing an energy efficient route of travel (Meagher 1989, 1993, 1998. (See also discussions of Meagher's research in NPS 2000b:143-147, 2003d:117-120, 2004a:80-81.)

Recent publications assert that road grooming is less important to 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). Instead, the publications attribute bison population growth to a natural increase in population following the cessation of active culling and management by the NPS. As population density increased, bison traveled outside the historical central range in search of forage, due to the limited availability of forage in their historic ranges in Hayden and Pelican valleys, in the interior of the park. The requirement for increased nutritional intake due to higher population density and bison's innate ability 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, pulses of winter bison movements from the central to northern parts of the park may have started in 1982 (Coughenour 2005; Fuller et al. 2007), but these movements became more common and included greater numbers of bison after 1996 (NPS 2008a).

Meagher's 1993, 1998, and 2001 articles and Coughenour's 2005 report 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 et al. 2007; Coughenour 2005; Taper et al. 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 et al. 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 road 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 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 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 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).

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). Although populations have fluctuated between 20,000 and 30,000, since 1980 populations have dropped. This is likely due to predation by grizzly bears and wolves, regulated human harvest of un-antlered elk north of park boundaries that has historically taken up to 10% of the herd annually, mortality during the harsh winter of 1997, and drought effects on pregnancy and survival (Vucetich et al. 2005; White and Garrott 2005; Eberhardt et al. 2007).

Historic and Current Park Management of Elk

Elk

More than 20,000 elk from seven to eight different herds summer in Yellowstone and up to 10,000 winter in the park, making elk the most abundant large mammal in Yellowstone. Another 50,000 to 60,000 elk inhabit the greater Yellowstone area, forming 10 to 12 separate herds. Elk choose habitat based on the correct 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. Winter range is limited by lower elevation and snow depth and is much smaller. Elk depend on thermal areas with snow-free vegetation and shallow snow cover for winter habitat along the Madison, Firehole, and Gibbon rivers (Craighead et al. 1973). The Madison headwaters elk herd is especially dependent on these areas for overwinter survival (Ables and Ables 1987). Like bison, elk use geothermal sites extensively during the winter for forage, due to minimal or reduced snow cover.

Elk play an important role in the ecology of the Yellowstone area. Winter-death 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% of the diet of gray wolves. Newborn or young elk are often killed and consumed by grizzly bears (Swensen et al. 1986; Smith et al. 1998; Barber et al. 2005). Elk are the most abundant larger grazers in Yellowstone. 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.

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Elk in the non-migratory Madison headwaters herd are exposed to high levels of OSV use, but there is no indication of effects on the population. 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 et al. 2009). Before the introduction of wolves to the park, female elk had a 90% annual survival rate, with healthy recruitment and high birth and survival rates of calves (Garrott et al. 2003).

Overall, elk range has remained stable throughout periods of OSV use in the park, and there is no evidence that elk populations and movements are affected by winter use. Elk are not observed to use groomed roads as travel corridors to the same extent as bison. However, as discussed previously in the recent research section, individual elk can occasionally be visibly bothered by OSV travel, demonstrated by increased attention/alert or active movement/fleeing (Hardy 2001; Bjornlie 2000; White et al. 2006). Studies reported in Borkowski et al. (2006) and White et al. (2008) indicate that 48% of individual elk had no apparent response to OSV use, 27%–32% exhibited a "look–resume" response, 12%–17% "alert," 5%–6% "travel," and 2% "flight." Most interactions between OSV users and elk occur in the northern range, along the groomed road corridors used by OSVs. In this area, the primary winter range is along the Firehole, Gibbon, and Madison rivers between the Norris Geyser Basin, Old Faithful, and West

Yellowstone, Montana. Major areas of geothermal activity, including Midway, Norris, and Old Faithful, and many other smaller geothermal areas, produce ice-free rivers and pockets of snow-free forage, where bison and elk congregate throughout the winter (Borkowski et al. 2006).

There is some evidence that elk were displaced approximately 60 meters 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.

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 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).

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Lynx are rarely found in Yellowstone and accurate historical population records are limited. Potential habitat for lynx is shown in figure 8. A total of 73 lynx sightings or tracks were reported in Yellowstone from 1887 to 1993, but the reliability of such reports is not guaranteed (Yellowstone National Park files; Consolo-Murphy and Meager 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; Murphy et al. 2006). 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 that lynx are primarily found in the east sector of the park. Lynx are also occasionally sighted in other areas of the park. Lynx were spotted at Indian Creek (just south of Mammoth) and in the Beryl Springs area (between Norris and Madison). Both times, the lynx were traveling near a snow road.

FIGURE 8: LYNX HABITAT IN YELLOWSTONE NATIONAL PARK

Data on lynx-human encounters suggest that lynx are generally tolerant of continued human presence, human scent, disturbance, and agricultural or housing development (Brand and Keith 1979; Fortin and Huot 1995; Staples 1995; Aubry et al. 1999). Mowat et al. (1999) states 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 ideal habitat and reduced prey availability compared to that available to lynx the boreal forests of Canada and Alaska. Observations in Washington found that logging and U.S. Forest Service roads that were little used in the summer but frequently used by snowmobiles in the winter and roads less than 15 meters 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. Many lynx are reported to have been killed by automobiles in other parts of the country and in Canada (Brocke et al. 1992; Weaver 1993; Staples 1995; Gibeau and Heuer 1996; Halfpenny et al. 1999; Murphy et al. 2006). There have been no reported lynx strikes in the greater Yellowstone area as of 2003 (Murphy et al. 2006). Thus, wide paved roads and those with higher traffic volume appear to have the most influence on lynx movements and habitat use.

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 et al. (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 authors found that lynx show a greater preference for higher elevations than coyotes. This also indicates that they prefer areas of the park not subject to winter use, because most OSV routes, except the Sylvan Pass area, occur at lower elevations in the park.

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 may 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 east sector 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 snow roads 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, and their 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 in the north-central area of the park would be traveling from one area of prime habitat to another for dispersal or breeding purposes. These travels are 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.

WOLVERINE (*GULO GULO*)

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.

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, 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. As of 2001, there were six studies published on North American wolverines, with only two in the United States (Heinemeyer et al. 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). Currently, this potential listing determination remains under review (USFWS 2010c).

Wolverines rely on carrion as a food source but are also known to prey on large ungulates (Magoun 1983), and snowshoe hare and ground squirrel in areas of Alaska and the Yukon (Gardner 1985; Banci 1987). In the Yellowstone area, researchers found that wolverines primarily fed 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. Marmots and ungulates are consumed 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 also contains suitable denning habitat. Wolverine tracks were seen on Sylvan Pass during the winter of 2009 (Sacklin, pers. comm., 2010).

The Abrasoka-Beartooth Wolverine Project was initiated in 2005 in collaboration with the NPS, to research wolverine ecology and provide a baseline for future research on wolverine ecology in the greater Yellowstone area. To date, four wolverines have been 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. The movements of those that were captured were tracked. One wolverine's home range was in the southeast corner of the park, and another overlapped this same area, with it home range also extending southwest of park boundaries. The two other wolverine home ranges were respectively north and south of park boundaries (Abrasoka-Beartooth Wolverine Project newsletter Spring 2009, 2008, 2007, 2006, available at http://www.wolverinefoundation.org/research/absaroka.htm).

The Greater Yellowstone Wolverine Program, established by the Wildlife Conservation Society (WCS), has conducted extensive research on wolverines in the greater Yellowstone area, with good capture success. During extensive trapping efforts from 2001 to 2007, 28 wolverines 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, and female wolverines had an average home range size of 453 square kilometers. Of the 28 wolverines captured and collared, 17 were females. Females give birth in mid-February to only 1 kit every 2.5 years. Seven females denned up and gave birth to young, with 6 using designated wilderness areas; one den 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 are 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, unpublished data). Yellowstone OSV use peaks in the morning, early afternoon, and late afternoon, likely corresponding with active periods for wolverines.

The WCS also conducted research on wolverine road crossing patterns and occurrence in Greater Yellowstone, focusing on a crossing near the Henry Lakes Range at Earthquake Lake (US287) 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 (Pullianian 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. Due to lack of any apparent habituation of the animals in the Yellowstone region, as inferred by the general elusiveness of the animals, rarity of sightings, and GPS tracking studies that indicate wolverines avoid roads, and areas of human development (Wildlife Conservation Society 2008), it can be inferred that human presence and sounds during the winter are generally negative for wolverines. 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.

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 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).

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 numbers about 14 swans, with fall migratory populations numbering as high as 500. 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 et al. 2010). The winter habitat of swans and eagles is shown in figure 9.

The resident Yellowstone trumpeter swan population is considered at risk, due to decreasing numbers of swans and cygnets from 1961 to present. Population numbers are currently so low in the park that any area with a nesting pair could be closed to the public until August 15, after the critical rearing stage has passed (Baril and Smith 2009). Surveys in 2009 counted 144 swans during midwinter, and 4 adults and no cygnets in autumn. This is the lowest number of swans documented in the park since 2000, and indicates a 73% decline in population over the last nine seasons (2001 is excluded; Proffitt et al. 2009). Proffitt et al. (2009) report that the estimated abundance of resident trumpeter swans in the park has ranged from 59 individuals in 1968 to a low of 10 in 2007. Studies suggest that actions outside of the park, including supplemental feeding programs and draining of wetlands, caused decreases in the resident swan population. Density-dependent factors including competition with either migratory or resident swans did not appear to affect population dynamics of resident swans. Instead, growth rates decreased following severe winters, wetter springs, and warmer summers. The decrease in Yellowstone's resident swan population, therefore, appears to be highly dependent on actions outside the park (Proffitt et al. 2009).

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. More than 53% of nest attempts failed to raise any young, which researches attribute to predation and early season flooding (Proffitt et al. 2009). 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).

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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. (2006, 2008) report on the results of winter monitoring that occurred in the park from 2002 to 2006. Trumpeter swan responses to OSVs were characterized as 57% "no apparent response," 21% "look-resume," 12% "alert," 9% "travel," and 1% "flight." In 2009 winter wildlife monitoring (McClure et al. 2009), 80% of trumpeter swans had no reaction to OSVs, 11% responded with "look-resume," 8% " travel," and 0.5% "alarm-attention." No swans had a flight response. As with other species, 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.

FIGURE 9: EAGLE AND SWAN WINTER HABITAT

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

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 OSV is no longer a presence in greater Yellowstone area parks (Stalmaster and Kaiser 1998; Steidl and Anthony 2000; Gonzalez et al. 2006; Olliff et al. 1999) (NPS 2008a). A site along the Madison River, less than 100 meters 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).

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 Migratory Bird Treaty Act.

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 1999; Swensen et al. 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 9. Bald eagles also feed on carrion, upland small game 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. In 2007, the park had 34 nesting pairs of bald eagles, which produced 26 eaglets, with 19 nesting pairs producing 7 eaglets in 2008 (Baril and Smith 2009). Bald eagle surveys in 2009 found 15 occupied eagle nests, 40% of which successfully fledged a total of 8 eaglets. 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. 2008; also see the Scientific Assessment of Yellowstone National Park Winter Use). The overall eagle population in the park has remained relatively stable; all 9 nests around Yellowstone Lake were unsuccessful in fledging any young in 2009, whereas the 6 nests in other areas of the park successfully reared a total of 8 eaglets. Surveyors attributed this to human disturbance, climate change, a reduction in cutthroat trout populations, and other unidentified variables (Baril et al. 2010). In 2009, productivity per nesting female (the number of young successfully fledged per nesting female), was 0.53, a decrease from the average productivity of nesting bald eagles in Yellowstone over 26 years, which was 0.68 young per nesting female (Baril et al. 2010). This 26-year average productivity is slightly lower than the 0.70 average productivity necessary to maintain a stable population in the park. Thus, bald eagle populations are likely to gradually decline (Baril et al. 2010).

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

Eagle Nesting in Yellowstone

White et al. (2008) 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 of the nest, successfully fledged young in 2001. Buffer areas of 400 to 800 meters have been recommended where watercraft or vehicles are not permitted to stop (Stalmaster and Kaiser 1998; Grubb et al. 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, 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 no-stop buffer for all eagle nests (White et al. 2006).

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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 by disturbed eagles. 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*)

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).

Historically found throughout North America, gray wolves were extirpated from the Yellowstone area by the mid-1930s by hunters and trappers. Wolves were reintroduced into the park between 1995 and 1997 by the USFWS and today, wolves in the Yellowstone area are classified as a non-essential, experimental population by the USFWS, and per the ESA 10(j), are managed in Yellowstone as a threatened population. Wolves in the Yellowstone region primarily prey on elk, which made up 83% 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 prior to denning and in early April, when the most carcasses are available (Green et al. 1997). 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). Figure 10 shows the ranges of Yellowstone wolf packs.

Until 2003, wolf numbers in the park increased following reintroduction. Between 2003 and 2008, density-dependent natural factors, such as fighting between and within wolf packs resulting in wolf mortality, food stress, and mange, caused declines. As of 2009, researchers observed 98 wolves in the park, split into 14 packs with 6 breeding pairs. This is a decline of 23% from 124 wolves in 2008. Despite the decline, the number of breeding pairs did not change (6 in 2008 and 2009). In 2009, pack size ranged from 3 (Lava Creek and Canyon) to 17 (Gibbon Meadows) and averaged 7.1, down from the long-term average of 9.8 wolves/pack. The overall average number of pups/pack in early winter was 1.8 for all packs (including packs that failed to produce pups). For packs that did produce pups, the average was 3.8 pups/pack, also down compared to the long-term average of 4.0 pups/pack (Smith et al. 2010).

Winter researchers monitoring wildlife behavioral responses to OSVs have observed wolves only rarely in 6 years of monitoring, with a total of just 14 sightings as of 2009 that involved OSV-wolf interactions (less than 1% 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 et al. 2005; Smith et al. 2007), 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 et al. 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).

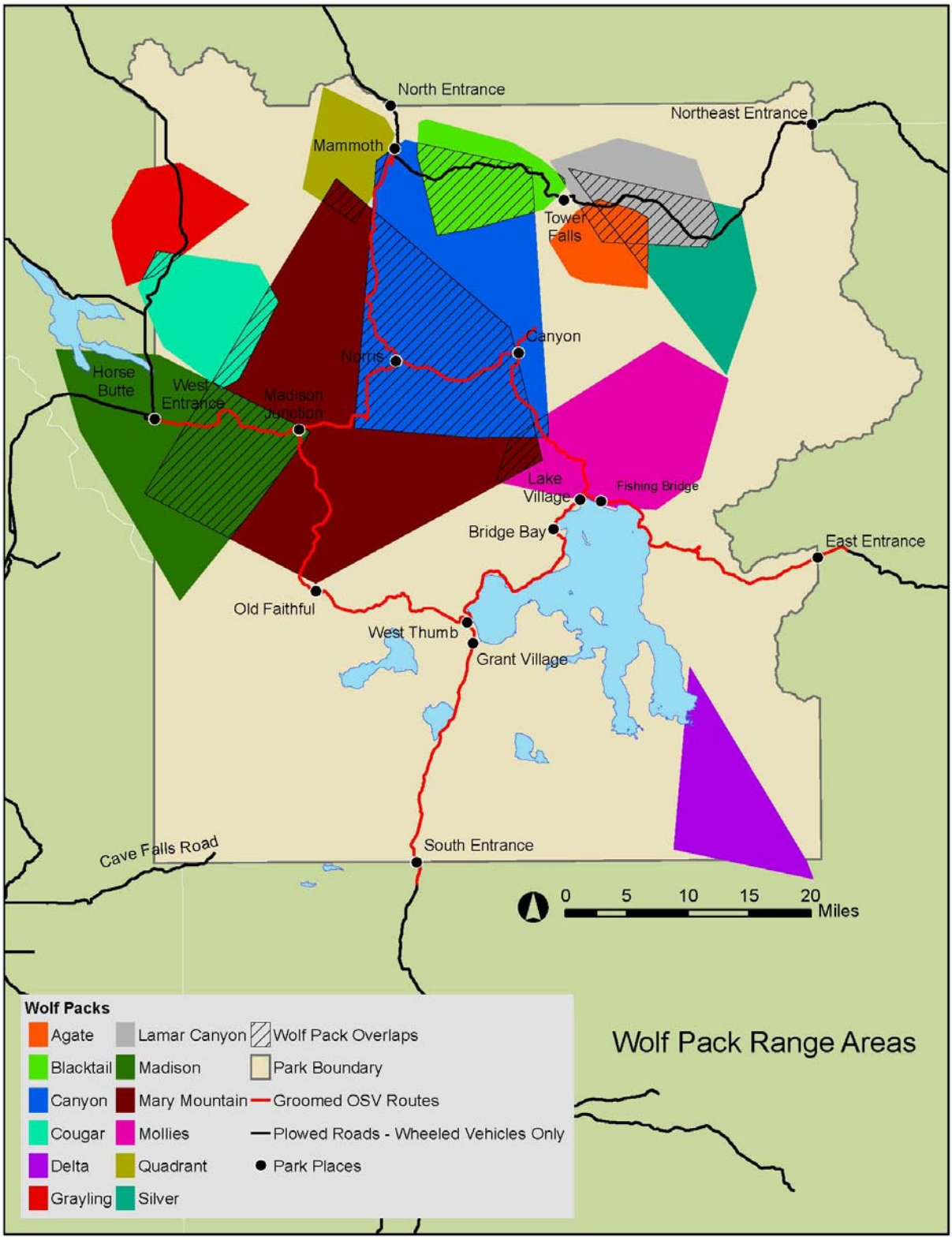


FIGURE 10: WOLF PACK RANGES IN YELLOWSTONE NATIONAL PARK

Human use of roads and avoidance of these areas by wolves may adversely affect wolf hunting success. Wolf hunting success data finds 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.

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.

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. In 2009, the four-member Canyon wolf pack was successfully hazed away from a denning site near Mammoth Hot Springs. Although the pack did not approach humans for food and did not appear to be human food conditioned, the amount of human use in the area and potential for negative interactions between wolves and visitors was a safety concern. After hazing, the pack moved on to its summer range in Hayden Valley. During the previous summer, prior to the hazing events of spring 2009, the wolves had approached vehicles, and were frequently observed traveling on the Hayden Valley road. During the summer of 2009, following hazing, such behaviors were no longer demonstrated by the Canyon wolf pack. The success of hazing with this pack and of other wolf hazing events in the park indicates that hazing is a successful strategy for habituated wolves and effectively stops unwanted behaviors (Smith et al. 2010).

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.). In Yellowstone, the Baseline Year concentrations for PSD are based on the ratio of 1979 snowmobile levels at the modeling locations. Snowmobile traffic in the park increased from 1979 until the early 2000s when the PSD ratio increased, and then decreased to levels less than the late-1970s,

while snowcoach travel steadily increased, almost doubling in 10 years, resulting in a PSD ratio decrease to less than 1 under the 2009 interim rule.

The PSD program includes a classification approach for controlling air pollution. Class I areas are afforded the greatest degree of air quality protection. Yellowstone National Park is classified as Class I area under the CAA PSD program. The PSD regulatory program generally consists of permitting and planning requirements to limit air quality deterioration and to prevent adverse impacts on Air Quality Related Values (AQRVs) in Class I areas. 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). A new major stationary pollution source proposing to locate near a Class I area must apply for a PSD permit from the appropriate regulatory agency, most often the state. The park superintendent, with technical assistance from the NPS Air Resources Division (ARD), then reviews the permit proposal for potential adverse impacts to park resources and provides comments to the permitting authority regarding permit conditions and approval of air pollution emissions from that source (NPS 2011).

The air quality analysis supporting a PSD permit application must analyze the impact of the proposed major source of emissions in comparison to PSD increments. A PSD increment is the maximum allowable increase in concentration that is allowed to occur above a baseline concentration for a pollutant. 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).

Even if the PSD increment is not exceeded, no PSD permit can be issued if the he federal land manager (in this case NPS) determines that the source of the emission will adversely affect the Class I area's AQRVs. Similarly, 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 be issued (NPS 2011). 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:

- **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 at room temperature, becoming a reddish-brown gas at temperatures above 70°F. 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 2010b). 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% 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 phase out 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 in humans. 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).

Primary standards protect public health 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 14. Units of measure for the standards are parts per million (ppm) 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).

TABLE 14: NATIONAL AND STATE (MONTANA) AMBIENT AIR QUALITY STANDARDS

Pollutant	Primary Standards			Secondary Standards		
	National Level	State Level	Averaging Time	National Level	State Level	Averaging Time
Carbon Monoxide	9 ppm (10 mg/m^3)	9 ppm	8-hour (1)	None		
	35 ppm (40 mg/m^3)	23 ppm	1-hour (1)			
Lead	0.15 $\mu g/m^3$ (2)	1.5 $\mu g/m^3$	Rolling 3-Month Average	Same as Primary		
	1.5 $\mu g/m^3$	—	Quarterly Average	Same as Primary		
Nitrogen Dioxide	53 ppb (3)	50 ppb	Annual (Arithmetic Average)	Same as Primary		
	100 ppb	300 ppb (1)	1-hour (4)	None		
Particulate Matter (PM_{10})	150 $\mu g/m^3$	150 $\mu g/m^3$	24-hour (5)	Same as Primary		
Particulate Matter ($PM_{2.5}$)	15.0 $\mu g/m^3$	—	Annual (6) (Arithmetic Average)	Same as Primary		
	35 $\mu g/m^3$	—	24-hour (7)	Same as Primary		
Ozone*	0.075 ppm (2008 std)	—	8-hour (8)	Same as Primary		
	0.08 ppm (1997 std)	—	8-hour (9)	Same as Primary		
	N/A	0.10 ppm (1)	1-hour	Same as Primary		
Sulfur Dioxide	0.03 ppm	0.02 ppm	Annual (Arithmetic Average)	0.5 ppm	—	3-hour (12)
	0.14 ppm (11)	0.10 ppm (1)	24-hour			
	75 ppb (10)	50 ppb	1-hour	None		

Source: EPA 2010j; Montana Department of Environmental Quality (MTDEQ) 2010a.

(1) Not to be exceeded more than once over any 12 consecutive months.

(2) Final rule signed October 15, 2008.

(3) The official level of the annual NO_2 standard is 0.053 ppm, equal to 53 ppb, which is shown here for the purpose of clearer comparison to the 1-hour standard.

(4) To attain this standard, the 3-year average of the 98th percentile of the daily maximum 1-hour average at each monitor within an area must not exceed 100 ppb (effective January 22, 2010).

(5) Not to be exceeded more than once per year on average over 3 years.

(6) To attain this standard, the 3-year average of the weighted annual mean $PM_{2.5}$ concentrations from single or multiple community-oriented monitors must not exceed 15.0 $\mu g/m^3$.

(7) To attain this standard, the 3-year average of the 98th percentile of 24-hour concentrations at each population-oriented monitor within an area must not exceed 35 $\mu g/m^3$ (effective December 17, 2006).

(8) To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.075 ppm (effective May 27, 2008).

(9) To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.08 ppm.

(10) Final rule signed June 2, 2010. To attain this standard, the 3-year average of the 99th percentile of the daily maximum 1-hour average at each monitor within an area must not exceed 75 ppb.

(11) Not to be exceeded more than once per calendar year.

*U.S. Environmental Protection Agency (EPA) is currently reconsidering the 8-hr ozone NAAQS set in 2008.

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 in non-attainment for SO_2; and
- Missoula (MT), Silver Bow (MT), Yellowstone (MT), Rosebud (MT), Power (ID), Bannock (ID), and Sheridan (WY) Counties 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. While it is clear that the CAA delegates jurisdiction for enforcement of air quality standards to conforming states, it is equally clear that the act gives federal land managers the affirmative responsibility to protect air quality and 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 their jurisdictions that either affect, or have the potential to affect, air quality or associated values.

AIR QUALITY AT YELLOWSTONE NATIONAL PARK

The climate in the area of Yellowstone is characterized by cold winters and mild to warm summers. During the winter months, the average daytime temperature ranges from zero to 20°F. 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, 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. Visibility is a very sensitive AQRV at Yellowstone. Although visibility in the park is still superior to that in many parts of the country, visibility in the park is often impaired by haze (light-scattering pollutants). The 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 occurs when acidic materials fall from the atmosphere to the Earth in either wet (rain, sleet, snow, fog) or dry (gases, particles) form. More commonly referred to as acid rain, acid deposition has two components: wet and dry deposition. 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

Based on the limited available data specific to OSVs, most potential ecosystem effects from OSV use are negligible. Atmospheric and snowpack concentrations of OSV emitted pollutants have decreased in

response to best available technology (BAT) implementation, and it appears that 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.

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 2009, these goals are improving or not degrading visibility in 95% of NPS reporting parks; reducing and maintaining at current levels of ozone in 86% of NPS reporting parks; and reducing and maintaining at current levels of atmospheric deposition in 76% of NPS reporting parks (NPS 2010g).

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 ARD uses all available monitoring data collected from NPS, EPA, state, tribal, and local monitors over a 5-year period, to generate interpolations for the continental United States. These interpolations allow the ARD to derive estimates of the air quality parameters at all NPS units in the continental United States. The interpolation values are used to determine 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 2010g): Air Quality is a Significant Concern, Air Quality is a Moderate Concern, Air Quality is a Good Concern.

Based on this air quality rating guidance published by ARD (NPS 2010g), the year-round air quality condition at Yellowstone is rated as a “significant concern” (or “degrading” trend) for nitrogen wet deposition (deposited nitrogen to the earth’s surface through precipitation). It is rated a “moderate concern” (or “stable” trend) for ozone, visibility, and sulfur wet deposition (deposited sulfur through precipitation) (NPS 2009b) (see table 15). However, it should be noted that the degrading trend for nitrogen wet deposition is due to regional sources and is not related to OSVs (the Scientific Assessment of Yellowstone National Park Winter Use). As noted previously in table 15, with the anticipated update to the EPA ozone standard, the air quality condition for ozone could to be revised to a “significant concern” in the foreseeable future (NPS 2010g). 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 air quality conditions and trends at the park, which is valuable when assessing air quality as it relates to winter use.

TABLE 15: CONDITION OF AIR RESOURCES AT YELLOWSTONE NATIONAL PARK, 2003-2007

Air Quality Resource	Condition	Trend
Visibility[1]	Moderate Concern (Caution)	Stable
Nitrogen Wet Deposition[2]	Significant Concern	Degrading
Sulfur Wet Deposition[3]	Moderate Concern (Caution)	Stable
Ozone[4]	Moderate Concern (Caution)	Stable

Source: NPS 2009b.

[1] Condition assessments derived from interpolations of average visibility conditions, 2003-2007.

[2] Condition assessments derived from interpolations of nitrogen deposition in precipitation, 2003-2007.

[3] Condition assessments derived from interpolations of sulfur deposition in precipitation, 2003-2007.

[4] Condition assessments derived from interpolated values of the annual 4th-highest 8-hour ozone concentrations, 2003-2007.

In accordance with the Government Performance and Results Act, the NPS Strategic Plan established the following air quality goals to be met by 2012:

- Visibility in 95% of NPS reporting parks has remained stable or improved
- Atmospheric deposition in 79% of NPS reporting parks has remained stable or improved
- Ozone in 89% of NPS reporting parks has remained stable or improved.

Progress toward these goals is measured annually through target goals. Making progress toward meeting park air quality is challenging because although the NPS is given a consultation role under the CAA, it has no direct authority to control sources of pollution outside park boundaries. In order to achieve park air quality goals, the NPS works collaboratively with federal and state air regulatory agencies, as well as neighboring land management agencies, to enhance and protect air quality in the parks to the greatest extent possible (NPS 2009b).

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 four-stroke machines. The 2000 Winter Use Plan FEIS proposed banning snowmobiles and only allowing cleaner and quieter snowcoaches (four-stroke snowmobiles were not available at the time). Subsequent winter use plans have proposed addressing impacts to air quality (among other issues) using a combination of new technologies, limits on vehicle numbers, mandatory guiding, and monitoring winter-use impacts on park resources (NPS 2010c). All documents proposed allowing a combination of snowmobiles and snowcoaches, with the snowmobile numbers decreasing from plan to plan and snowcoach numbers remaining consistent.

Despite numerous legal challenges, an important consequence of past winter use planning has been the implementation of snowmobile BAT requirements and entrance limits. The implementation of BAT requirements and reduction in the number of OSVs entering the park 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 0.4 ppm in 2007/2008. The 98th percentile $PM_{2.5}$ concentrations at Old Faithful have decreased from 21 $\mu g/m^3$ in 2002/2003 to 5.8 $\mu g/m^3$ in 2007/2008 (Ray 2008). In addition to BAT requirements and lower snowmobile numbers, improvements in air quality have been assisted by

commercial guiding (which helps assure use of BAT and helps encourage idling to be kept to a minimum) and changes in entrance station procedures to prevent idling groups of snowmobiles.

The substantial CO and PM emissions reductions from requiring four-stroke snowmobiles have come with one important tradeoff—an increase in NO_x emissions. Four-stroke snowmobiles have higher NO_x emissions than two-stroke snowmobiles. Diesel snowcoaches have higher NO_x emissions than gasoline snowcoaches. Preliminary monitoring results for the 2009/2010 season indicate that NO_2 concentrations at the west entrance are slightly below 50% of the recently established 1-hour NO_2 standard of 0.100 ppm. The available monitoring data supports the conclusion that the park is 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. NPS will continue NO_2 monitoring to better understand any trends in concentrations and the relationship between NO_2 concentrations and specific OSV types.

Additional monitoring will be needed to further characterize existing NO_2 concentrations in the park and ensure compliance with the standard.

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 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**—Dark night skies are considered an important AQRV at Yellowstone. 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 ½ mile away from a moderately used OSV route (Site ID 560391011) (EPA 2009e; Ray 2008). The lake station measures ozone, meteorology, 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 is near the Tower Ranger Station (near a wheeled vehicle road and 15 miles from the nearest OSV route), and 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 16, 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 16: RESULTS OF OZONE MONITORING AT YELLOWSTONE NATIONAL PARK, 1998–2008

Site ID	Location	County	Year	4th Highest 1-hour Max (ppm)	4th Highest 8-hour Max (ppm)
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

Source: EPA 2009e.

The EPA has data for $PM_{2.5}$ from 2003 to 2008 from one location in the park near the West Yellowstone Entrance Station (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 further 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 17, which presents a trend of general decline since 1998 in PM_{10} that has remained well below the current 24-hour standard of 150 $\mu g/m^3$. 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 $\mu g/m^3$ and 15 $\mu g/m^3$, respectively (EPA 2009e).

TABLE 17: 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[1]	Annual Mean[2]	Daily Value[1]	Annual Mean[2]
300310012	Firehole, West Yellowstone[3]	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	2003	4.1	3.80	—	—
		2004	10.2	5.00	—	—
		2005	6.8	4.26	—	—
		2006	10.3	3.67	—	—
		2007	10.4	4.68	—	—
		2008	4.7	2.47	—	—

Source: EPA 2009e.

[1] Fourth highest 24-hour maximum.

[2] Fourth highest 24-hour maximum.

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

— = 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 550391012) 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 18 and 19.

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

Old Faithful							
Winter Carbon Monoxide	**2008/2009**	**2007/2008**	**2006/2007[1]**	**2005/2006**	**2004/2005**	**2003/2004**	**2002/2003**
Max 1-hour	1.1	0.9	0.9	1.6	1.6	2.2	2.9
% of Standard	3%	2%	3%	4%	4%	6%	8%
Max 8-hour	0.4	0.4	0.4	0.5	0.8	0.9	1.2
% of Standard	4%	5%	4%	6%	7%	10%	13%
Average	0.1	0.19	0.27	0.18	0.12	0.26	0.24
90th percentile[2]	0.2	0.24	0.19	0.26	0.29	0.5	0.5
West Entrance							
Winter Carbon Monoxide	**2008/2009**	**2007/2008**	**2006/2007**	**2005/2006**	**2004/2005**	**2003/2004**	**2002/2003**
Max 1-hour	2.4	6.1	3.7	2.1	2.8	6.4	8.6
% of Standard	7%	17%	11%	6%	8%	18%	25%
Max 8-hour	0.6	1.6	0.8	0.9	1.0	1.3	3.3
% of Standard	6%	18%	9%	10%	11%	14%	37%
Average	0.2	0.23	0.19	0.23	0.24	0.26	0.57
90th percentile[2]	0.3	0.4	0.27	0.4	0.43	0.5	1.3
West Yellowstone, Montana[3]							
Winter Carbon Monoxide	**2008/2009**	**2007/2008**	**2006/2007**	**2005/2006**	**2004/2005**	**2003/2004**	**2002/2003**
Max 1-hour	7.9	6.7	5.0	—	—	—	—
% of Standard	23%	19%	14%	—	—	—	—
Max 8-hour	3.1	2.2	2.4	—	—	—	—
% of Standard	34%	25%	27%	—	—	—	—
Average	0.5	0.4	0.5	—	—	—	—
90th percentile[2]	0.9	0.7	0.9	—	—	—	—

Source: Ray 2010a.

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

[2] 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.

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

—= Data not available from this source.

TABLE 19: RESULTS OF WINTER $PM_{2.5}$ (µG/M^3) MONITORING AT YELLOWSTONE NATIONAL PARK MONITORING STATIONS

Old Faithful							
Winter $PM_{2.5}$	**2008/2009**	**2007/2008**	**2006/2007[2]**	**2005/2006**	**2004/2005**	**2003/2004**	**2002/2003**
Max 1-hour	23	32	20	56	38	151	200
Max 24-hour	5.7	8.1	6.6	9	6	16	37
98th percentile[1]	5.2	5.8	6.4	9	9	9	21
% of Standard	15%	17%	18%	13%	14%	14%	33%
Average	3.1	3.2	3.3	3.5	4.0	4.9	6.9
West Entrance							
Winter $PM_{2.5}$	**2008/2009**	**2007/2008**	**2006/2007**	**2005/2006**	**2004/2005**	**2003/2004**	**2002/2003**
Max 1-hour	53	44	40	44	21	29	81
Max 24-hour	5.1	9.5	8.8	7	6	8	15
98th percentile[1]	4.8	7.8	8.7	6	6	7	17
% of Standard	14%	22%	25%	10%	9%	11%	26%
Average	1.5	2.6	2.1	1.9	2.9	4.0	8.2
West Yellowstone, Montana[3]							
Winter $PM_{2.5}$	**2008/2009**	**2007/2008**	**2006/2007**	**2005/2006**	**2004/2005**	**2003/2004**	**2002/2003**
Max 1-hour	145	167	119	—	—	—	—
Max 24-hour	27.5	24.7	32	—	—	—	—
98th percentile[1]	27	22	32	—	—	—	—
% of Standard	77%	63%	91%	—	—	—	—
Average	12.3	5.6	12.9	—	—	—	—

Source: Ray 2008, 2010a.

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

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

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

—= Data not available from this source.

As described in chapter 1, after the BAT requirement and limitations on the number of OSVs permitted in the park were implemented, air quality improved quickly between the winters of 2002 and 2004 (Ray n.d.). CO concentrations have continued to decrease, with some fluctuation, since the 2002/2003 winter season. Measurements of the 8-hour CO levels improved from 1998/1999 to 2008/2009 by ten times. 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 2009, air quality has stabilized at the monitoring stations in the park. These positive trends in air quality are primarily the result of requirements for BAT snowmobiles and a lower number of snowmobiles entering the park in recent years; requiring the use of only four-stroke engine 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 $PM_{2.5}$ concentrations. More recent air quality monitoring in the park (Ray 2008, 2010a) has 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 concentrations up to 200 ppb in the park are still above the background CO concentrations for Yellowstone, which are estimated at less than 100 ppb. Results of winter 2008/2009 air monitoring for Yellowstone reveal diminishing daily average concentrations of $PM_{2.5}$ in the park, with concentrations in the town of West Yellowstone remaining constant or increasing slightly over previous years. Hourly and 8-hour average CO concentrations have recently decreased at the west entrance while remaining relatively constant at Old Faithful (Ray 2010a).

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

On February 9, 2010, the EPA announced a revised NO_2 standard of 100 ppb as a one-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 previously been collected at Yellowstone, 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; the second analyzer was new and performed well. Although NO_2 concentrations of just under 50% of the NAAQS (100 ppb 1-hour average) were observed with the first analyzer, the more reliable values are from the replacement analyzer with NO_2 concentrations up to 26% of the health standard (Ray 2010b). In addition, early winter NO_2 monitoring results for winter 2010/2011 show a daily maximum hourly concentration of 31 ppb, less than the 45 ppb maximum recorded in 2009/2010. 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. NPS will continue NO_2 monitoring to better understand any trends in concentrations and the relationship between NO_2 concentrations and specific OSV types.

SOUNDSCAPES

INTRODUCTION

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.

According to the 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). Natural soundscapes exist in the absence of human-caused 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. Inappropriate sounds are of concern because they 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 to meet other survival needs.

Natural soundscapes are also important to park visitors. A majority of park visitors value and enjoy natural sounds, solitude, and quiet (Mace et al. 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

Currently, winter soundscapes in Yellowstone consist of both natural and non-natural sounds. Bird and animal calls, running water, wind, and thermal activity (e.g., geysers and hot springs) contribute natural sounds to Yellowstone. Non-natural sounds include those produced by snowmobiles, snowcoaches, snow groomers, aircraft, human voices, wheeled vehicles, and building operations (Burson 2009). Yellowstone's soundscapes vary 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 call, and geyser activity), snow cover, and other atmospheric conditions. In general, low frequency sounds travel farther from the source at lower temperatures. 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, because experienced by most visitors, include sound from OSV use (Burson 2009), as most visitors either use OSVs to tour the park or stay within two miles of motorized routes if engaging in non-motorized uses.

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. Overall, audibility of OSVs has been reduced since the 2002/2003 winter season by limiting the number of OSVs allowed in the park daily, reducing the number of groups, requiring visitors to use BAT snowmobiles, limiting motorized access to few park roads and travel corridors, and enforcing a low speed limit. Results of soundscape monitoring conducted from 2003 to 2010 show that although certain areas of the park have some of the lowest sound levels ever recorded (Burson 2004–2010a), many travel corridors and developed areas, particularly those near motorized routes or with heavy use, experience higher sound levels.

SOUNDSCAPES TERMINOLOGY

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

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. 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 sounds 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.

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 decibels 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. 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." 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 20, including typical sounds found in Yellowstone.

Because sound is described in a logarithmic scale (i.e., dBA), sound levels cannot be added by ordinary arithmetic. An increase of 3 dB represents a doubling of sound energy, so two helicopters flying side-by-side would be 3 dB louder than one. A 6-dB increase represents a quadrupling of energy and this increase generally doubles the distance at which the sound can be heard. Decibels are often related to perceived loudness, and in some frequency bands a 10-dB increase is said to double the loudness of the sound, 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 dB increase in noise (ANSI Standard 12.9-2005/Part 4, table F.1).

Sound Level Metrics

Metrics used to describe sound levels include L_{eq}, L_{min}, L_{max}, L_{50}, and L_{90}. L_{eq} is 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).

The L_{min} is the lowest sound level measured in the analysis period, and the L_{max} is the maximum. The L_{50} value represents the sound level exceeded 50% 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. The L_{90} value represents the sound level exceeded 90% 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% of sound levels are less likely to be affected by non-natural sounds.

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.

TABLE 20: DECIBEL LEVELS OF COMMON SOUND SOURCES

Sound	Noise Level (dB)	Effect
Shotgun firing, jet takeoff (at 100-200 feet)	130	Painful
Turbo-prop at 200 feet, rock concert	110-140	Threshold of pain begins around 125 dB
Thunderclap (near)	120	Threshold of sensation begins
Stereo (over 100 watts)	110-125	Regular exposure to sound over 100 dB of more than one minute risks permanent hearing loss
Symphony orchestra, chainsaw, jackhammer	110	
Jet flyover (1,000 feet)	103	
Electric furnace, garbage truck, cement mixer	100	No more than 15 minutes of unprotected exposure recommended for sounds between 90-100 dB
Subway, motorcycle (at 25 feet)	88	Very annoying
Lawnmower/nearby thunder	85-90	85 dB is the level at which hearing damage (8 hrs) begins
Recreational vehicles	70-90	
Diesel truck (40 mph at 50 feet)	84	80 dB or higher is annoying, interferes with conversation, constant exposure may cause damage
Snowcoach at 50 feet, average city traffic	77-80	
Dishwasher, washing machine	75-78	70 dB or higher is intrusive, interferes with telephone conversation
Two-stroke snowmobile (30 mph at 50 feet), vacuum cleaner	70	
Four-stroke snowmobile (30 mph at 50 feet), automobile (45 mph at 100 feet)	60	Comfortable hearing levels are less than 60 dB.
Croaking raven (100 feet), conversation	50-65	
Quiet Office	50-60	
Refrigerator humming, Snake River (at 100 feet)	40	Quiet
Summer backcountry, Snake River (at 300 feet)	30	
Natural ambient sound levels in Yellowstone	0-25	
Rustling leaves, winter backcountry	20	Very quiet
Normal breathing	10	Barely audible
Lowest ambient sound levels in Yellowstone winter backcountry	0	Approximate threshold of human hearing at 1 kHz

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

Human Perception of Sounds

Percent time audible and sound level metrics 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 to sounds is complex and setting-dependent. 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 et

al. 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 et al. 1989; Carles et al. 1999; Ozawa et al. 2003; Schulte-Fortkamp et al. 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."

SOUNDSCAPES MONITORING

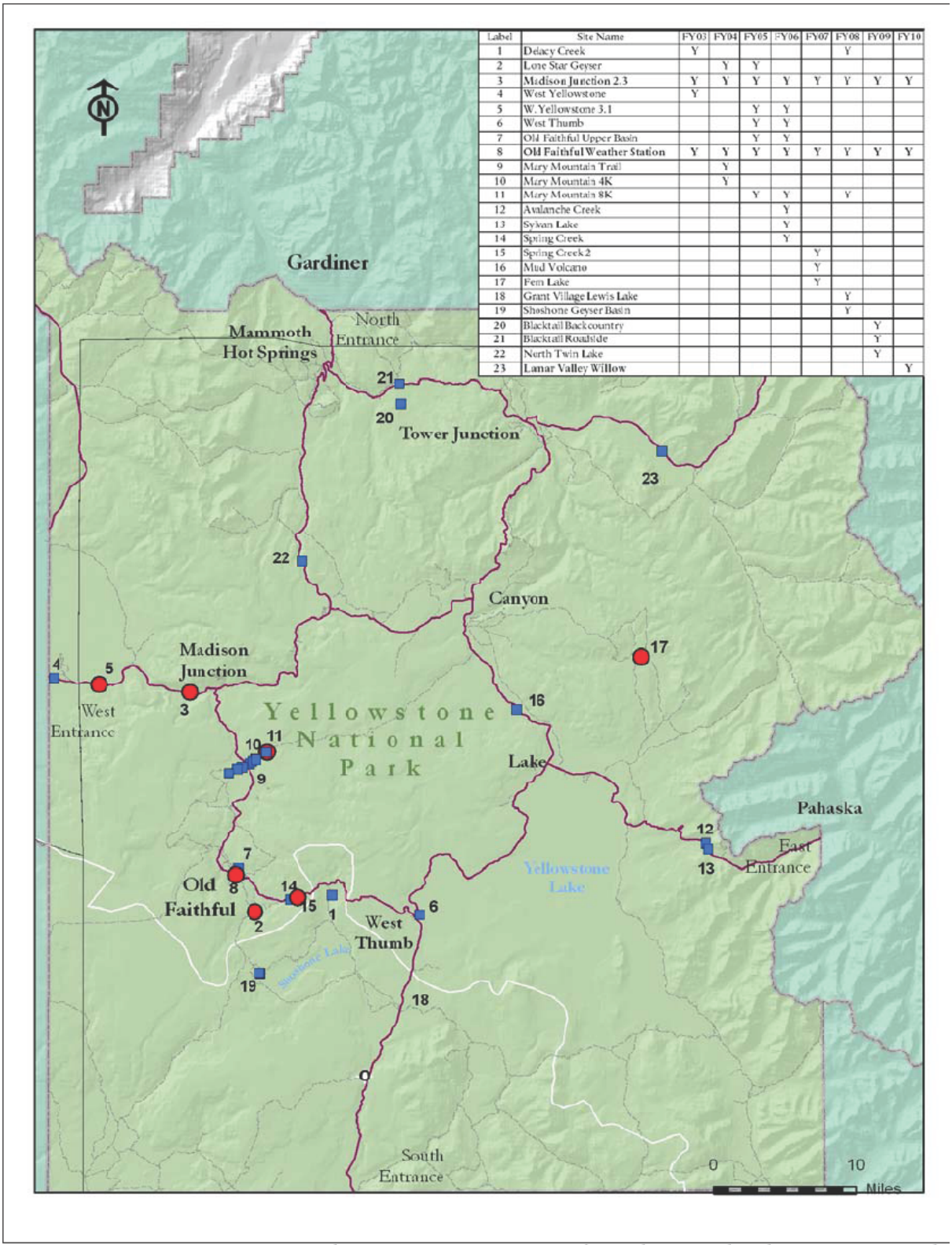
NPS has conducted winter soundscapes monitoring in Yellowstone since the 2003/2004 season. The most recent soundscapes monitoring data at the time this draft Winter Use Plan and Environmental Impact Statement (plan/EIS) was prepared was for the 2009/2010 winter season (Burson 2004–2010a). A total of 21 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 11 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 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 2004–2010a.

The acoustic monitors were not capable of distinguishing between the various OSV user groups in the park (e.g., visitors, administrative). To determine the type and proportion of OSV use in the park, a separate observational study was conducted during the past six winters, from 2005 to 2010. Data on the time audible, and type of usage for each OSV was collected by observers at locations in developed areas and travel corridors (Burson 2010a).

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 21 summarizes the percent of the time between 8:00 a.m. to 4:00 p.m. that OSVs were audible at the Old Faithful Weather Station and Madison Junction 2.3. Table 22 summarizes the percent time audible information for other locations throughout the park that have been monitored only 1 or 2 years.



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 11: LOCATION OF SOUND MONITORING LOCATIONS 2003–2010

TABLE 21: DAILY PERCENT TIME AUDIBLE (8:00 A.M.-4:00 P.M.) OF OVERSNOW VEHICLE SOUNDS AT OLD FAITHFUL AND MADISON JUNCTION 2.3

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

**Indicates monitoring for only 1 or 2 days (may not represent typical or average acoustic conditions).

TABLE 22: DAILY PERCENT TIME AUDIBLE (8:00 A.M.-4:00 P.M.) OF OVERSNOW VEHICLE SOUNDS 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%*
			2005/2006	62%*
Travel Corridor	West Yellowstone 3.1	5	2004/2005	55%
	Spring Creek	14	2005/2006	34%*
	Spring Creek 2	15	2006/2007	44%
	Grant Village Lewis Lake	18	2007/2008	37%
	Mud Volcano	16	2006/2007	26%
	North Twin Lake	22	2008/2009	24%*
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%**
	Delacy Creek Trail	1	2007/2008	20%*
	Lone Star Geyser Basin	2	2003/2004	3%
			2004/2005	4%
Backcountry	Mary Mountain 8k	11	2004/2005	26%
			2007/2008	26%*
	Shoshone Geyser Basin	19	2007/2008	18%*
	Fern Lake Backcountry	17	2006/2007	0%

*Indicates monitoring for 7 days or less (may not represent typical or average acoustic conditions).

**Indicates monitoring for only 1 or 2 days (may not represent typical or average acoustic conditions).

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 decreases to 0% to 30% in the transition and backcountry areas farther from road corridors. Based on all the available monitoring data, the average percent time audible was 59% for developed areas, 39% for travel corridors, 20% for transition zone, and 15% for backcountry areas (Burson 2010a).

There is considerable variation in percent time audible between sites, even within the same management zone, due to factors such as the number and type of OSVs on different road segments and topography. Percent time audible does not always correlate with distance from roadways. For example, the percent time audible at the Lone Star Geyser Basin site was 3% to 4%, compared to 18% 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).

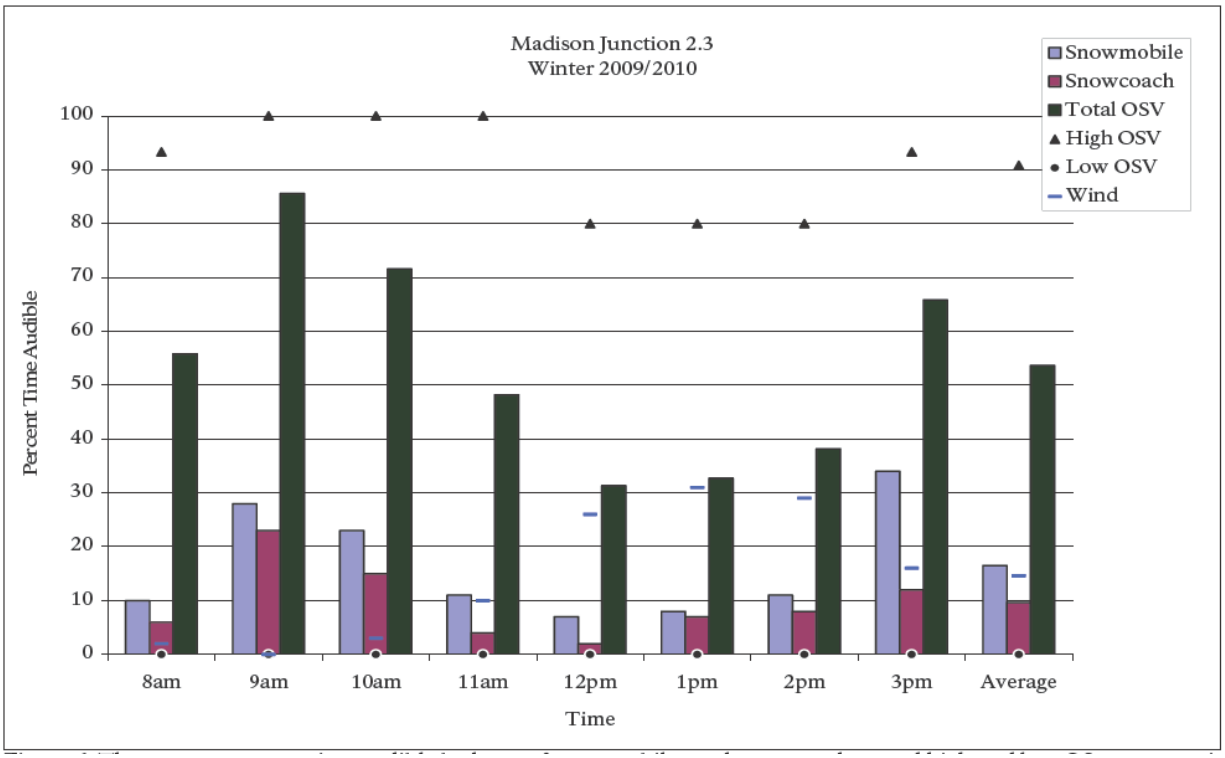
Prior to the implementation of snowmobile guiding and BAT requirements during winter 2002/2003, the average percent time OSVs were audible at the Old Faithful Weather Station was close to 93%. The percent time audible was reduced to an average of 61% during winter 2003/2004.

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 67% to 69% from winter 2004 to winter 2008. In 2008/2009 and 2009/2010 winter seasons, the percent time audible at the Old Faithful weather station decreased to 55% as both snowmobile and snowcoach entries dropped.

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% in 2008/2009 to 54% in 2009/2010. 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 sounds). Wind was audible at Madison Junction 2.3 only 15% of the time in 2009/2010, compared to 27% of the time in 2008/2009 (Burson 2010a).

Figure 12 provides an example of the variation in percent time audible by hour at Madison Junction 2.3 in the 2009/2010 winter season. Percent time audible exceeded 80% during the morning when many OSVs are entering the park, but dropped to less than 35% time audible midday. A peak number of OSVs leaving the park occurred in the afternoon; resulting in a percent time audible of over 60% between 3:00 p.m. and 4:00 p.m. OSVs were audible for an average of 54% of the time during the winter use season at Madison Junction 2.3.

As shown in figure 11, 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 is not influenced by OSVs—only wheeled vehicles are audible. OSVs are not audible due to the distance between these monitoring sites and the nearest OSV routes (see figure 11). 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% between 8:00 a.m. and 4:00 p.m. Wheeled vehicles were audible an average of 12% 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 percent time audible of 34% in 2008/2009. At both the Blacktail Backcountry and Blacktail Roadside sites wind was audible on the majority of days and likely masked wheeled vehicle audibility.



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, 2009–March 15, 2010.

FIGURE 12: AVERAGE OSV PERCENT TIME AUDIBLE BY HOUR

Sound Levels

Table 23 summarizes sound level metrics for the 2008/2009 and 2009/2010 winter seasons at the Old Faithful Weather Station and Madison Junction 2.3. 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 were noted to be the main source of the loudest events recorded during the monitoring studies.

TABLE 23: SOUND LEVEL METRICS, 8:00 A.M. TO 4:00 P.M.

	Old Faithful Weather Station (Developed)		Madison Junction 2.3 (Travel Corridor)	
	2008/2009	2009/2010	2008/2009	2009/2010
L_{min}	22.0	23.7	17.8	15.3
L_{90}*	31.2	30.0	26.7	22.0
L_{50}*	36.7	35.2	30.6	28.2
L_{eq}*	42.1	41.9	43.7	42.2
L_{max}	77.7	74.5	78.2	79.5

*Median from hourly calculations

The 8-hour L_{eq} sound level at Old Faithful Weather Station and Madison Junction 2.3 was slightly higher than 40 dBA.

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 minimum sound levels are constrained by limitations of the acoustic instruments in measuring extremely quiet sounds.

Observational Study Results

The 2005–2010 observational study summarized in Burson (2010a) found that in developed areas 78% of snowmobile traffic consisted of guided visitor snowmobiles and 18% consisted of administrative snowmobiles. The percentage of guided visitor snowmobiles was higher along travel corridors (92%) 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 7.25, whereas the average administrative snowmobile group size was just over one. Snowcoaches transporting visitors accounted for 85% of total snowcoach traffic in developed areas and 94% 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 sounds were audible 56% of the time during the observational study. Snowmobiles accounted for 56% of the duration of motorized sounds, compared to 28% for snowcoaches and 7% 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% of the snowmobile groups. Along road corridors, administrative groups are 33% of the snowmobilers.

VISITOR USE AND EXPERIENCE

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.

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% 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. The west entrance is the next busiest, with about 33% of winter visitors. The south entrance accounts for 16%, with the east entrance admitting 0.5%. During the winter, the northeast entrance is not staffed.

OSV travel is allowed on most main line interior park road segments (see figure 2), with the exception of Dunraven Pass between Tower and Washburn Hot Springs overlook, which is closed due to avalanche danger. Where OSV travel is allowed, the roads are 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 193 miles of OSV routes in the park.

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 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.

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 signage 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 Teepee 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, well before snowmobiles first arrived on the scene 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. Many continue in operation today. In the 1970s, conversion of wheeled vehicles to OSVs began. These are 12- to 30-passenger vans to 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. Snowcoaches get 2 to 4 miles per gallon, depending on 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 are authorized to operate every day in the park. The snowcoaches carry 12 to 30 passengers per day, with a visitor capacity of approximately 936 visitors per day.

Snowmobiles were first used in Yellowstone in 1963, and thousands of visitors had entered the park using snowmobiles by the 1980s. Businesses in surrounding communities have run 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 (and certainly changed the quality of) snowmobile sound.

Since the winter of 2004/2005, all 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 and 2010/2011 winter season, the limit was 318 snowmobiles per day. Guided snowmobile service is available from a total of 22 different companies at the various park entrances.

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

Visitation and OSV Transportation Modes

Total visitation to the park during the 2009/2010 winter season decreased approximately 25.6 percent from the 1999/2000 winter season (NPS 2010h). The change in visitation numbers—specifically among OSV users—is, in part, attributable to the daily limit on numbers, the commercial guide requirement, and the BAT requirement. Table 24 provides the visitor use numbers in Yellowstone by transportation mode for the winter seasons 1999/2000 through 2009/2010. The winter season runs from mid-December through mid-March; visitor counts include the entire months of December and March.

An increase in those using cars, recreational vehicles, and buses to access and enjoy park resources during the winter months of December through March has occurred. Only one road provides access to the park for these vehicle types; therefore, the totals for these modes of transportation presented in table 24 include numbers for the north entrance only.

The numbers presented below for snowmobiles and snowcoaches include all entering the park, not just those via the north entrance. Snowcoach travel increased by 74.3% between the 1999/2000 and 2009/2010 winter seasons, whereas snowmobile travel decreased by 71.0% during the same period (see table 24) (NPS 2010h).

TABLE 24: NUMBER OF VISITORS BY TRANSPORTATION MODE, WINTER SEASONS 1999/2000 TO 2009/2010

Winter Season	Recreation	Automobile	Recreation Vehicle	Bus	Snowmobile	Snowcoach	Total*
1999/2000	130,563	45,162	139	747	76,571	11,699	333,774
2000/2001	139,122	43,036	138	3,071	84,473	11,683	347,939
2001/2002	144,490	47,750	215	417	87,206	11,832	351,844
2002/2003	112,741	41,666	278	796	60,406	12,154	291,647
2003/2004	86,107	42,767	181	1,141	30,210	14,823	252,508
2004/2005	83,235	42,639	138	1,153	24,049	17,218	292,612
2005/2006	88,718	44,136	92	1,288	28,833	19,856	284,753
2006/2007	95,675	45,519	144	1,658	31,805	20,350	297,809
2007/2008	99,975	48,404	104	1,667	31,420	22,344	294,357
2008/2009	86,784	45,088	221	1,945	23,417	18,963	244,598
2009/2010	93,838	52,662	643	1,121	22,228	20,388	248,232
Average	105,568	45,348	208	1,364	45,511	16,483	294,552

Source: NPS Park Statistics. 2010. http://www.nature.nps.gov/stats/viewReport.cfm (NPS 2010h).

*The total number of visitors to Yellowstone does not equal the sum of the different modes used once visitors are inside the park. All numbers are best estimate.

Snowmobiling is a primary activity in the park during the winter season (Freimund et al. 2009). Other activities enjoyed by visitors include cross-country skiing (16%), snowcoaches (13%), snowshoeing and wildlife viewing (8%), photography (2%), and unknown (12%).

Table 25 provides the average daily number of snowmobiles and snowcoaches in the park during specific winter seasons. Because the number of snowmobiles permitted in the park on a given day changed over the most recent seasons, the daily limit column shows the maximum number of OSVs permitted in the park on a given day during the winter season. During the first three winter seasons (2006/2007 through 2008/2009), the maximum number of snowmobiles permitted in the park each day was 720. The daily average ranged from 205 to 299 snowmobiles (NPS 2010h).

Cross-country Skiing

TABLE 25: AVERAGE DAILY OSVS, WINTER SEASONS 2006/2007 TO 2009/2010

Winter Season	Snowmobile			Snowcoach		
	Daily Average	Peak	Daily Limit	Daily Average	Peak	Daily Limit
2006/2007	299	542	720	34	58	78
2007/2008	294	557	720	35	60	78
2008/2009	205	426	720 (540)*	29	54	78
2009/2010	187	293	318	32	59	78

Source: Recent Yellowstone Oversnow Winter Use Patterns, Summary of Air Quality Workshop, NPS 2010o.

*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.

Snowmobiles

Although the number of snowmobiles permitted in the park changed between the 2008/2009 and 2009/2010 winter seasons, the number of snowcoaches permitted remained unchanged. Over the past four winter seasons, the average daily number of snowcoaches in the park ranged from 29 to 35 vehicles. This translates into a utilization rate of between 37.2% and 44.9%. Snowcoach use on peak days ranged from 54 to 60 vehicles, for a utilization rate of between 69.2% and 76.9%. Snowcoach utilization rates are also affected by the multiple trips some coaches make in a day. For example, a Xanterra coach originating at Old Faithful may do a ski-drop in the morning, a mid-day trip to the west entrance to pick up visitors, and an early evening moonlight tour (NPS 2010o).

Snowcoach

Average ridership per mode (snowmobile or snowcoach) has been calculated and is available for the 2006/2007 through 2008/2009 winter seasons. Information for the 2009/2010 winter use season was unavailable at the time of publication. The average number of groups per day ranges from 31 to 42, with an average of between 6.6 and 6.9 vehicles per group. The number of people per snowmobile averaged 1.3.

In the 2007/2008 winter season, the average daily number of snowmobiles was five vehicles less than the previous season. Additionally, the number of commercially guided snowmobile groups was 14.3% less than the previous year. The average number

of people per group was 9.3, as compared to 9.1. The average number of snowcoaches, as well as people per coach, was highest during the 2007/2008 winter season (NPS 2010o).

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 and 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. Plowed roads, which permit vehicular movements, are few but they provide scenic drives with beautiful landscapes and vistas. These visitor activities are generally available throughout the winter season, but the park superintendent may restrict use of any area or trail to protect visitors and park resources. Weather conditions may also warrant closing an area.

The ability for 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 26. 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 it all becomes the same temperature, marking the beginning of spring melt. Mid-winter melt can also be a problem for maintaining snow on roadways; therefore mid-winter melt affects visitor use (Farnes and Hansen 2005).

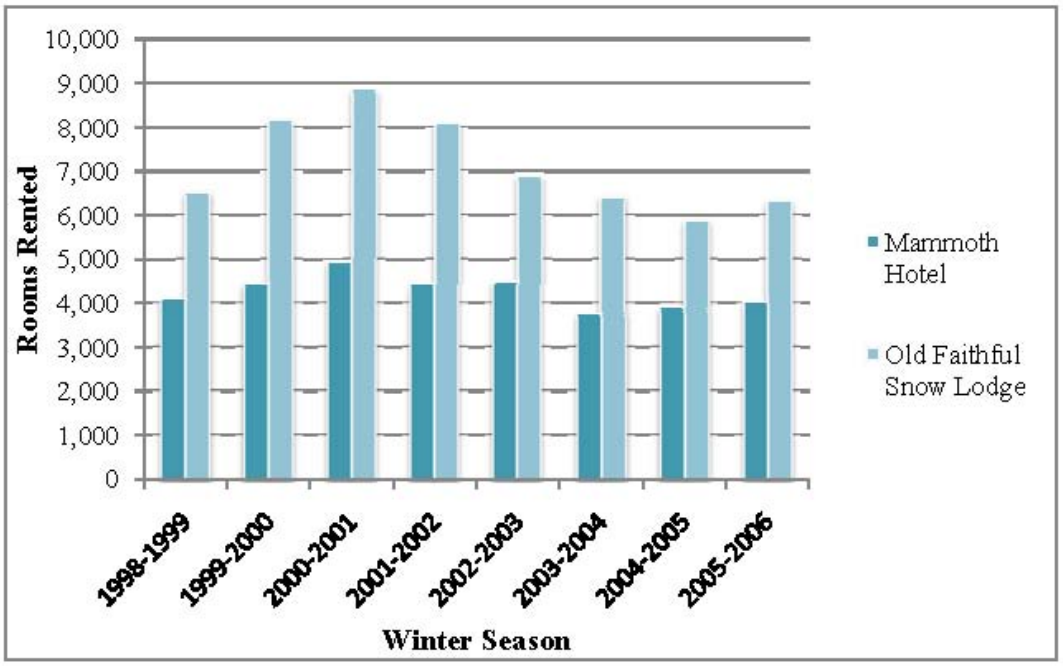
TABLE 26: OPENING DATES OF ENTRANCES

Entrance	Date of Opening
North	Open year-round
South	December 15
East	December 22
West	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 13). 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 13: 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 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 snow machines 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 et al. 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 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 et al. 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 was 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 sound 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% of cross-country skiers, 81% of snowshoers, 75% of snowcoach tourists, but only 55% 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% 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% of visitors were able to find these experiences all of the time they were in the park. Still, very few respondents (8%–

13%) 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% of snowmobilers supported it.

The majority of respondents supported requiring BAT vehicles, continuing guide requirements, limiting the total number of snow machines 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% 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 the peace and quiet 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.

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 viable 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. Four hundred eleven visitors were surveyed at the park. From these surveys, Freimund et al. (2009) found that 71% 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% 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% of respondents had interactions with bison where they witnessed a defensive charge or felt bison were hurried or put into flight. Specifically, when asked to describe the most significant or "intense" encounter with bison that they witnessed, 43% of visitors described responses no more intense than bison noticing the presence of humans and resuming their activity. Another 36% 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% of visitors indicated seeing interactions where bison were hurried, put to flight, 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 is beneficial to the ecology, improves the soundscape, and enhances 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 regulation 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 limiting the size of groups. Additionally, they felt that sufficient lands exist surrounding Yellowstone accommodate unguided snowmobiling, and the park should be a place to enjoy nature and to be educated. The majority of guides felt that that 720 snowmobile per day limit was working well. Some snowmobile guides were concerned about road conditions and the 1/3 mile rule which states 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 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 et al. 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 and identity-based, have been studied at Yellowstone.

As suggested by previous noise research, the probability of conflicts arising from visitors' annoyance with motorized sounds in Yellowstone may be highest in areas where the sounds 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 sounds 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 may be audible to humans in areas up to 10 miles from travel

corridors (Hastings et al. 2006). This means that most non-motorized visitors to the park could encounter OSV sounds during their visit. 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 well within the audible range of OSVs.

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 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 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 et al. 2006)

This study by the Institute of 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 2-page questionnaire to complete during the last five minutes of their trip back to West Yellowstone. The survey period was conducted over a two-year period, resulting in 266 useable 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%) and to ski at Big Sky (41%) compared to Montanans, 69% of whom said they came to visit the park and only 8% of whom indicated they came to ski at Big Sky. Of those who spent a night in West Yellowstone, 24% 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 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 Study (Clement and Chang 2009)

Bridger-Teton National Forest (BTNF) conducted a survey of the 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 BTNF report was designed to

- Conduct a random sample survey of local residents to explore their values and preferences in relation to the BTNF
- 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 BTNF with members of local communities who participate 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% response rate.

Recreational activities in the BTNF 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 in within the forest. Approximately 87% of respondents prefer to experience the forest through non-motorized recreational activities. Forty-four percent enjoy all-terrain vehicle use, 33% like the four-wheel driving experience, and 56% like OSVs.

Approximately 42% of respondents indicated they felt that the current level of motorized activity was appropriate, while approximately 37% 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% of respondents indicated that they believe the level of motorized road access should be reduced or eliminated. Additionally, 65% of respondents indicated that the current level of outfitter guide use (i.e., fishing, hunting, hiking, and snowmobiling) should be maintained. Approximately 48% 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 et al. 2008)

Shoshone National Forest (Taylor 2008) conducted a survey of public values and preferences for the counties bordering the forest in 2006. 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%; of those responses, 69% 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 that forest;
- The preferences and attitudes associated with uses and issues in relation to the Shoshone National Forest; and
- 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 country 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% of respondents prefer to experience the forest through non-motorized recreational activities. Forty percent enjoy all-terrain vehicle use, 37% like the four-wheel driving experience, and 28% like OSVs.

Approximately 39% of respondents believed the level of existing road access was appropriate (recognizing that roads may be relocated or rehabilitated to protect resources). Nineteen percent believed there was a need for more motorized road access and 8% commented that the level of motorized open roads should be reduced. Thirty-four percent of respondents replied as being "very satisfied" with winter recreation experiences in the forest. Additionally, 72% 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 era and have limited applicability for impact analysis. These studies are further described in the Scientific Assessment of Yellowstone National Park Winter Use.

VISITOR ACCESSIBILITY

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.

As noted above in visitor use and experience, 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 with those that 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).

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 are snow covered in the winter. These routes are kept open, but soft or fresh snow may preclude easy access between the Snow Lodge, the Old Faithful Visitor Education Center, and the geyser basin boardwalks. 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).

Visitors can also visit the park from afar. 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).

Visitors requiring audio assistance have several services offered. Films shown at the Old Faithful Visitor Education Center include assistive listening devices and captioning. Films shown in other visitor center theaters meet some accessibility needs. Sign language interpreters are available for rangers programs, three weeks' advance notice. By October 2011, a public TTY (teletypewriter) service will be available in all major park areas (NPS 2010m).

Visitors requiring visual assistance can enjoy films at the Old Faithful visitor center with audio descriptions. The park newspaper, *Yellowstone Today*, is available in a Braille edition at visitor centers and large print text information is accessible on the park's website (NPS 2010l).

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 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 even that of industries known to be risky, such as oil and gas drilling. In response to this problem, Yellowstone partnered with OSHA to improve employee safety. With OSHA's assistance, the NPS has improved workplace safety, an improvement reflected in an overall drop in employee injuries. The NPS remains committed, as does the Department of the Interior, to providing safe work places, with a goal of no lost time accidents for its employees

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 carbon monoxide (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) and can cause headaches, nausea, and irritation when exposure is over the National Institute for Occupational Safety and Health (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, 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 President's 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 the following tables. In 1997, personnel exposure measurements for carbon monoxide were conducted at the west entrance (Radtke 1997). The 8-hour TWA for carbon monoxide was between 2 and 4 parts per million (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 carbon monoxide did not appear to be an important hazard for employees at the west entrance.

In 2000, OSHA conducted personnel and area sampling for benzene, gasoline, formaldehyde, and carbon monoxide. They concluded that exposures were below PELs and TLVs, except for exposure to benzene, formaldehyde, and carbon monoxide which exceeded the NIOSH REL for one employee at the west entrance express lane.

A 2001 study included personnel exposure monitoring for respirable PM, carbon monoxide, 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 et al. 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, carbon monoxide, 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, carbon monoxide, 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 et al. 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 fewer 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 Yellowstone entrance station over President's Day weekend. Monitoring showed carbon monoxide slightly elevated from 2008 readings, but still below occupational exposure limits. On one sample day, snowcoaches and snowmobiles were separated. The exposure results showed carbon monoxide was slightly higher over the sampling period for snowmobiles; however, the peak reading for carbon monoxide 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 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% of the OSHA PEL. Three of the nine aldehyde samples had detectable levels of formaldehyde. These measurements were only approximately 2% –3% 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 cognitive 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. 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 eight-hour TWA of their exposure to noise, 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 Industrial Hygienists (ACGIH) action level for noise of 85 dBA. The only noise overexposures to west entrance employees occurred when two-stroke machines were allowed.

In 2004, 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% and 5.5% of the allowable noise exposure, respectively. Peak 8-hour TWAs for those two winters were 75 and 80 dBA, or 12.5% and 26.0% 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 operated for more than four hours. As noted earlier, 98% of loud OSV sounds are from coaches. 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 snow machines 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. For the park, an estimated exposure of 77 dBA for 8 hours when wearing earplugs falls within acceptable exposure limits set forth by OSHA, NIOSH, and ACGIH.15.

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

Further information on the impact of noise and its impacts to motor abilities is provided in the Scientific Assessment of Yellowstone National Park Winter Use. Average and maximum exposure levels at the west entrance are summarized in tables 27 and 28.

TABLE 27: AVERAGE PERSONNEL EXPOSURE TO SOUND LEVELS

Sample Description	Kiosk A	Kiosk B	Kiosk C	Rider Average
Radtke 1997 – no snowmobile count taken, mostly two-stroke sleds through west entrance	70.9 dBA	Not sampled in 1997	Not sampled in 1997	Not sampled in 1997
OSHA 2000 – 976 two-stroke sleds through west entrance	72.1 dBA	75.2 dBA	88.3 dBA	93.1 dBA riding two stroke snowmobile
IHI 2004 – average of 220 sleds, primarily four-strokes through west entrance	62.9 dBA	68.8 dBA	Not used during 2004	82.4 dBA riding four stroke snowmobile
Spear and Stephenson 2005 – average of 180 sleds, primarily four-strokes through west entrance	60.6 dBA	Not sampled in 2005	Not used during 2005	85.5 dBA riding four stroke snowmobile
Spear, Hart, and Stephenson 2006 – average of 216 sleds, primarily four-strokes through west entrance	71.3 dBA	71.0 dBA	Not used during 2006	Not used during 2006

Dosimeter settings set to evaluate compliance with OSHA Hearing Conservation Amendment (threshold = 80 dB; exchange rate = 5 dB Criterion Level = 90 dB; Time Constant = slow). Results are A-weighted.

TABLE 28: MAXIMUM EXPOSURE TO SOUND LEVELS

Sample Description	Kiosk A	Kiosk B	Snowmobile Riders
IHI 2004 – average of 220 sleds, primarily four-strokes through west entrance	114.0 dBA 108.3 dBA 106.6 dBA 89.6 dBA 106.8 dBA 97.8 dBA	112.5 dBA 112.8 dBA 108.3 dBA 103.8 dBA 108.3 dBA	110.3 dBA 111.6 dBA
Spear, Hart, and Stephenson 2006 – average of 216 sleds, primarily 4 strokes through west entrance (P) Denotes 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)	

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 draft plan/EIS. 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 one-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-feet 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 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% 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 will 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 management of Sylvan Pass during the 2009 interim rule. 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 make the operational determination when safety criteria have been met and operations can be conducted with acceptable levels of risk. The NPS will not take unacceptable risks (figure 14). 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.

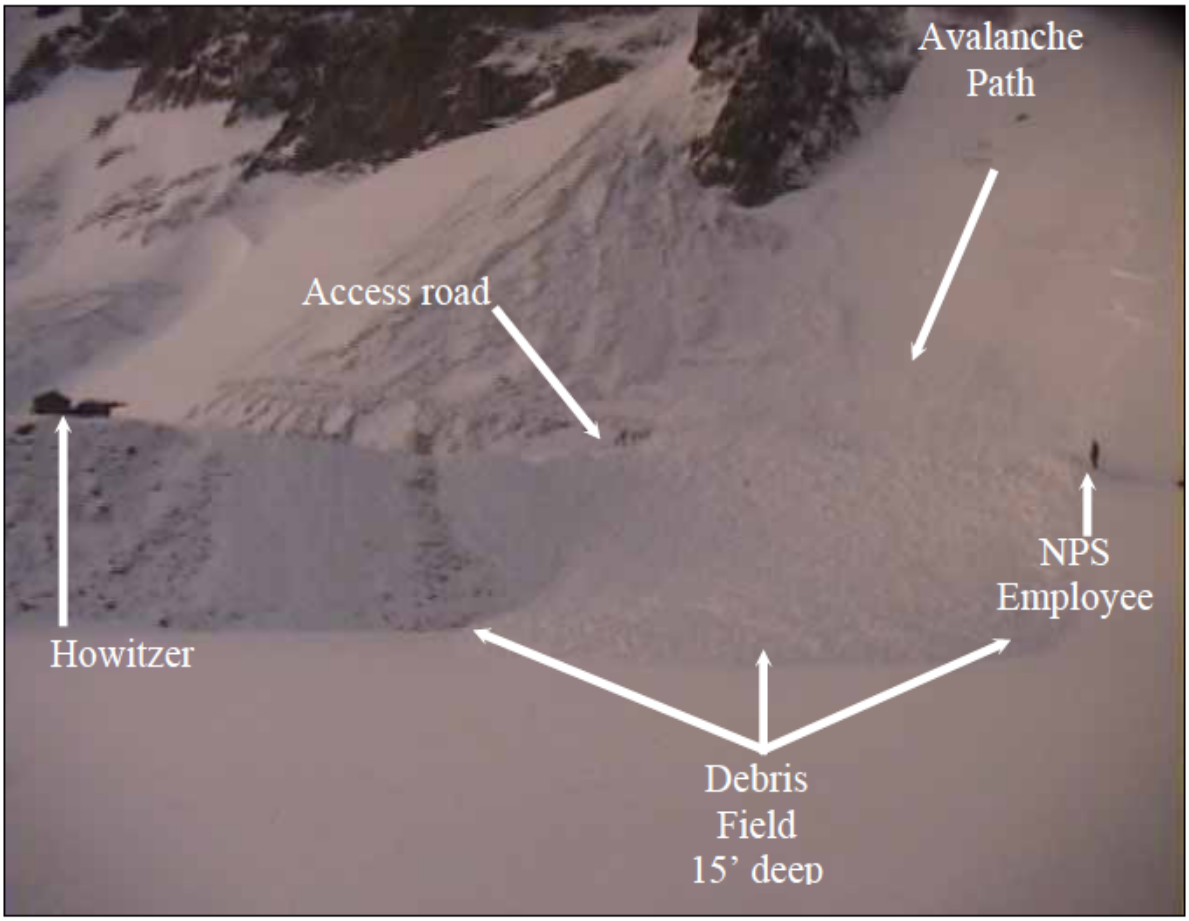


FIGURE 14: AVALANCHE THAT CROSSED THE ACCESS ROAD TO THE HOWITZER PLATFORM

Sylvan Pass Avalanche Forecasting and Hazard Mitigation Program

Prior to and since the Sylvan Pass Agreement, the NPS has adopted several mitigation measures to reduce the dangers 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 to be farther from avalanche paths
- 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 2011n).

The following is a discussion of the avalanche mitigation procedures summarized from the recent Operational Risk Management Assessment 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 to 15°F 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 smoothes 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 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 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 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 15 shows avalanche paths at Sylvan Pass.

Unexploded Ordnance

Unexploded ordnance at Sylvan Pass presents many more 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 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 roadway (Comey 2007). When one did so in 2006, the roadway had to be closed for 24 hours while a military team was brought in to remove the hazard. On a larger scale, before the July 2004 mud and rock slide on Sylvan Pass could be removed from the road, the 10,000 cubic yards of material had to be laboriously searched for unexploded ordnance.

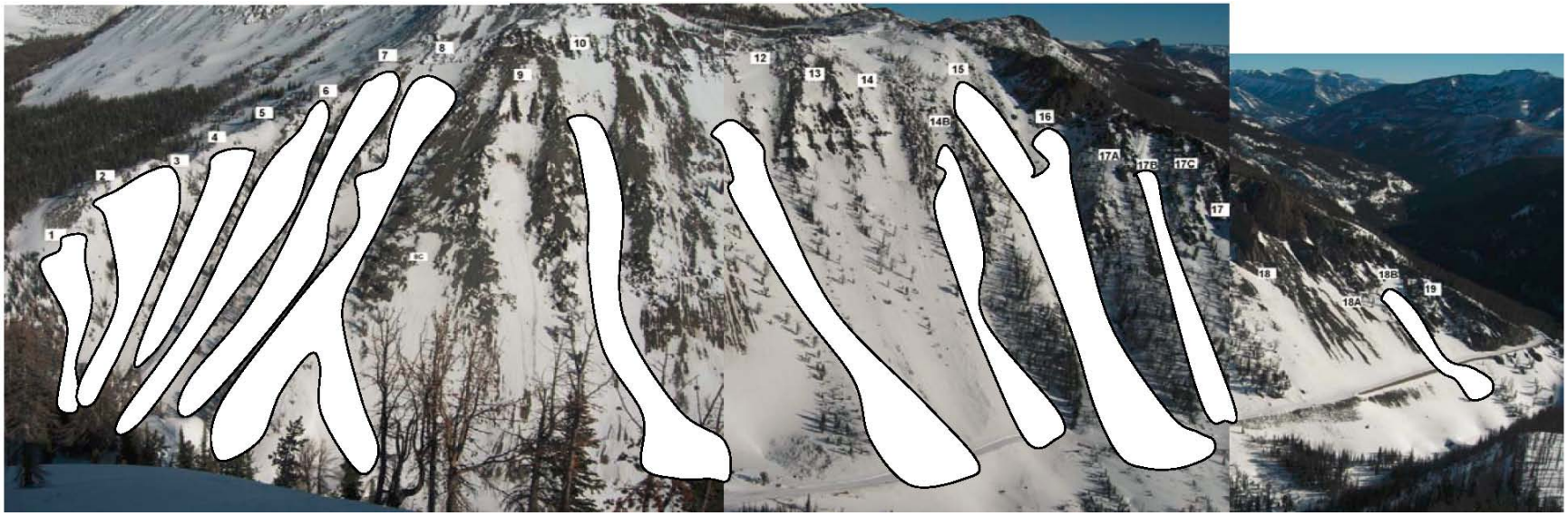


FIGURE 15: MAP OF SYLVAN PASS (AVALANCHE PATHS INDICATED BY NUMBER)

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 roadway by a slide, it would drop about five to ten feet, a fall unlikely to be fatal. 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 1999; NPS 2007b; Mossman 2003).

In the late 1990s, following a series of winters with above average snowfall, several avalanche-related deaths in the park, and the death of a ski-patroller at Big Sky related to hand-charge use (Livingston Enterprise 1997), park staff evaluated options for avalanche management at Talus Slope and elsewhere. The review recommended use of an avalauncher (rather than the hand-charges that had historically been employed) (NPS 2002b). After 2 to 3 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 2003; Johnson 1999) and that the risk to employee safety of avalauncher misfiring substantially exceeded the expected risk of a life-threatening avalanche discharging at Talus Slope (Keator 2004). The review also concluded that avalanche risk there would be best managed through careful observation of snow and weather conditions, signs for the visiting public prohibiting stopping in the avalanche zone, possible structural designs, and use of helicopter-dropped explosives (Johnson 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 2004; NPS 2007b). Even so, Yellowstone park staff monitor the Talus Slope area just as regularly, and with just as much vigilance, as they do other infrequent slide zones in the park. Should a heavy storm produce severe avalanche conditions, or should such conditions develop in other ways (as was documented in the 1999 report by Alan Sumeriski), park staff would close the roadways until conditions 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 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 BETWEEN 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 between the use of non-motorized use and motorized use, including the concern that the use of a snowcoach or snowmobile on the same roadway as a cross-country skier or snowshoer could pose a threat to their 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 commercial guides. Some visitors to Yellowstone have never ridden a snowmobile, and commercial guides help to teach how to safely travel through the park. Commercial guides are experts at snowmobile and/or snowcoach driving in Yellowstone and know the conditions that may be encountered with such travel. All commercial 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. Commercial 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 16, introduction of commercially led snowmobile tours has reduced the number of law enforcement incidents since 2003/2004. Based on these raw numbers, OSV related incidents are down 90% 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).

Severe Weather Conditions

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

Current Yellowstone employee procedures state that snowmobile travel is not advised for non-essential work at temperatures below -20°F. Non-essential work includes activities such as travel to meetings, training, and other administrative travel; avalanche control procedures; interpretive programs and roving interpretation; resource monitoring; research fieldwork, etc. Temporary park closures may be enacted as necessary to provide for the safety of the public and employees during severe weather.

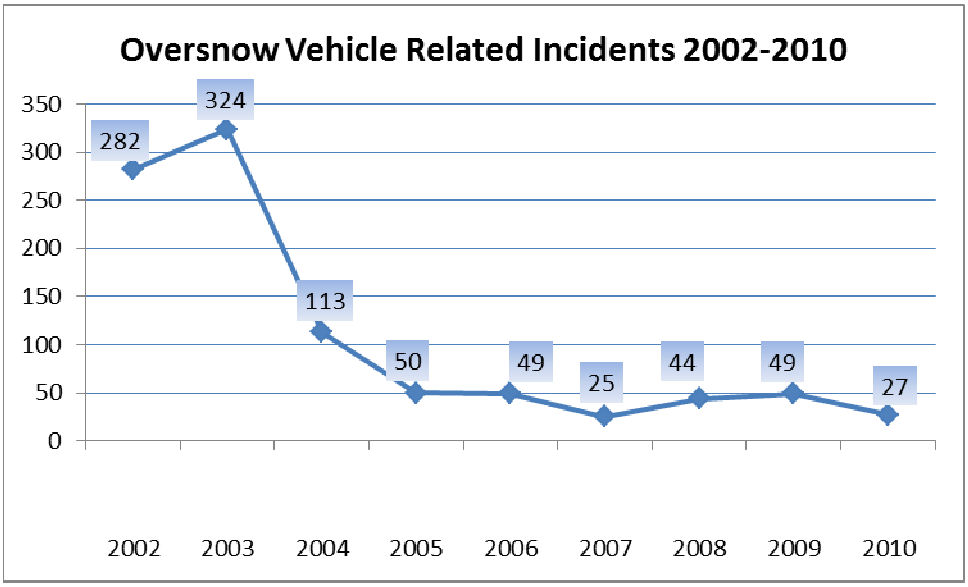


FIGURE 16: WINTER LAW ENFORCEMENT STATISTICS, 2002–2010

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: a state level (Idaho, Montana, and Wyoming) and a county level (Fremont County in Idaho, Gallatin and Park Counties in Montana, and Park and Teton Counties in Wyoming). The economy is discussed in further detail at a 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 four 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 north east entrances. Dubois, Wyoming, is a gateway community to both Yellowstone and Grand Teton. Island Park and other Idaho communities are gateways to Yellowstone. Other geographic 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 masked even at the zip code level of analysis that occurs with IMPLAN modeling, but the effects will be represented through qualitative discussions.

Table 29 presents the relative sizes of the economies of the five counties within the affected region. The range of total economic output among these areas ranges from $248 million annually in Fremont County to $3.9 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 29: ECONOMIC OUTPUT AND EMPLOYMENT LEVELS FOR THE GREATER YELLOWSTONE AREA, 2008

County	Total 2008 Output in $(2011)	Total 2008 Employment
Gallatin County, MT	4,111,797,126	64,737
Park County, MT	479,283,748	8,730
Fremont County, ID	259,490,804	4,418
Park County, WY	1,300,250,448	19,448
Teton County, WY	2,417,607,915	30,458
Cody, WY	786,677,477	11,876
West Yellowstone, MT	101,281,028	1,740
Jackson, WY	1,854,443,978	22,565
Five-County Area Total	8,568,430,041	127,791
3-State Area Total	130,462,241,081	1,942,947

Source: IMPLAN (2008).

Table 30 illustrates 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 2010).

TABLE 30: EMPLOYMENT BY MAJOR INDUSTRY AND GEOGRAPHIC REGION, 2008

Industry	Five-County Area (Employees)	% of total Employees
Farm employment	3,512	2.6%
Forestry, fishing, and related activities	1,138	0.8%
Mining	1,550	1.2%
Utilities	238	0.2%
Construction	15,243	11.4%
Manufacturing	4,518	3.4%
Wholesale trade	2,176	1.6%
Retail trade	15,150	11.3%
Transportation and warehousing	2,740	2.0%
Information	1,748	1.3%
Finance and insurance	5,005	3.7%
Real estate and rental and leasing	10,354	7.7%
Professional, scientific, and technical services	9,701	7.2%
Management of companies and enterprises	183	0.1%
Administrative and waste services	4,519	3.4%
Educational services	1,725	1.3%
Health care and social assistance	8,236	6.1%
Arts, entertainment, and recreation	5,189	3.9%
Accommodation and food services	16,704	12.5%
Other services, except public administration	6,976	5.2%
Government and government enterprises	17,557	13.1%
Total	134,162	100%

Source: BEA 2010.

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 31). Park County had the highest earnings between 1997 and 2006. Taylor et al. also present information in their report on the counties surrounding BTNF. After adjusting for inflation, total visitor spending in Fremont, Lincoln, Sublette, and Teton counties in Wyoming (the counties surrounding BTNF) increased from $467.4 million in 1997 to $605.4 million in 2005 (+29.5%) (Taylor et al. 2008).

TABLE 31: 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 3-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: Dean Runyan Associates (in 2000$), from 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 International 2004). The current analysis, however, benefits from several years of data collected during periods of varying winter use visitation levels. These sources of observed data allow the current analysis to incorporate trends in winter economic activity to supplement predictions based on visitor survey responses. Visitation data for the park is 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 has 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.[1]

[1] All the tax information reported in the tables and figures are as reported by the respective states and do 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 since there are a variety of possible indices, but notes through the reference to Taylor 2007 that such adjustments can be made. Also, another similar report examining tourism in Wyoming (Dean Runyan Associates 2006) and cited by Taylor 2007 does not (except for one table in a 71-page report) take inflation into account.

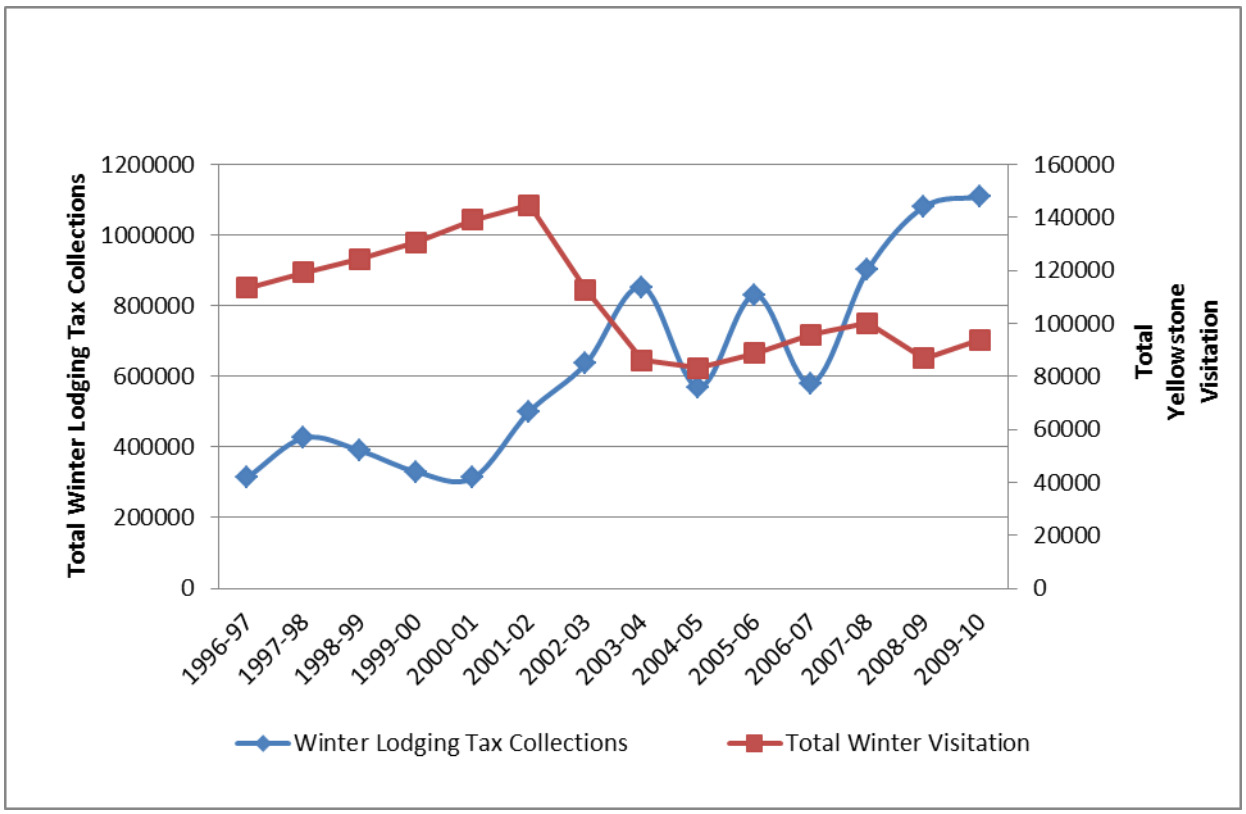
Table 32 and figure 17 present winter lodging collections for Fremont County, Idaho. In general, during the period of time when winter visitation to Yellowstone was decreasing (2002/2003 through 2005/2006), winter lodging tax collections in Fremont County trended upwards—the opposite of Yellowstone visitation trends. Fremont County winter lodging tax collections in 2005-2006 were over double the level seen in the four years prior to 2002 (and the management changes that began in 2003). Winter lodging taxes in Fremont County seem to more closely match the statewide 16.7% growth in lodging tax that occurred during the same period (Otter 2007). From 2006 to 2010, winter park visitation has remained relatively stagnant, whereas winter lodging tax collections have increased by more than 90%. Park County, Wyoming, on the east side of Yellowstone has similar winter lodging tax information during this same time period (see table 33 and figure 18).

TABLE 32: FREMONT COUNTY, IDAHO, WINTER LODGING TAX COLLECTIONS COMPARED WITH YELLOWSTONE NATIONAL PARK WINTER VISITATION, 1996/1997 THROUGH 2009/2010

Winter Season	Dec	Jan	Feb	Mar	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

Note: Not adjusted for inflation.

Source: Idaho State Tax Commission (2010).



Note: Lodging collections not adjusted for inflation.

Source: Idaho State Tax Commission (2010).

FIGURE 17: COMPARISON OF FREMONT COUNTY, IDAHO, WINTER LODGING COLLECTIONS AND YELLOWSTONE NATIONAL PARK WINTER RECREATIONAL VISITATION, 1996/1997 THROUGH 2009/2010

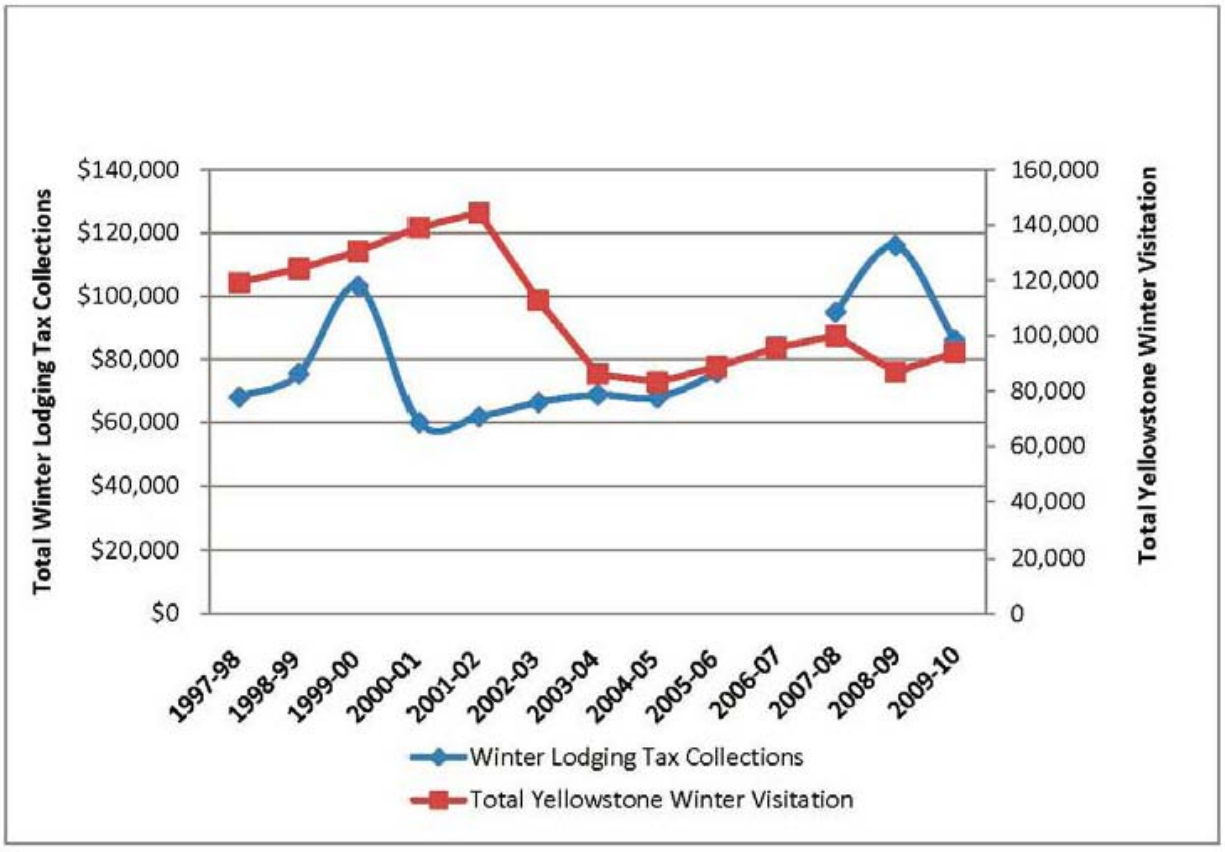
TABLE 33: PARK COUNTY, WYOMING, WINTER LODGING TAX COLLECTIONS, IN TAX YEAR DOLLARS, COMPARED WITH YELLOWSTONE NATIONAL PARK OVERSNOW VISITATION, 1997/1998 THROUGH 2009/2010*

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

Note: 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 2-months) for 5 of the 9 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 2010.



Note: Data for 2007-08 are not available. Lodging tax collections not adjusted for inflation.

Source: Wyoming Department of Revenue 2010.

FIGURE 18: COMPARISON OF PARK COUNTY, WYOMING, WINTER LODGING TAX COLLECTIONS, AND YELLOWSTONE NATIONAL PARK OVERSNOW VISITATION, 1997/1998 THROUGH 2009/2010

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 OSV 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% of the Park County lodging tax in the winter.

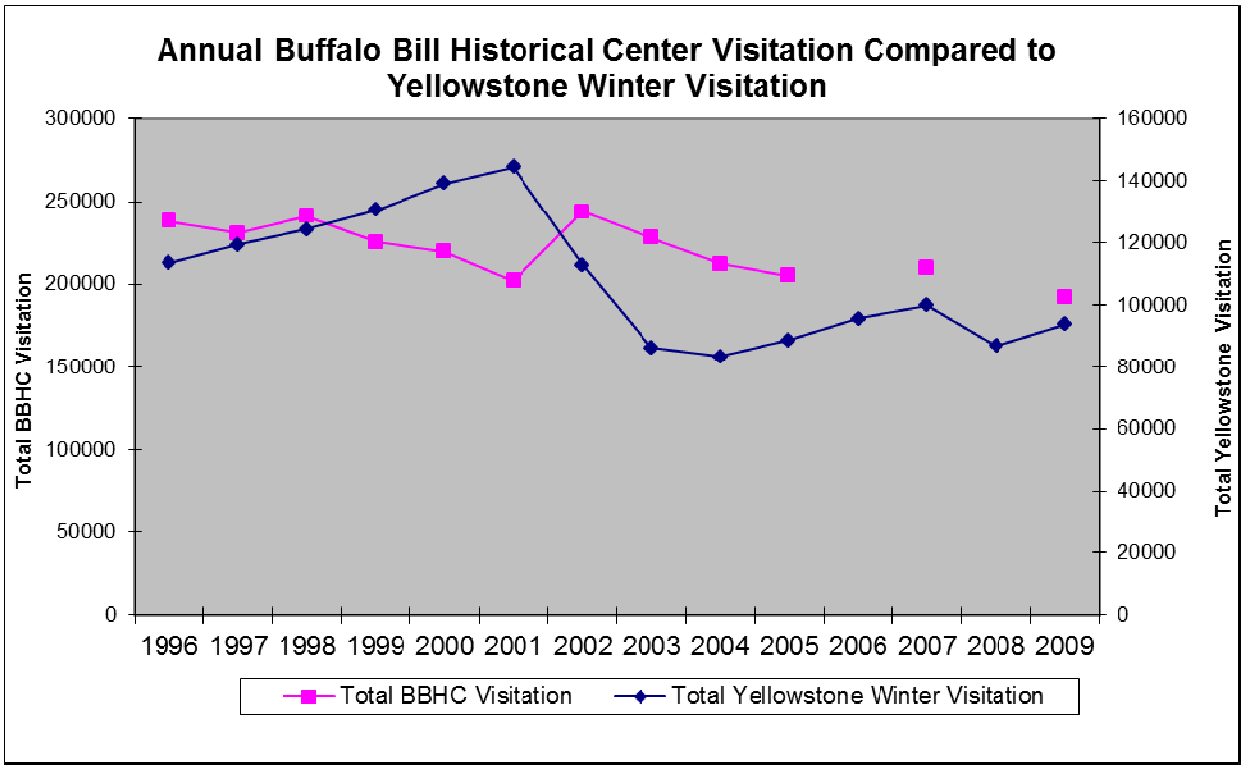
Table 34, from Taylor, Foulke, and Coupal (2008), shows local tax revenue collections for the entire year, adjusted for inflation, for Fremont, Hot Springs and Park Counties. Between 1997 and 2006, tax revenues increased in a similar manner to the winter lodgings tax revenue displayed in table 34. Park County has higher travel-related tax revenue than Fremont and Hot Springs. The report by Taylor et al. (2008) also presented information on local tax receipts for the counties surrounding BTNF (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%, and a compound average growth rate of 2.2 percent per year).

TABLE 34: TRAVEL INDUSTRY LOCAL TAX REVENUE FOR SHOSHONE NATIONAL FOREST AREA (FREMONT, HOT SPRINGS AND PARK COUNTIES), 1997–2006

Year	Deflated			
	Fremont	Hot Springs	Park	3-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: Dean Runyan Associates (in 2000 dollars), from Taylor, Foulke, and Coupal (2008).

Recent lodging and tax data for Fremont and Park counties indicate that declines in snowmobile entries into Yellowstone in particular, and in winter visitation in the park in general, have not detectably impacted the overall winter tourist economy in the counties as measured by monthly lodging tax collections. This is despite the fact that the economies of these counties are relatively small. Visitation to Yellowstone can also be compared to other local attractions. The Buffalo Bill Historical Center (BBHC) is in Cody, Wyoming. Figure 19 indicates that overall Yellowstone winter visitation and BBHC winter visitation seem to move together.



Source: BBHC (2010)

Note: Data on visitation to BBHC missing for 2006 and 2008.

FIGURE 19: COMPARISON OF BUFFALO BILL HISTORIC CENTER WINTER VISITATION WITH AND 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 IMPLAN data available) 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).

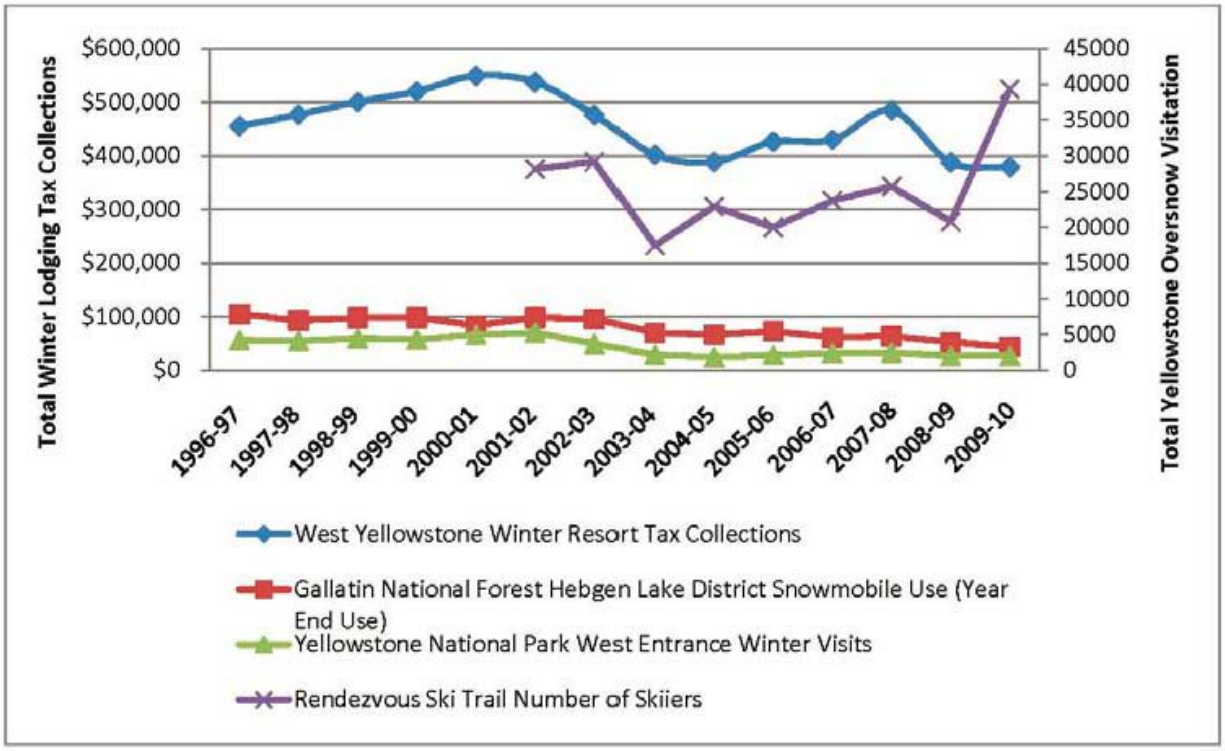
At the north entrance gateway of Gardiner, Montana (Park County), almost all winter use is wheeled vehicle entries. Neither the 2004 Temporary Winter Use Plan (NPS 2004a) nor the 2007 FEIS had a noticeable effect on visitation through this entrance. Visitors there are destined for Mammoth Hot Springs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

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

The remaining major gateway community for Yellowstone is West Yellowstone, at the west entrance to Yellowstone. Table 35 provides time series data for this entrance, shown graphically in figure 20. Included in the table are winter resort tax collections for the town of West Yellowstone, winter entries through the west entrance to Yellowstone, and winter snowmobile visits to the Hebgen Lake District of the Gallatin National Forest, which abuts the town to the west. Unlike the cases of Park and Fremont counties discussed above, 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% on average, winter tax collections only fell 19.7%. However, Montana's statewide lodging tax rose 17% during the same time period.

TABLE 35: 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 20: 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

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

Table 35 and figure 20 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 noticeable increased use in the adjacent national forest.

Table 35 and figure 20 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

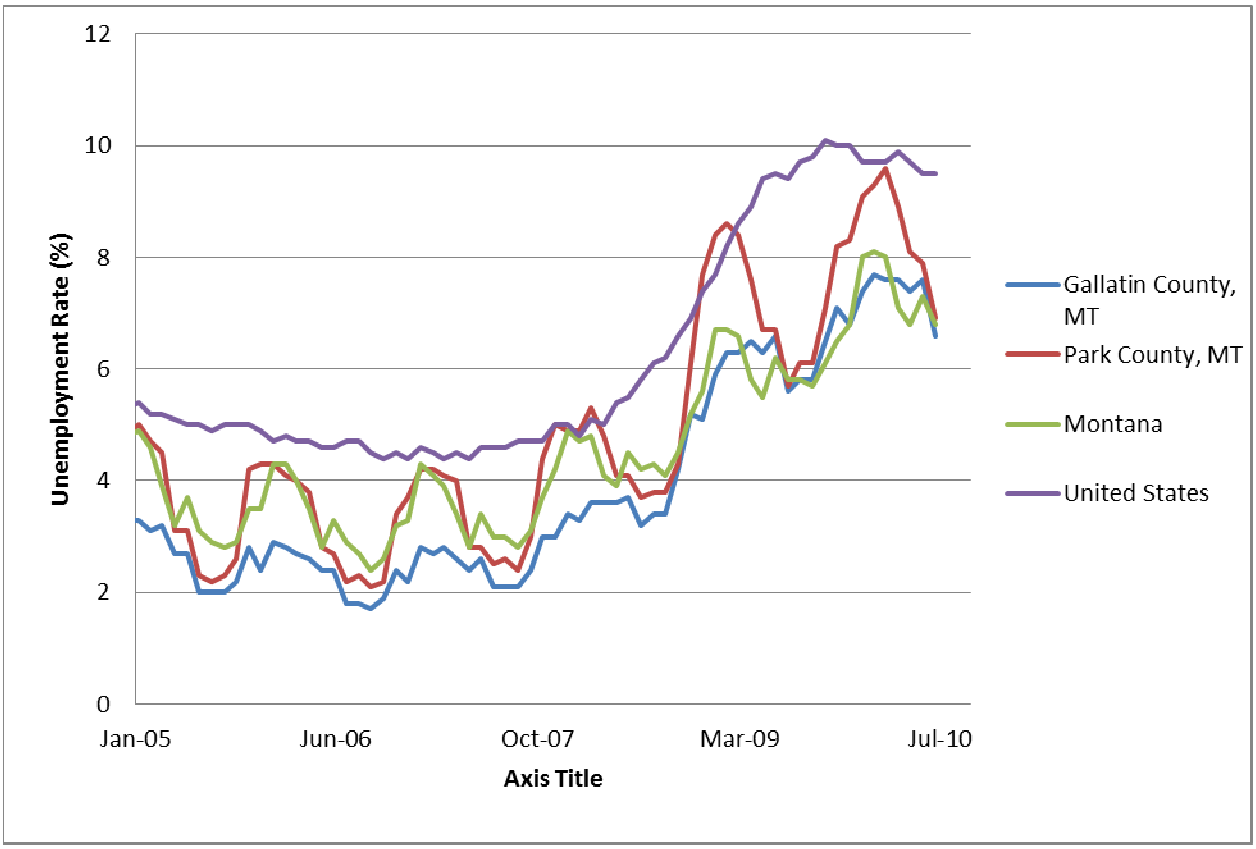
West Yellowstone economy. That hypothesis was tested by estimating a second linear regression model of winter West Yellowstone tax receipts, this time including snowmobile counts in the Hebgen Lake District as an explanatory variable in addition to Yellowstone west entrance winter visits. In this model, 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).

Of the five regional economic areas examined in this analysis, only for the gateway community of West Yellowstone is there a detectable impact on the relevant area's economy from winter use in Yellowstone (and 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 oversnow use from snowmobiles to snowcoaches. Snowmobile visitation dropped by some 60,000 and snowcoach visitors increased by approximately 10,000.

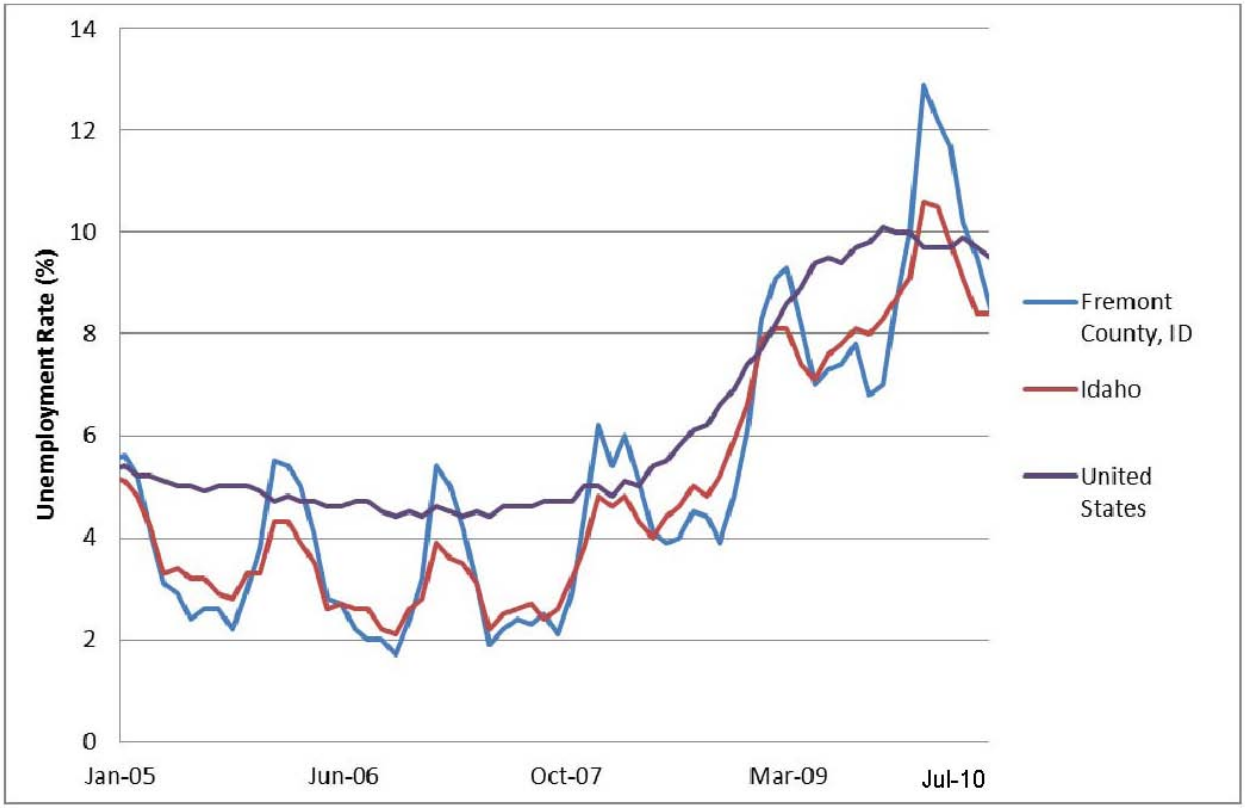
The Recent Economic Downturn

Economic conditions have worsened considerably since September 2008. The economic downturn will most likely impact visitation to the greater Yellowstone area, as well as spending by visitors who come to the area. Figures 21 to 23 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 21), unemployment in Gallatin and Park counties has remained below that of the United States for the most part, although Park County's unemployment rate has grown more volatile in the past two years. After a spike near the end of 2009, unemployment in Idaho's Fremont County (figure 22) dropped back below the national average and fell in line with Idaho's statewide rate. In Wyoming, Park County has generally mirrored the statewide unemployment rate whereas Teton County has exhibited much more exaggerated highs and lows from late 2008 into early 2010 (figure 23). As of July 2010, all counties in the affected area had unemployment rates below the national average.



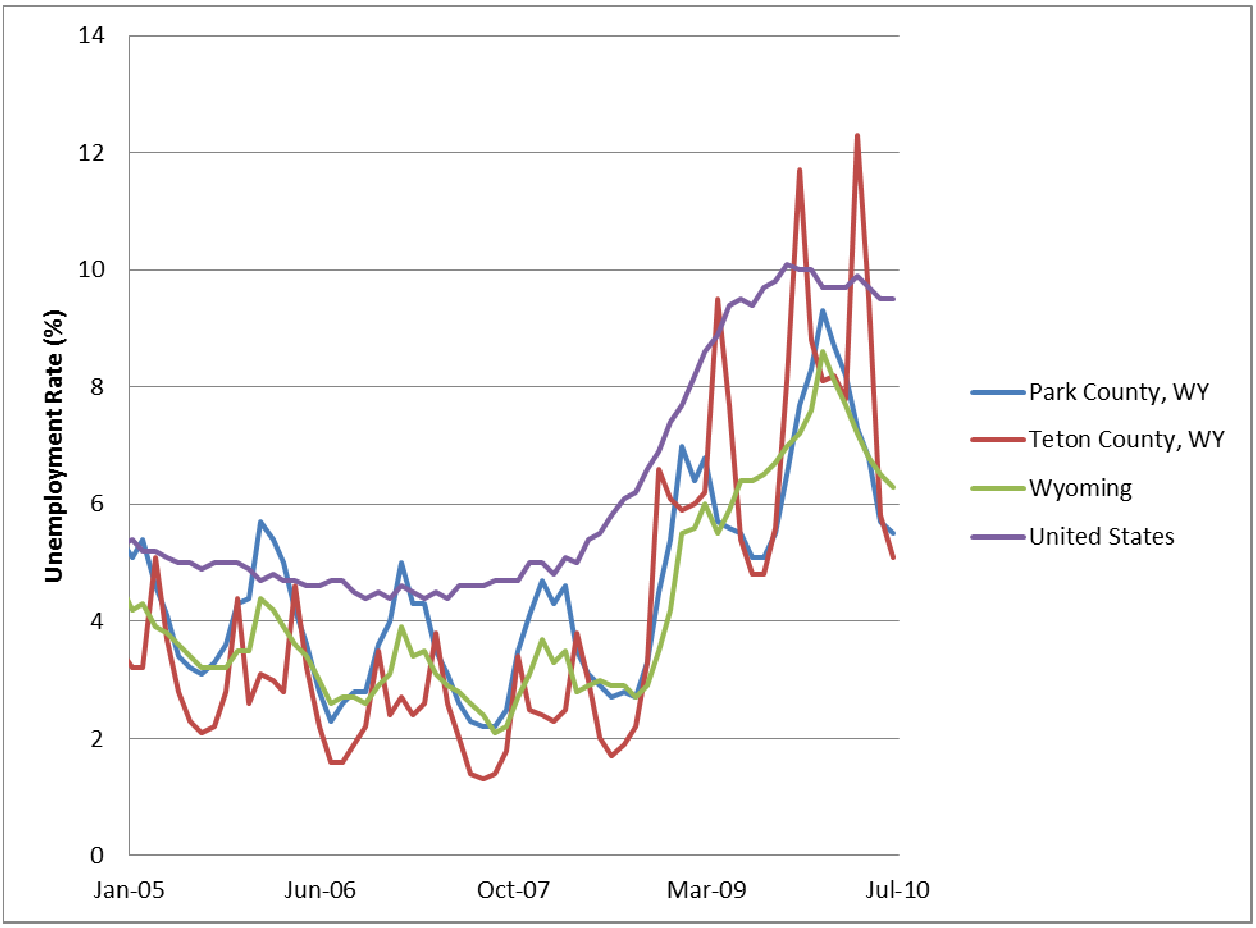
Source: Bureau of Labor Statistics 2010. Series LAUCN30031003, LAUCN30067003, LAUST30000003, LNS14000000.

FIGURE 21: UNEMPLOYMENT RATES IN GALLATIN COUNTY, PARK COUNTY, MONTANA, AND THE UNITED STATES, JANUARY 2005-JULY 2010



Source: Bureau of Labor Statistics, 2010. Series LAUCN16043003, LAUST16000003, LNS14000000.

FIGURE 22: UNEMPLOYMENT RATES IN FREMONT COUNTY, IDAHO, AND THE UNITED STATES, JANUARY 2005-JULY 2010



Source: Bureau of Labor Statistics, 2010. Series LAUCN56029003, LAUCN56039003, LAUST56000003, LNS14000000.

FIGURE 23: UNEMPLOYMENT RATES IN PARK COUNTY, TETON COUNTY, WYOMING, AND THE UNITED STATES, JANUARY 2005-JULY 2010

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, but are within the scope of analysis in this draft plan/EIS because as shown in the analysis for some impact topics, such as soundscapes, winter operations have an effect.

NPS EMPLOYEES AND CONCESSIONS

Approximately 82 permanent and seasonal NPS employees, including those at the West Entrance, plus their family members overwinter in the interior of Yellowstone. Additionally, Xanterra Parks & Resorts stations 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, for 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, conduct similar work and personal activities by OSV. Park guides and outfitters are also authorized to use snowmobiles and snowcoaches in the park for administrative access to repair or tow disabled vehicles. These and other administrative uses are necessary for the 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.

Most permanent interior NPS employees must own a snowmobile as a precondition of employment, but interior-based concessions employees do not have such a requirement. Guests of any employees are encouraged to use BAT OSVs when authorized to enter the park. Permitted researchers are encouraged to use BAT vehicles as a condition of their permit. Any newly issued contracts that require a contractor to travel via OSV to conduct their work in the park (for example, a construction project) include a BAT requirement. Older contracts did not include this requirement.

The majority of the NPS administrative OSV fleet in Yellowstone is now BAT. For the 2009/2010 season, Yellowstone had 126 snowmobiles (both leased and owned) in its administrative fleet, of which 93% met BAT requirements. All non-BAT vehicles (9 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. Other administratively authorized snowmobiles, such as employee-owned snowmobiles, are encouraged to meet BAT requirements.

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 uses about 23,000 gallons of bio-diesel (primarily for grooming equipment) and about 14,000 gallons of ethanol blend gasoline per winter in its oversnow fleet (average of the winters 2002/2003 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 include resource monitoring, personal use, and concession support such as laundry and luggage service.

COST OF WINTER USE MANAGEMENT

Under the 2009 interim rule (winter seasons 2009/2010 and 2010/2011), winter operations cost the park approximately $3,967,350. This includes the cost of grooming snow roads, plowing operations for spring opening, plowing the west side roads, and removal in the spring, leasing and maintenance of parks OSVs (snowmobiles and tracked vehicles), Sylvan Pass management, operation of the sand shed and warming huts, and the employees needed during this time.

Park staff in the winter season includes 82 employees duty stationed in interior locations, including the West Entrance. Winter operations also include the operation of 126 snowmobiles and 14 tracked vehicles. The cost of winter operations is shown in table 36.

TABLE 36: UNIT COSTS FOR WINTER USE MANAGEMENT

Units	Cost
Grooming snow roads: (grooming 180 miles every third day)	$314,640 per season; $46 per mile per day
Spring opening: (average of past three years; 199 miles of mainline road are plowed in park)	$789,000 per year; $3,965 per mile
Plowing West Side Roads (approximately 65 miles and parking areas; plowing every day)	$457,240 per winter
Sand removal in spring	$120/mile
Snowmobile fleet lease and maintenance (currently 126 snowmobiles)	$317,030; $2,516 per snowmobile
Tracked vehicle maintenance (currently 14 tracked vehicles)	$5,000 per vehicle per year
Sylvan Pass avalanche management	$325,000 per season
Sand Shed (sand and vehicle storage-plowing)	$450,000 per building
Warming Hut	$200,000 per building
Employee cost per year (average salary and benefits) (currently 82 staff are duty stationed in the interior of the park in the winter)	$78,720 / FTE