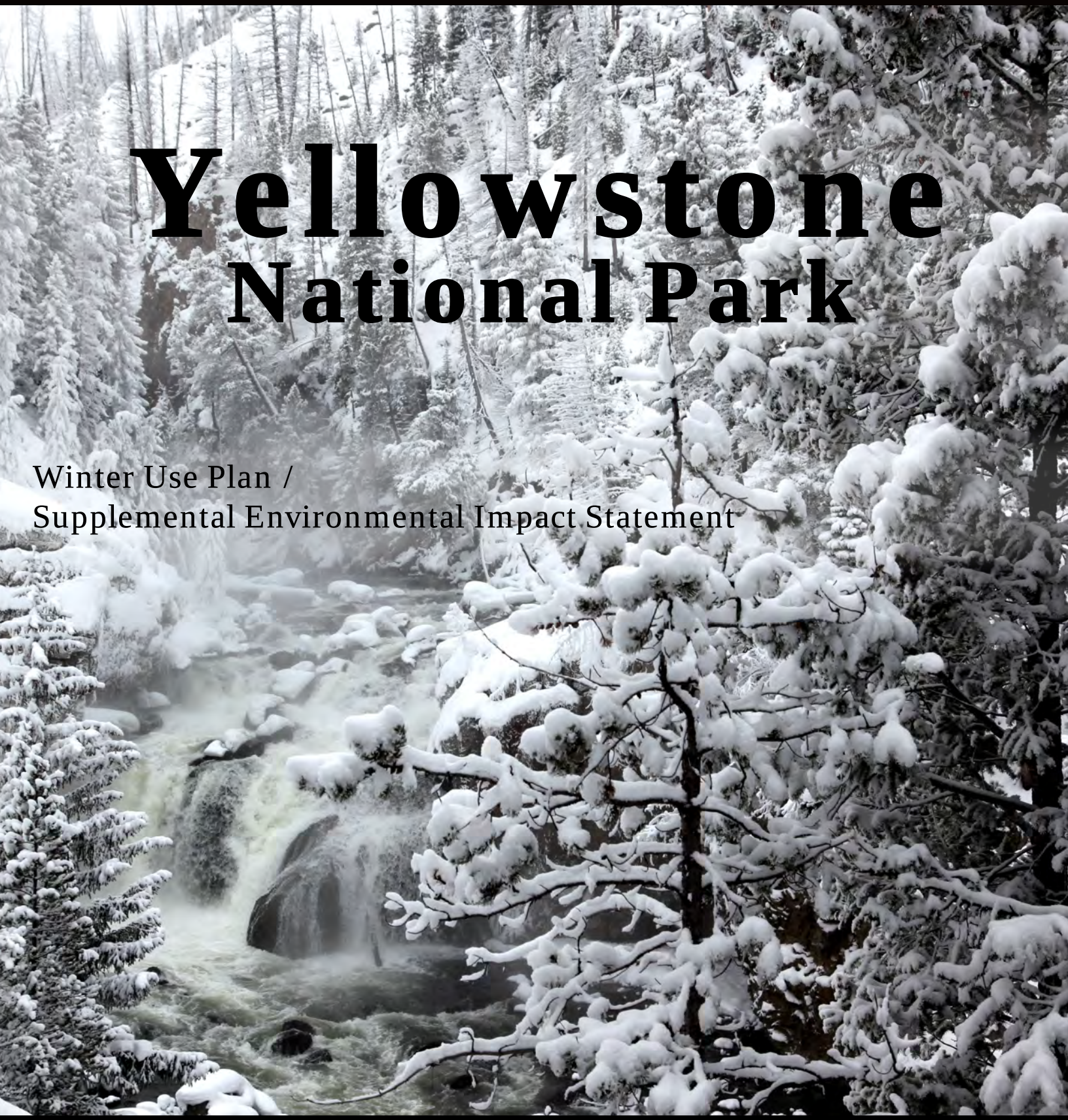
Yellowstone National Park
Winter Use Plan /
Supplemental Environmental Impact Statement
Wyoming, Montana, Idaho

National Park Service
U.S. Department of the Interior



Yellowstone National Park

Winter Use Plan / Supplemental Environmental Impact Statement

February 2013

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

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

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

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

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

For further information, visit http://parkplanning.nps.gov/yell or contact:
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National Park Service
U.S. Department of the Interior

Yellowstone National Park
Wyoming, Montana, Idaho

YELLOWSTONE NATIONAL PARK

WINTER USE PLAN / SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT

February 2013

EXECUTIVE SUMMARY

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

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

BACKGROUND

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

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

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

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

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

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

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

PURPOSE OF THE PLAN

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

NEED FOR ACTION

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

OBJECTIVES IN TAKING ACTION

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

VISITOR USE, EXPERIENCE, AND ACCESSIBILITY

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

RESOURCES

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

HEALTH AND SAFETY

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

COORDINATION AND COOPERATION

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

PARK OPERATIONS AND MANAGEMENT

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

PURPOSE AND SIGNIFICANCE OF YELLOWSTONE NATIONAL PARK

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

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

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

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

ISSUES AND IMPACT TOPICS

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

TABLE ES-1: ISSUES AND IMPACT TOPICS

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

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

ALTERNATIVES

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

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

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

ELEMENTS COMMON TO ALL ALTERNATIVES

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

Administrative Use

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

Accessibility

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

Plowed Roads

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

Non-motorized Access

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

Emergency Actions

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

Monitoring

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

Education and Outreach

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

NO-ACTION ALTERNATIVE

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

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

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

ACTION ALTERNATIVES

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

ENVIRONMENTAL CONSEQUENCES

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

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

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

TABLE ES-2: SUMMARY OF ALTERNATIVE ELEMENTS

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

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

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

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

TABLE ES-3: HOW ALTERNATIVES MEET OBJECTIVES

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

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

TABLE ES-4: ESTIMATED VISITATION UNDER EACH ALTERNATIVE

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

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

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

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

N/A = not applicable.

TABLE ES-5: IMPACT SUMMARY

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

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

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

Contents

Chapter 1: Purpose of and Need for Action 1

Purpose of the Plan 1
Need for Action 1
Objectives in Taking Action 2
Visitor Use, Experience, and Accessibility 2
Resources 2
Health and Safety 2
Coordination and Cooperation 2
Park Operations and Management 3
Project Study Area 3
Purpose and Significance of Yellowstone National Park 3
Summary of Oversnow Vehicle Management at Yellowstone National Park 5
Summary of Scientific Literature on Oversnow Vehicle Use 6
Science Advisory Team 6
Scientific Assessment of Yellowstone National Park Winter Use 7
Operational Risk Management Assessment 7
Issues and Impact Topics 7
Wildlife and Wildlife Habitat, Including Rare, Unique, Threatened, or Endangered Species, and Species of Concern 8
Air Quality 9
Soundscapes and the Acoustic Environment 10
Visitor Use, Experience, and Accessibility 10
Health and Safety 11
Socioeconomic Values 11
Park Operations and Management 11
Issues and Impact Topics Considered but Dismissed from Further Analysis 11
Geologic Resources (Soils, Bedrock, Streambeds, etc.) Including Geothermal Resources 12
Geohazards 12
Other Wildlife and Wildlife Habitat 13
Water Quality 21
Wetlands and Floodplains 21
Ecologically Critical Areas 21
Important Scientific, Archeological, and Other Cultural Resources, Including Historic Properties Listed or Eligible for the National Register of Historic Places 23
Possible Conflicts Between the Proposed Action and Land Use Plans, Policies, or Controls for the Area (Including Local, State, or Indian Tribe) 24
Energy Requirements and Conservation Potential 24
Natural or Depletable Resource Requirements and Conservation Potential 24
Indian Trust Resources and Sacred Sites 25
Related Laws, Policies, Plans, and Constraints 26
Guiding Laws and Policies 26

Related Plans, Policies and Actions for Yellowstone National Park 30
Other Federal Agency Plans, Policies, and Actions 32
Other State and Local Planning Documents, Policies, Actions 34

Chapter 2: Alternatives 37

Description of the Alternatives 37
Definitions 42
Elements Common to all Alternatives 44
Administrative Use 44
Accessibility 44
Plowed Roads / Wheeled Vehicle Management 45
Non-motorized Access 45
Emergency Actions 45
Management Zones 45
Monitoring 46
Education and Outreach 46
Alternative 1: No Snowmobile/Snowcoach Use (No-Action Alternative) 46
Action Alternatives 47
Elements Common to all Action Alternatives 47
Discussion of Action Alternatives 52
Alternative 2: Continue Snowmobile/Snowcoach Use at 2012/2013 Winter Season Interim Regulation Limits 52
Alternative 3: Transition to Snowcoaches that Meet BAT Requirements Only 54
Alternative 4: Manage OSV Use by Transportation Events 57
Alternatives and Actions Considered but Dismissed from Further Consideration 65
Sound Event Management, with Vehicle Limits and Other Elements from the Plan/SEIS Public Scoping 65
Modifications to Draft SEIS Alternative 3 including Immediate Phaseout of Snowmobile Use, a Reduction in Snowmobile Numbers During Phaseout, and Reduced Number of Snowcoaches 67
Additional Suggestions for Non-commercially Guided Use 67
Limit Routes Where OSVs are Permitted to the South Entrance Only 67
Change the Opening Date of Sylvan Pass so it is the Same as the Rest of the Park 68
Prohibit Cross-country Skiing on Roads Groomed for OSV Travel 68
Expand Non-motorized Uses in Yellowstone 69
Alter the Road Grooming Schedule 69
Weight/Pounds per Square Inch Requirements for Snowcoaches 69
Allow for Private Snowcoaches and Snowmobiles 70
Mandate Use of E-Fuels 70
Revise BAT Requirements for Snowmobiles to be Less Restrictive (for Example, Adopt EPA Standards) 70
Allow Snowbikes and Kite-Skiing (and Other Uses) 71
Alternatives Carried Forward for Detailed Analysis in the 2011 Final EIS but Dismissed from the SEIS 71

Alternatives and Actions Considered But Dismissed from Further Consideration in the 2011 Winter Use Plan/Final EIS ... 73
How Alternatives Meet Objectives ... 73
Consistency with the Purposes of NEPA ... 73
Environmentally Preferable Alternative ... 76
National Park Service Preferred Alternative ... 77
Chapter 3: Affected Environment ... 89
Wildlife and Wildlife Habitat, Including Rare, Unique, Threatened, or Endangered Species, and Species of Concern ... 89
Recent Research and Monitoring ... 90
Bison (*Bison bison*) ... 93
Elk (*Cervus elaphus*) ... 100
Canada Lynx (*Lynx canadensis*) ... 102
Wolverine (*Gulo gulo*) ... 104
Trumpeter Swan (*Cygnus buccinator*) ... 107
Bald Eagle (*Haliaeetus leucocephalus*) ... 110
Gray Wolf (*Canis lupus*) ... 112
Air Quality ... 115
Prevention of Significant Deterioration ... 115
National Ambient Air Quality Standards ... 115
Air Quality at Yellowstone National Park ... 118
Air Quality Related Values ... 119
Air Quality Conditions and Trends ... 120
General Air Quality Trends Related to OSV Use ... 121
Air Quality Monitoring in Yellowstone National Park ... 122
Soundscapes and the Acoustic Environment ... 127
Introduction ... 127
Overview of Yellowstone Soundscapes ... 128
Soundscapes Terminology ... 129
Soundscapes Monitoring ... 132
Visitor Use, Experience, and Accessibility ... 138
Visitor Access and Circulation ... 138
Visitor Activities ... 154
Visitor Surveys ... 156
Other Surveys ... 160
Previous Studies ... 162
Health and Safety ... 162
Personnel and Occupational Exposure to Contaminants ... 162
Avalanche Hazards ... 169
Safety Concerns among Different Modes of Winter Transportation ... 175
Socioeconomic Values ... 177
Existing and Historic Socioeconomic Conditions ... 177
Recent Trends in Park Visitation ... 180

Recent Trends in the Greater Yellowstone Area Economy 180
Park Operations and Management 190
NPS Employees and Concessions 190
Cost to Operate Sylvan Pass 191
Chapter 4: Environmental Consequences 193
General Assumptions 193
Analysis Period 193
Geographic Area Evaluated for Impacts 194
Type of Impacts 194
Duration of Impacts 195
Intensity Definitions 195
Format of the Analysis 195
Number of Transportation Events 196
Cumulative Impacts 196
Wildlife and Wildlife Habitat, Including Rare, Unique, Threatened, or Endangered Species, and Species of Concern 201
Guiding Regulations and Policies 201
Assumptions, Methodology, and Intensity Definitions 202
Summary of Impacts (All Species) 203
Detailed Impact Analysis 205
Bison and Elk 205
Impacts on Bison and Elk by Alternative 209
Lynx and Wolverines 219
Trumpeter Swans and Eagles 228
Gray Wolves 234
Air Quality 242
Guiding Regulations and Policies 242
Methodology 242
Summary of Impacts 256
Detailed Impact Analysis 256
Soundscapes and the Acoustic Environment 261
Guiding Regulations and Policies 261
Soundscapes Terminology 261
Methodology 261
Intensity Definitions 264
Summary of Modeling Results 265
Summary of Impacts 272
Detailed Impact Analysis 273
Visitor Use, Experience, and Accessibility 277
Assumptions, Methodology, and Intensity Definitions 278
Intensity Definitions 279
Summary of Impacts 280
Detailed Impact Analysis 281

Health and Safety 289
Guiding Regulations and Policies 289
Assumptions, Methodology, and Intensity Definitions 294
Summary of Impacts 295
Detailed Impact Analysis 296
Socioeconomic Values 304
Guiding Regulations and Policies 304
Assumptions, Methodology, and Impact Definitions 305
Summary of Impacts 311
Detailed Impact Analysis 312
Park Operations and Management 317
Guiding Regulations and Policies 317
Assumptions, Methodology, and Intensity Definitions 317
Summary of Impacts 318
Detailed Impact Analysis 319
Unavoidable Adverse Impacts 325
Impacts of Alternative 1: No Action - No Snowmobile/Snowcoach Use 325
Impacts of Alternative 2: Continue Snowmobile/Snowcoach Use at 2012/2013 Winter Season Interim Regulation Limits 325
Impacts of Alternative 3: Transition to Snowcoaches Meeting BAT Requirements Only 325
Impacts of Alternative 4: Manage OSV Use by Transportation Events 326
Sustainability and Long-term Management 327
Impacts of Alternative 1: No Action - No Snowmobile/Snowcoach Use 327
Impacts of Alternative 2: Continue Snowmobile/Snowcoach Use at 2012/2013 Winter Season Interim Regulation Limits 327
Impacts of Alternative 3: Transition to Snowcoaches Meeting BAT Requirements Only 328
Impacts of Alternative 4: Manage OSV Use by Transportation Events 328
Irreversible or Irretrievable Commitments of Resources 328
Alternative 1: No Action - No Snowmobile/Snowcoach Use 329
Alternative 2: Continue Snowmobile/Snowcoach Use at 2012/2013 Winter Season Interim Regulation Limits 329
Alternative 3: Transition to Snowcoaches Meeting BAT Requirements Only 329
Alternative 4: Manage OSV Use by Transportation Events 330

Chapter 5: Consultation and Coordination 331

The Scoping Process 331
Scoping Process for the Supplemental Winter Use Plan/EIS 331
Public Review of the Draft Winter Use Plan/EIS 332
Cooperating Agencies 334
List of Recipients 335
Congressional Delegates 335
National Park Service 335
U.S. Forest Service 335
Environmental Protection Agency 336

U.S. Army Corps of Engineers 336
U.S. Fish and Wildlife Service 336
Western Federal Lands Highway Division 336
State of Idaho 336
State of Montana 336
State of Wyoming 336
American Indian Tribes 337
Libraries 338
Other Organizations and Businesses 338
List of Preparers and Contributors 341
National Park Service – Project Team 341
Contractors 342
References 345
Glossary 381
Index 385

APPENDICES

Appendix A: Comparability Assessment of Snowmobile and Snowcoach Transportation Event Impacts to Park Resources and Values and the Visitor Experience

Appendix B: Best Available Technology Standards for Snowcoaches

Appendix C: Non-commercially Guided Snowmobile Access Program

Appendix D: Winter Use Collaborative Adaptive Management and Monitoring Framework

Appendix E: Soundscapes Modeling Maps

Appendix F: Yellowstone Winter Use Noise Modeling for the 2011 EIS and 2013 SEIS

Appendix G: Comment Response Report

FIGURES

Figure 1: Yellowstone National Park Map 4
Figure 2: OSV Routes under All Action Alternatives 49
Figure 3: General Adaptive Management Process Diagram 51
Figure 4: Ranges for Bison 94
Figure 5: Lynx Habitat in Yellowstone National Park 103
Figure 6: Eagle and Swan Winter Habitat 108
Figure 7: Wolf Pack Ranges in Yellowstone National Park 113
Figure 8: Sound Monitoring Locations 2003–2011 133
Figure 9: Average OSV Percent Time Audible by Hour 135
Figure 10: Total Number of Snowmobiles and Snowcoaches Run during Tours in the Park for the Winter Seasons of 2004/2005 to 2011/2012 143
Figure 11: Percent of Persons Using Each OSV Transportation Type 144
Figure 12: Numbers of Transportation Events by OSV Type Per Winter Season throughout Managed Use Era 145
Figure 13: Percentage of Transportation Events by OSV Type 146
Figure 14: Average Number of Persons per Transportation Event by Transportation Event Type 146
Figure 15: Daily Snowmobile Averages from Winter Seasons 2004/2005 to 2011/2012 (Parkwide and by Gate) 149
Figure 16: Daily Snowcoach Averages from Winter Seasons 2004/2005 to 2011/2012 (Parkwide and by Gate) 150
Figure 17: Peak Daily Utilization Rates of Snowmobile and Snowcoaches during Managed Use Era 151
Figure 18: Average Daily Snowmobile Use Rates throughout Managed Use Era 152
Figure 19: Average Daily Snowcoach Utilization Rates throughout Managed Use Era 153
Figure 20: Hotel Rooms Rented in Yellowstone National Park, Various Winter Seasons 155
Figure 21: Comparison of Snowcoach Noise Relative to Other Sources 168
Figure 22: Avalanche that Crossed the Access Road to the Howitzer Platform 171
Figure 23: Map of Sylvan Pass (Avalanche Paths Indicated by Number) 174
Figure 24: Winter Law Enforcement Statistics, 2002–2010 176
Figure 25: Comparison of Fremont County, Idaho, Winter Lodging Collections and Yellowstone National Park Winter Recreational Visitation, 1996/1997 through 2010/2011 182
Figure 26: Comparison of Park County, Wyoming, Winter Lodging Tax Collections, and Yellowstone National Park Oversnow Visitation, 1997/1998 through 2009/2010 183
Figure 27: Comparison of Buffalo Bill Historical Center Winter Visitation with Yellowstone National Park Overall Winter Visitation (Wheeled and Oversnow), 1996/1997 through 2009 184
Figure 28: West Yellowstone Winter Resort Tax Collections, Hebgen Lake District Snowmobile Use, Yellowstone West Entrance Winter Visits, and Rendezvous Ski Trail Visits 1996/1997 through 2009/2010 187
Figure 29: Unemployment Rates in Gallatin County, Park County, Montana, and the United States, January 2002–January 2012 188
Figure 30: Unemployment Rates in Fremont County, Idaho, and the United States, January 2002–January 2012 189
Figure 31: Unemployment Rates in Park County, Teton County, Wyoming, and the United States, January 2002–January 2012 189
Figure 32: Green-Amber-Red Scale for the ORMA Process 293

TABLES

Table 1: Estimated Transportation Events, OSVs, and Visitation Under Each Action Alternative 40
Table 2: Daily Snowmobile Entry Allocations under Alternative 2 52
Table 3: Maximum Daily Snowcoach Entry Allocations under Alternative 2 53
Table 4: Initial Daily Snowmobile Entry Allocations under Alternative 3..... 55
Table 5: Daily Snowcoach Entry Allocations Under Alternative 3 55
Table 6: Daily Snowmobile Transportation Event Entry Limits (Alternative 4)..... 60
Table 7: Maximum Number of Snowmobiles in the Park if all Snowmobile Transportation Events are Used 60
Table 8: Maximum Daily Numbers of Snowcoach Entry Limits (Alternative 4)..... 62
Table 9: Summary of Alternative Elements..... 79
Table 10: How Alternatives Meet Objectives..... 83
Table 11: Impact Summary..... 85
Table 12: Observed Responses of Wildlife to OSV Use 91
Table 13: Bison – Behavioral Responses to Snowmobile and Snowcoach Transportation Events 98
Table 14: Elk – Behavioral Responses to Snowmobile and Snowcoach Transportation Events..... 101
Table 15: Swans – Behavioral Responses to Snowmobile and Snowcoach Transportation Events..... 110
Table 16: National and State Ambient Air Quality Standards 118
Table 17: Condition of Air Resources at Yellowstone National Park 121
Table 18: Results of Ozone Monitoring at Yellowstone National Park, 1998–2011 123
Table 19: Results of $PM_{2.5}$ and PM_{10} Monitoring at Yellowstone National Park 124
Table 20: Results of Winter Carbon Monoxide (ppm) Monitoring at Yellowstone National Park Monitoring Stations 125
Table 21: Results of Winter $PM_{2.5}$ ($\mu g/m^3$) Monitoring at Yellowstone National Park Monitoring Stations..... 126
Table 22: Decibel Levels of Common Noise Sources 130
Table 23: Daily Percent Time Audible (8:00 a.m. to 4:00 p.m.) of Oversnow Vehicle Noises at Old Faithful and Madison Junction 2.3 134
Table 24: Daily Percent Time Audible (8:00 a.m. to 4:00 p.m.) of Oversnow Vehicle Noises at Other Locations..... 134
Table 25: Average Elapsed Time Audible per OSV Passby (in Minutes: Seconds) (2005–2011)..... 137
Table 26: Sound Level Metrics (8:00 a.m. to 4:00 p.m.) 137
Table 27: Number of Visitors by Transportation Mode, Winter Seasons 1999/2000 to 2011/2012 142
Table 28: Average Daily Number of OSVs, Winter Seasons 2004/2005 to 2011/2012 148
Table 29: Target Opening Dates 154
Table 30: Average Personnel Exposure to Noise Levels 163
Table 31: Maximum Exposure to Noise Levels..... 163
Table 32: Average Interior Snowcoach Noise Measured in dBA at Indicated Cruising Speeds 166
Table 33: Sound Level Measurements in dBA Measured at Operator's Ear 167
Table 34: Economic Output and Employment Levels for the Greater Yellowstone Area, 2008..... 178
Table 35: Employment by Major Industry and Geographic Region, 2009 179
Table 36: Travel Industry Earnings for Shoshone National Forest Area (Fremont, Hot Springs, and Park Counties), 1997–2006 180
Table 37: Fremont County, Idaho, Winter Lodging Tax Collections Compared with Yellowstone National Park Winter Visitation, 1996/1997 through 2010/2011 181
Table 38: Park County, Wyoming, Winter Lodging Tax Collections, in Tax Year Dollars, Compared with Yellowstone National Park OSV Visitation, 1997/1998 through 2010/2011 183

Table 39: Travel Industry Local Tax Revenue for Shoshone National Forest Area (Fremont, Hot Springs and Park Counties), 1997–2006 184
Table 40: West Yellowstone Winter Resort Tax Collections, Hebgen Lake District Snowmobile Use, Yellowstone West Entrance Winter Visits, and Rendezvous Ski Trail Visits 1996/1997 through 2009/2010 186
Table 41: OSV Use Levels Referred to in the Analysis 194
Table 42: Cumulative Impact Scenario 198
Table 43: Additional Air Quality Modeling Changes 243
Table 44: Air Quality Intensity Definitions 247
Table 45: Visibility Intensity Definitions 248
Table 46: Maximum Predicted 1-Hour Carbon Monoxide (CO) Concentrations (in ppm) 249
Table 47: Maximum Predicted 8-Hour Carbon Monoxide (CO) Concentrations (in ppm) 250
Table 48: Maximum Predicted 1-Hour Nitrogen Dioxide (NO_2) Concentrations (in ppb) 251
Table 49: Maximum Predicted 24-Hour $PM_{2.5}$ Concentrations (in $\mu g/m^3$) 252
Table 50: 24-Hour PM_{10} PSD Increment Consumption in Micrograms per Cubic Meter ($\mu g/m^3$) 253
Table 51: Parkwide Total Winter Season Mobile Source Emissions 254
Table 52: Parkwide Total Winter Season Mobile Sources HAPs Emissions 255
Table 53: Additional Changes to Soundscape Modeling 263
Table 54: Intensity Definitions for Soundscapes 264
Table 55: Travel Corridor Percent Time Audible Modeling Results 265
Table 56: Backcountry Percent Time Audible Modeling Results 266
Table 57: Travel Corridor Audible L_{eq} Modeling Results 267
Table 58: Backcountry Audible L_{eq} Modeling Results 268
Table 59: Travel Corridor Peak 4 Modeling Results 269
Table 60: Backcountry Peak 4 Modeling Results 270
Table 61: Travel Corridor 8-Hour L_{eq} Modeling Results 271
Table 62: Backcountry 8-Hour L_{eq} Modeling Results 272
Table 63: Aircraft Time Audible, 2005-2010 Observational Study 274
Table 64: OSHA and ACGIH Limits for Air Contaminants 290
Table 65: OSHA Permissible Noise Exposures 291
Table 66: Comparison of Noise Exposure Standards Set by Different Organizations 292
Table 67: Lower and Upper Bound Visitation Forecasts and Visitor Spending per Day Assumptions 307
Table 68: Impacts of Action Alternatives Relative to No-action Alternative (Alternative 1) and Percent Change from Total for the 3-State and 5-County Regions, Lower Bound Visitation 309
Table 69: Impacts of Action Alternatives Relative to No-action Alternative (Alternative 1) and Percent Change from Total for the 3-State and 5-County Regions, Upper Bound Visitation 309
Table 70: Average Impacts of Action Alternatives Relative to No-Action Alternative (Alternative 1) and Percent Change from Total for Three Gateway Communities 309

ACRONYMS AND ABBREVIATIONS

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

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

CHAPTER 1

Purpose of and Need for Action

CHAPTER 1: PURPOSE OF AND NEED FOR ACTION

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

Specifically, this chapter includes the following:

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

PURPOSE OF THE PLAN

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

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

NEED FOR ACTION

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

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

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

OBJECTIVES IN TAKING ACTION

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

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

VISITOR USE, EXPERIENCE, AND ACCESSIBILITY

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

RESOURCES

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

HEALTH AND SAFETY

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

COORDINATION AND COOPERATION

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

PARK OPERATIONS AND MANAGEMENT

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

PROJECT STUDY AREA

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

PURPOSE AND SIGNIFICANCE OF YELLOWSTONE NATIONAL PARK

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

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

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

Hot Spring in Winter

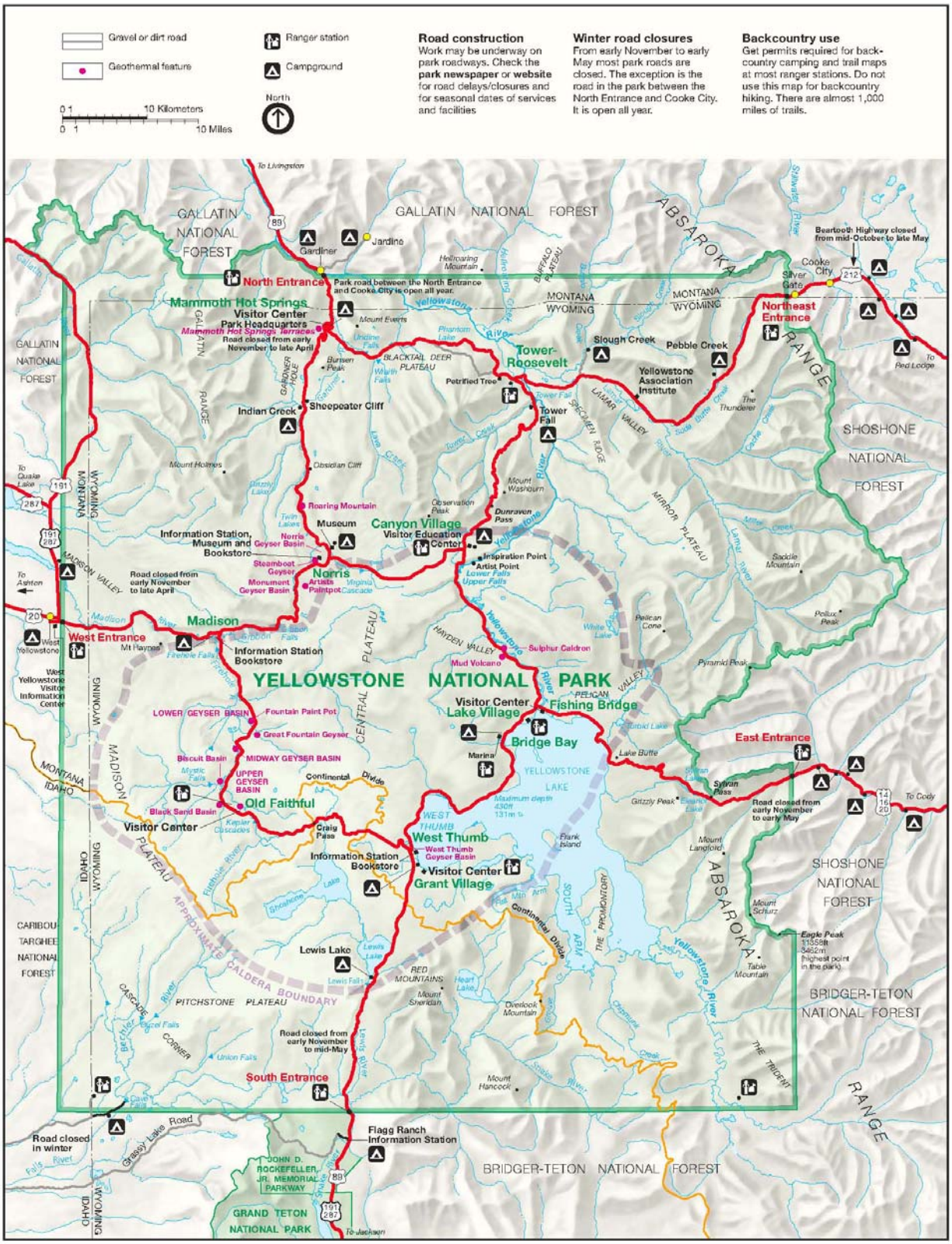


FIGURE 1: YELLOWSTONE NATIONAL PARK MAP

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

SUMMARY OF OVERSNOW VEHICLE MANAGEMENT AT YELLOWSTONE NATIONAL PARK

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

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

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

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

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

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

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

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

SUMMARY OF SCIENTIFIC LITERATURE ON OVERSNOW VEHICLE USE

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

SCIENCE ADVISORY TEAM

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

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

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

SCIENTIFIC ASSESSMENT OF YELLOWSTONE NATIONAL PARK WINTER USE

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

OPERATIONAL RISK MANAGEMENT ASSESSMENT

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

ISSUES AND IMPACT TOPICS

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

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

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

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

Public Scoping Meeting Held in West Yellowstone, Montana

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

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

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

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

Bison Foraging in Winter

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

AIR QUALITY

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

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

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

SOUNDSCAPES AND THE ACOUSTIC ENVIRONMENT

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

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

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

VISITOR USE, EXPERIENCE, AND ACCESSIBILITY

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

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

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

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

HEALTH AND SAFETY

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

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

SOCIOECONOMIC VALUES

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

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

PARK OPERATIONS AND MANAGEMENT

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

ISSUES AND IMPACT TOPICS CONSIDERED BUT DISMISSED FROM FURTHER ANALYSIS

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

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

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

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

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

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

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

GEOHAZARDS

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

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

OTHER WILDLIFE AND WILDLIFE HABITAT

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

Grizzly Bear (*Ursus arctos horribilis*)

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

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

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

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

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

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

Black Bear (*Ursus americanus*)

Similar to grizzly bears, black bears begin to den in late October to mid-November and re-emerge any time from March through early May, with a general denning period of about five months. Therefore, during winter use, black bears are typically hibernating. In addition, previous analysis has demonstrated that existing winter recreation activities in the park do not affect black bears. Destruction of den sites or den habitat does not appear to be an issue in the park. Bears are not being disturbed while they are preparing or occupying den sites (Reinhart and Tyers 1999; Podruzny et al. 2002; Haroldson et al. 2002). The main concern is the potential for bear/human conflicts and displacement of bears while they are foraging during the pre-denning and post-emergence periods. The current winter recreation season in the park does not overlap with most bear activity and therefore precludes most risks of bear/human conflicts. For these reasons, impacts on black bears would be no more than short term and negligible under all alternatives considered in this plan/SEIS. Therefore, potential impacts on black bears from the alternatives under consideration in this plan are not analyzed in further detail.

Cougar (*Puma concolor*)

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

Coyote (*Canis latrans*)

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

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

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

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

Other Mid-sized Carnivores

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

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

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

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

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

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

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

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

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

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

Moose (*Alces alces*)

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

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

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

Bighorn Sheep (*Ovis canadensis*)

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

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

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

Birds

Most bird species are not addressed further in this analysis because they are only in the park during the summer and/or their habitats are not likely to be impacted by winter recreation; therefore impacts from OSV use would be short term and would range from no impact to negligible adverse impacts for most species. This includes peregrine falcons (*Falco peregrinus*), a species of special concern that was

removed from the endangered species list in 1999. Peregrines' seasonal occurrence precludes them from being affected by winter recreation. Most avian predators except for bald eagles, golden eagles, and owls are not present in the park in the winter and would therefore not be impacted by OSV use. Annual winter wildlife monitoring reports observed very few golden eagle and OSV interactions. Out of about five to eight observations from winter 2007 to 2009, the majority of observed golden eagle behavioral responses consisted of look-resume or no visible response, indicating few active movement responses by golden eagles (McClure et al. 2009, 2008; Davis et al. 2007). For the golden eagle and other avian predator species, due to the limited number of interactions and the limited amount of habitat that would be disturbed, impacts would not be greater than minor. Potential impacts on bald eagles are further addressed and carried forward for analysis in the "Environmental Consequences" chapter of this plan/SEIS.

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

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

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

Subnivean Fauna

Subnivean fauna are small mammals that live under snow during winter, including pikas, shrews, voles, pocket gophers, and mice. They are active throughout the year, eat a variety of plant and animal foods, and generally occupy habitats on or below the ground. They are important prey species for a variety of birds and mammals. In general, subnivean fauna are abundant residents of the park and any potential loss of habitat caused by road grooming or plowing operations would be compensated for by the vast amount of area in the park without roads. Also, because OSV travel is only allowed on hard road surfaces that are driven on during non-winter months, no impacts on subnivean species or their habitat would be likely. Research in other areas indicates that subnivean pits and burrows have been found under roads that have been groomed for OSV use and in snowmobile play areas (Wildlife Resource Consultants 2004). These potential impacts were determined to be short term and negligible.

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

Reptiles, Amphibians, Fish, and Invertebrates

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

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

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

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

WATER QUALITY

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

WETLANDS AND FLOODPLAINS

Executive Order 11988 and NPS policy require that impacts on floodplains be considered in NPS undertakings. The intent of the order and guidelines is to provide for human safety and protect floodplain functions by preventing development in 100-year floodplains. Floodplains for Yellowstone are well defined. No actions proposed in this plan/SEIS would occur in or encroach on floodplains, and all actions would occur during the winter months when there is little concern for flooding.

Similarly, Executive Order 11990 and NPS policy require that impacts on wetlands be considered in NPS undertakings. The intent of the order and guidelines is to protect the high resource values found in wetlands by requiring that evaluation of the alternatives occur and mitigation be designed prior to development in wetlands. No actions proposed in this plan/SEIS would occur in or encroach on wetlands and all actions would occur during the winter months on paved roads that are open for wheeled vehicle travel in the summer. Therefore, potential impacts on wetlands and floodplains from the alternatives under consideration in this plan/SEIS are not analyzed in further detail.

ECOLOGICALLY CRITICAL AREAS

Rare or Unusual Vegetation

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

Unique Ecosystems, Biosphere Reserve, and World Heritage Sites

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

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

Wilderness

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

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

Wild and Scenic Rivers

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

Important Scientific, Archeological, and Other Cultural Resources, Including Historic Properties Listed or Eligible for the National Register of Historic Places

Cultural Landscapes

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

Prehistoric/Historic Structures and Districts

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

Ethnographic Resources

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

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

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

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

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

ENERGY REQUIREMENTS AND CONSERVATION POTENTIAL

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

NATURAL OR DEPLETABLE RESOURCE REQUIREMENTS AND CONSERVATION POTENTIAL

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

weather patterns. These changes will likely affect winter precipitation patterns and amounts in the park; however, it would be speculative to predict localized changes in snow water equivalency or average winter temperatures, in part because many variables are not fully understood and there may be variables not currently defined. Therefore, the analysis in this document is based on past and current weather patterns and the effects of future climate changes are not discussed further.

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

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

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

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

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

INDIAN TRUST RESOURCES AND SACRED SITES

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

RELATED LAWS, POLICIES, PLANS, AND CONSTRAINTS

GUIDING LAWS AND POLICIES

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

NPS Organic Act and General Authorities Act

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

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

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

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

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

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

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

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

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

Yellowstone National Park Organic Act

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

National Parks Omnibus Management Act of 1998

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

NPS Management Policies 2006

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

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

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

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

Architectural Barriers Act of 1968

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

National Environmental Policy Act Regulations and Procedures

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

NPS Director's Order 77: Natural Resource Protection

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

Wilderness Act of 1964

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

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

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

Director's Order 41: Wilderness Preservation and Management

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

Endangered Species Act of 1973

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

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

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

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

Bald and Golden Eagle Protection Act

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

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

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

RELATED PLANS, POLICIES AND ACTIONS FOR YELLOWSTONE NATIONAL PARK

Yellowstone National Park Master Plan

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

Yellowstone National Park Long-Range Interpretive Plan

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

Yellowstone National Park Strategic Plan

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

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

Construction Projects throughout the Park

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

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

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

Implementation of the Interagency Bison Management Plan

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

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

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

Remote Vaccine Plan for Bison

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

OTHER FEDERAL AGENCY PLANS, POLICIES, AND ACTIONS

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

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

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

Gallatin National Forest Travel Plan Revision

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

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

Consolidation of Checkerboard Lands in the Gallatin National Forest

In the last 10 years, the Gallatin National Forest has negotiated several land exchanges that have consolidated some previously checkerboarded holdings. Although this has generally positive effects for most wildlife (because consolidated lands are less subject to development), it has the negative side effect of private land consolidation (especially in the Big Sky area), which has allowed more land subdivision and rural growth, with consequent effects on wildlife, air quality, socioeconomics, and visitor access and circulation. The availability of wildlife habitat on surrounding lands, including management of the Gallatin National Forest, was considered in this plan/SEIS when analyzing wildlife and wildlife habitat, including rare, unique, threatened, or endangered species, and species of concern.

Gardiner Basin and Cutler Meadows Restoration

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

Beartooth District of Custer National Forest Travel Management Plan

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

EPA Regulations and Improving OSV Technologies

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

OTHER STATE AND LOCAL PLANNING DOCUMENTS, POLICIES, ACTIONS

A Toolkit to Protect the Integrity of Greater Yellowstone Area Landscapes

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

Reclamation of Historic Mines above Cooke City

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

Reclamation of McLaren Mine Tailings Site

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

Rendezvous Ski Trail Development Plan

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

Yellowstone Chamber of Commerce, and the West Yellowstone Ski Education Foundation. The USFS and trail managers are revising their trail plan, which would develop, improve, abandon, and/or maintain the cross-country ski trails there. This could affect socioeconomics and visitor access and circulation. Once implemented, this plan would contribute additional non-motorized winter use activities near the West Entrance. The availability of recreation on surrounding lands, including the Rendezvous Ski Trails, was considered in this plan/SEIS when analyzing visitor use, experience, and accessibility.

Reopening of the Sleeping Giant Ski Area

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

Oil and Gas Leasing

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

Aircraft Overflights

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

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

CHAPTER 2

Alternatives

CHAPTER 2: ALTERNATIVES

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

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

DESCRIPTION OF THE ALTERNATIVES

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

[d] Based on 90-day season.

N/A = not applicable.

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

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

DEFINITIONS

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

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

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

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

ELEMENTS COMMON TO ALL ALTERNATIVES

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

ADMINISTRATIVE USE

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

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

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

ACCESSIBILITY

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

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

PLOWED ROADS / WHEELED VEHICLE MANAGEMENT

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

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

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

NON-MOTORIZED ACCESS

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

EMERGENCY ACTIONS

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

MANAGEMENT ZONES

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

Developed Area—Areas under the direct influence of human development and dominated by human structures. These range in size from small areas, such as the Indian Creek warming hut, to large areas,

such as Old Faithful. Structures include buildings, sewage treatment facilities, campgrounds, employee housing areas, maintenance yards and structures, boardwalks, hotels, and lodges. This zone is most similar to ROS classes "Rural" and "Urban." It includes areas within 100 yards of developed areas (but does not include backcountry cabins or utility lines).

Road Corridor—Areas directly influenced by roads; specifically, all primary and secondary roads open to either visitor or administrative motorized travel in the winter. As with the developed area, this zone extends 100 yards on either side of the road's center line. This zone is most similar to ROS class "Roaded Natural." Note that for purposes of this plan/SEIS this zone would not include roads open in the summer to motorized use but closed in the winter to OSV use. Some boardwalks and some utility lines would appear in this zone, but no buildings (which are zoned as developed areas).

Transition Zone—Areas indirectly influenced (mainly by sight and noise) by developed areas and roads. Specifically, they include all areas between 100 yards and 1.5 miles from either a developed area or a road corridor. This zone would include those roads closed to OSV travel in winter (with the possible exception of NPS authorized ski trail grooming equipment) but which may be open to motorized travel in summer. Yellowstone's Blacktail Plateau Drive, Bunsen Peak Road, and Lone Star Geyser Trail are examples of secondary roads included in transition zones. When a groomed ski trail is designated a transition zone, the zone would be 100 yards on either side of the groomed trail's center line. This zone would be most similar to ROS class "Roaded Natural" within 1/2 mile of roadways. From 0.5 mile to 1.5 miles from roads, "Semi-primitive Non-motorized" would be the nearest ROS class or, as is sometimes used, "Semi-primitive Wilderness," since these areas are recommended wilderness. Some utility lines could appear in this zone.

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

MONITORING

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

EDUCATION AND OUTREACH

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

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

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

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

ACTION ALTERNATIVES

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

ELEMENTS COMMON TO ALL ACTION ALTERNATIVES

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

Best Available Technology

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

Personal Protective Equipment

Personal protective equipment is recommended for snowmobilers, including helmet, snowmobile suit and gloves, proper footwear, and hearing protection. People traveling by snowcoach should also wear or have access to appropriate personal protective equipment including winter clothing, footwear, and hearing protection. Non-motorized users are advised to wear and carry personal protective equipment as appropriate for their winter travel. For all user groups, personal protective equipment including avalanche rescue gear (shovel, probe, and transceiver) is encouraged, but not required.

Licensing and Registration

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

Speed Limits

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

OSV Routes

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

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

FIGURE 2: OSV ROUTES UNDER ALL ACTION ALTERNATIVES

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

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

OSV Management

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

Non-motorized Use Areas

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

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

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

Sylvan Pass Avalanche Control

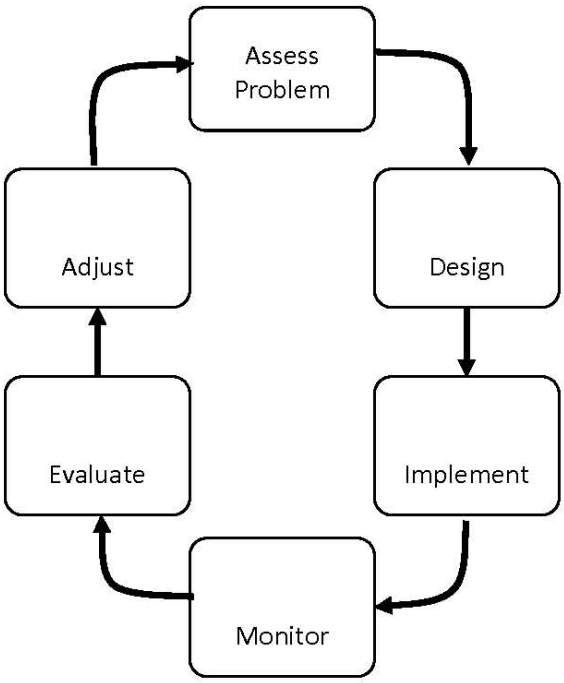
For action alternatives that include maintaining Sylvan Pass for OSV access (alternatives 2 and 4), the pass would continue to be operated in accordance with the Sylvan Pass Working Group Agreement. A combination of avalanche mitigation techniques may be used, including forecasting and helicopter and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

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

Adaptive Management

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

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



Source: Williams et al. 2007

FIGURE 3: GENERAL ADAPTIVE MANAGEMENT PROCESS DIAGRAM

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

DISCUSSION OF ACTION ALTERNATIVES

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

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

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

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

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

TABLE 2: DAILY SNOWMOBILE ENTRY ALLOCATIONS UNDER ALTERNATIVE 2

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

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

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

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

TABLE 3: MAXIMUM DAILY SNOWCOACH ENTRY ALLOCATIONS UNDER ALTERNATIVE 2

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

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

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

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

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

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

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

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

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

ALTERNATIVE 3: TRANSITION TO SNOWCOACHES THAT MEET BAT REQUIREMENTS ONLY

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

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

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

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

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

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

TABLE 4: INITIAL DAILY SNOWMOBILE ENTRY ALLOCATIONS UNDER ALTERNATIVE 3

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

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

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

TABLE 5: DAILY SNOWCOACH ENTRY ALLOCATIONS UNDER ALTERNATIVE 3

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

ALTERNATIVE 4: MANAGE OSV USE BY TRANSPORTATION EVENTS

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

ALTERNATIVES AND ACTIONS CONSIDERED BUT DISMISSED FROM FURTHER CONSIDERATION

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

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

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

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

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

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

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

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

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

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

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

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

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

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

ADDITIONAL SUGGESTIONS FOR NON-COMMERCIALLY GUIDED USE

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

LIMIT ROUTES WHERE OSVS ARE PERMITTED TO THE SOUTH ENTRANCE ONLY

During public scoping, commenters suggested that, due to potential impacts on animal migration patterns, OSV use should be limited to the South Entrance Road only (to Old Faithful) and that no OSVs should be permitted in the remainder of the park. As stated in the 2011 Winter Use Plan/EIS, the best available scientific evidence regarding the effect of road grooming on bison distribution and population patterns suggests the following: first, the observed changes in bison distribution that have occurred were likely consequences of natural population growth and range expansion, which would have occurred regardless of the presence of snow-packed roads (Bjornlie and Garrott 2001; Coughenour 2005; Gates et al. 2005; Bruggeman et al. 2009a). Second, road grooming did not change the population growth rates of bison relative to what may have been realized in the absence of road grooming (Gates et al. 2005; Bruggeman et al. 2006; Fuller 2006; Wagner 2006). Third, there is no evidence that bison preferentially used groomed

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

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

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

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

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

PROHIBIT CROSS-COUNTRY SKIING ON ROADS GROOMED FOR OSV TRAVEL

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

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

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

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

EXPAND NON-MOTORIZED USES IN YELLOWSTONE

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

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

ALTER THE ROAD GROOMING SCHEDULE

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

WEIGHT/POUNDS PER SQUARE INCH REQUIREMENTS FOR SNOWCOACHES

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

ALLOW FOR PRIVATE SNOWCOACHES AND SNOWMOBILES

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

MANDATE USE OF E-FUELS

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

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

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

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

ALLOW SNOWBIKES AND KITE-SKIING (AND OTHER USES)

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

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

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

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

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

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

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

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

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

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

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

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

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

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

HOW ALTERNATIVES MEET OBJECTIVES

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

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

CONSISTENCY WITH THE PURPOSES OF NEPA

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

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

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

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

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

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

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

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

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

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

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

4. Preserve important historic, cultural, and natural aspects of our national heritage and maintain, wherever possible, an environment that supports diversity and variety of individual choice.

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

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

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

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

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

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

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

ENVIRONMENTALLY PREFERABLE ALTERNATIVE

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

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

NATIONAL PARK SERVICE PREFERRED ALTERNATIVE

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

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

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

TABLE 9: SUMMARY OF ALTERNATIVE ELEMENTS

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

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

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

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

TABLE 10: HOW ALTERNATIVES MEET OBJECTIVES

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

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

TABLE 11: IMPACT SUMMARY

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

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

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

CHAPTER 3

Affected Environment

CHAPTER 3: AFFECTED ENVIRONMENT

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

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

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

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

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

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

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

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

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

RECENT RESEARCH AND MONITORING

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

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

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

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

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

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

TABLE 12: OBSERVED RESPONSES OF WILDLIFE TO OSV USE

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

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

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

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

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

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

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

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

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

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

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

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

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

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

BISON (*BISON BISON*)

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

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

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

FIGURE 4: RANGES FOR BISON

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

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

Historical and Current Park Management of Bison

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

Bison

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

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

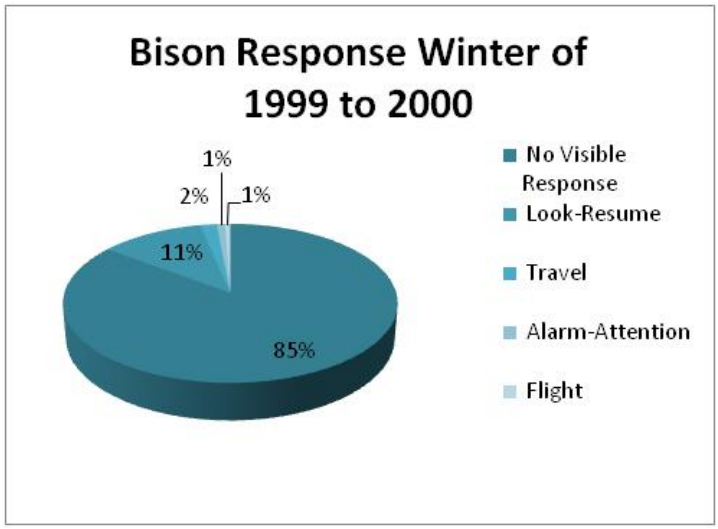
Management removals at (or near) the park boundary along with predation and winterkill (starvation) have been the primary causes of bison mortality in the park. The risk of brucellosis (a contagious bacterial disease associated with spontaneous abortion) transmission from bison to cattle, and the economic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

Behavioral Responses of Bison to OSVs and Visitors

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

Bison

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



Source: McClure et al. 2009

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

ELK (*CERVUS ELAPHUS*)

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

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

Historic and Current Park Management of Elk

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

Elk

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

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

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

Behavioral Responses of Elk to OSVs and Visitors

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

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

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

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

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

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

CANADA LYNX (*LYNX CANADENSIS*)

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

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

Lynx are rarely found in Yellowstone and accurate historical population records are limited. Potential habitat for lynx is shown in figure 5. A total of 73 lynx sightings or tracks were reported in Yellowstone from 1887 to 1993, but the reliability of many reports is questionable and cannot be verified (Yellowstone National Park files; Consolo-Murphy and Meagher 1995). A survey conducted from 2001 to 2004 for lynx in Yellowstone National Park found DNA and track evidence for three lynx, a female and two kittens, all east of Yellowstone Lake (Murphy et al. 2005). This area also contained the highest indices of abundance for snowshoe hare and red squirrel, which form a large percentage of lynx diets (Koehler and Aubry 1994; Sunquist and Sunquist 2002). The authors note that lynx in other areas of the park could have escaped detection, but state that based on their data, they believe lynx are primarily found in the eastern portions of the park. Lynx are also occasionally seen in other areas of the park, such as Indian Creek (just south of Mammoth) and in the Beryl Springs area (between Norris and Madison). Both times, the lynx were traveling near a road that was groomed for OSV travel.

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

FIGURE 5: LYNX HABITAT IN YELLOWSTONE NATIONAL PARK

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

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

WOLVERINE (*GULO GULO*)

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

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

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

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

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

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

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

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

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

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

TRUMPETER SWAN (*CYGNUS BUCCINATOR*)

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

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

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

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

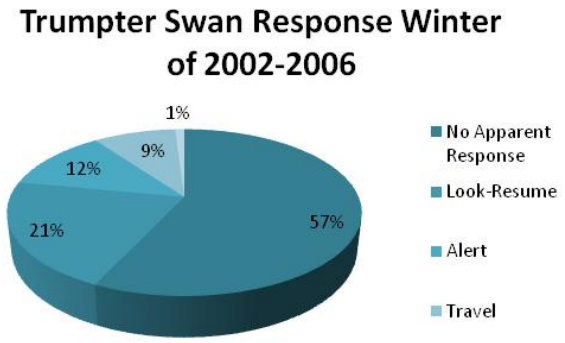
There was no swan reproduction in Yellowstone National Park during 2011. Only two nesting pairs were observed over the past four seasons. Since 2001, there were at most four annual nesting attempts by trumpeter swan pairs in the park. More than 53 percent of nest attempts failed to raise any young, which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

FIGURE 6: EAGLE AND SWAN WINTER HABITAT

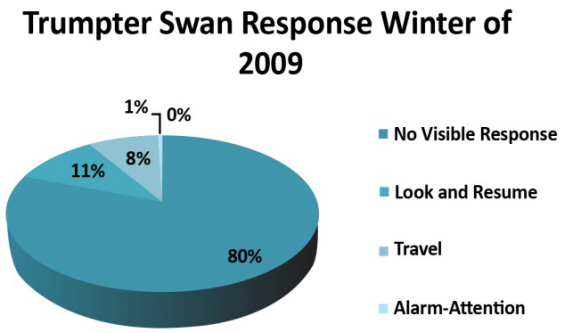
Behavioral Responses of Swans to OSVs and Visitors

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

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



Source: McClure et al. 2009



Source: White et al. 2009

It is also unlikely that poor production across the greater Yellowstone area has resulted from OSV use in the park. Swans generally return to their breeding territories between February and late May, with young hatching in late June when OSVs are no longer present in greater Yellowstone area parks (Stalmaster and Kaiser 1998; Steidl and Anthony 2000; Gonzalez et al. 2006; Olliff, Legg, and Kaeding 1999; NPS 2008a). A site along the Madison River, less than 100 meters (328 feet) from the park's heavily used West Entrance Road, has been a traditional swan nesting area for decades, and at least 23 cygnets have fledged from this site since 1983, making it one of the more productive nesting areas in the park. Researchers attribute the overall decline in the greater Yellowstone area to drought and wetland loss, low immigration rates, predation, and competition with other migrants, particularly snow geese (Baril and Smith 2009).

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

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

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

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

BALD EAGLE (*HALIAEETUS LEUCOCEPHALUS*)

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

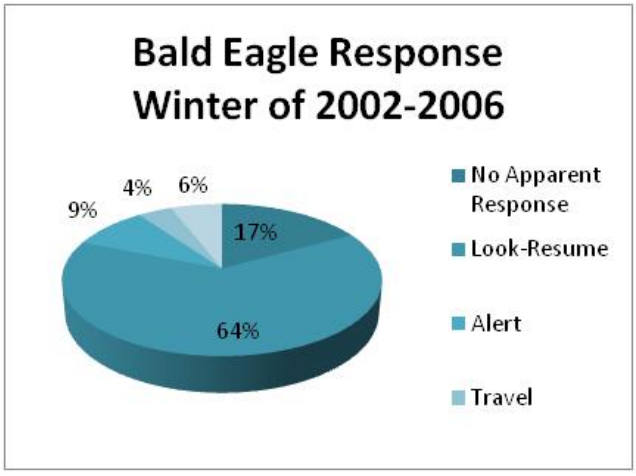
The park has a substantial resident population of eagles that may migrate short distances in winter to be near open water. This population expands seasonally with the addition of migratory eagles.

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

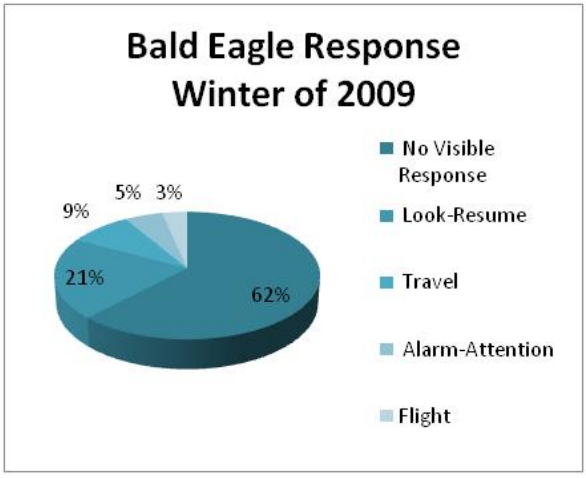
Behavioral Responses of Eagles to OSVs and Visitors

Eagle Nesting in Yellowstone

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



Source: McClure et al. 2009



Source: White et al. 2009

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

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

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

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

GRAY WOLF (*CANIS LUPUS*)

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

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

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

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

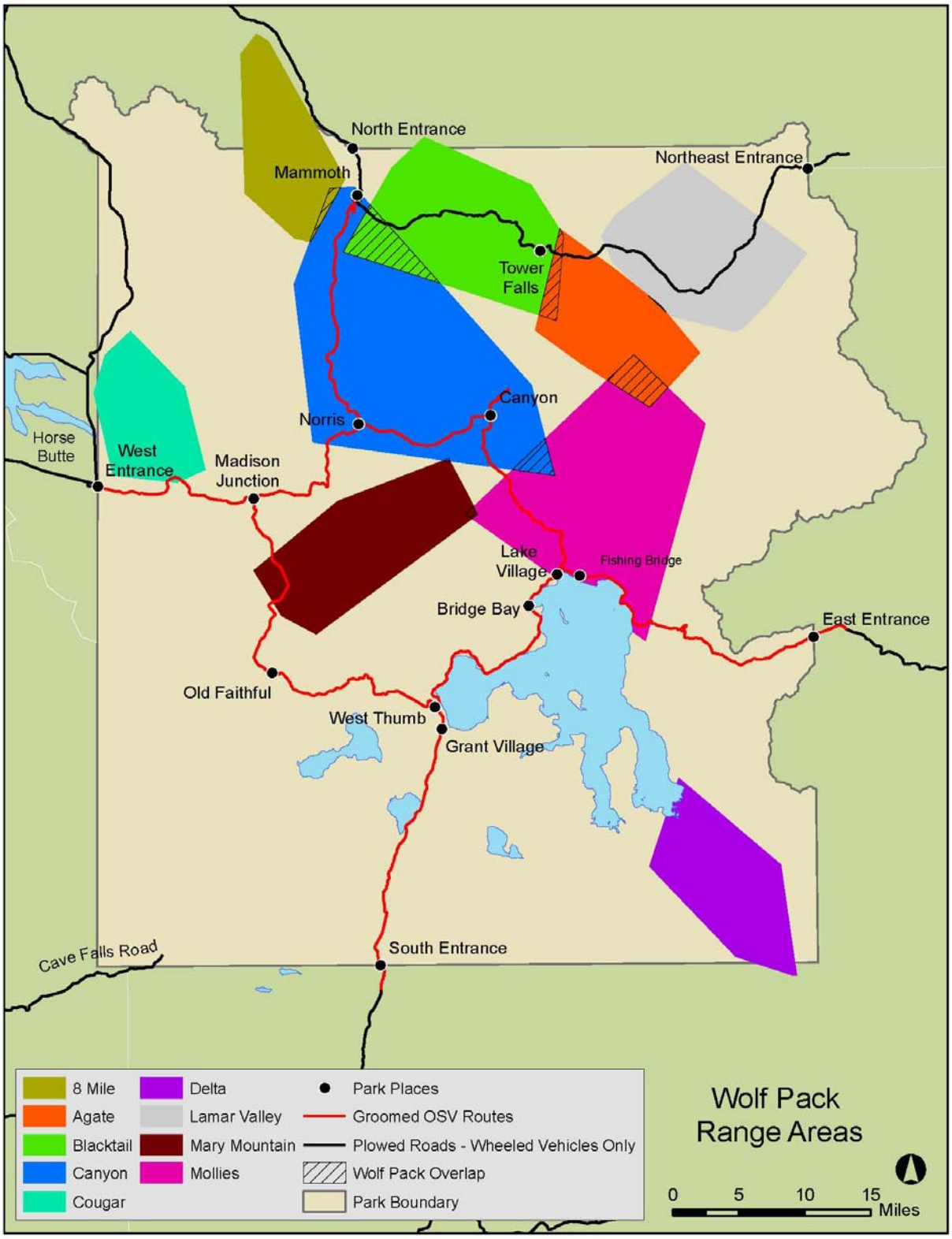


FIGURE 7: WOLF PACK RANGES IN YELLOWSTONE NATIONAL PARK

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

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

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

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

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

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

AIR QUALITY

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

PREVENTION OF SIGNIFICANT DETERIORATION

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

CAA—Clean Air Act

PSD—Prevention of Significant Deterioration

NAAQS—National Ambient Air Quality Standards

AQRV—air quality related value

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

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

NATIONAL AMBIENT AIR QUALITY STANDARDS

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

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

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

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

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

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

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

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

TABLE 16: NATIONAL AND STATE AMBIENT AIR QUALITY STANDARDS

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

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

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

AIR QUALITY AT YELLOWSTONE NATIONAL PARK

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

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

AIR QUALITY RELATED VALUES

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

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

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

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

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

Effects of OSVs on Air Quality Related Values

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

AIR QUALITY CONDITIONS AND TRENDS

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

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

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

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

GENERAL AIR QUALITY TRENDS RELATED TO OSV USE

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

TABLE 17: CONDITION OF AIR RESOURCES AT YELLOWSTONE NATIONAL PARK

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

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

[b] NPS ARD 2010.

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

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

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

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

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

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

AIR QUALITY MONITORING IN YELLOWSTONE NATIONAL PARK

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

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

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

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

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

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

Source: EPA 2012.

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

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

N/A = not applicable.

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

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

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

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

Source: EPA 2009e.

[a] Fourth highest 24-hour maximum.

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

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

— Data not available.

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

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

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

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

Source: Ray 2010a.

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

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

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

— Data not available from this source.

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

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

Source: Ray 2008, 2010a.

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

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

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

— Data not available from this source.

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

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

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

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

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

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

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

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

SOUNDSCAPES AND THE ACOUSTIC ENVIRONMENT

INTRODUCTION

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

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

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

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

OVERVIEW OF YELLOWSTONE SOUNDSCAPES

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

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

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

SOUNDSCAPES TERMINOLOGY

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

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

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

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

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

TABLE 22: DECIBEL LEVELS OF COMMON NOISE SOURCES

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

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

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

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

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

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

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

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

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

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

SOUNDSCAPES MONITORING

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

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

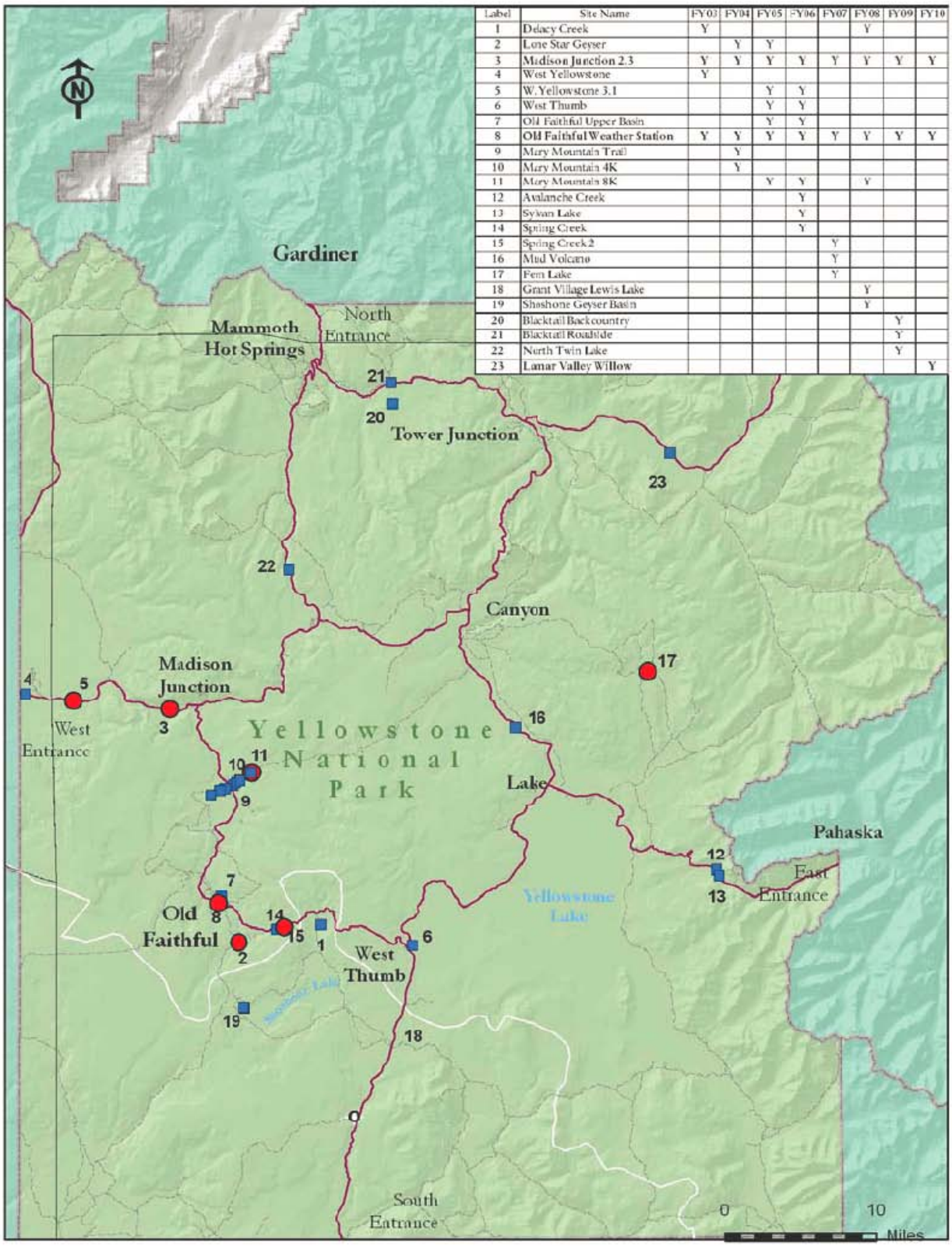
To distinguish between the various OSV user groups in the park (e.g., visitors, administrative), a separate observational study was conducted during seven winters, from 2005 to 2011. Data on the time audible and type of usage for each OSV were collected by observers at locations in developed areas and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

Percent Time Audible

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

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

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



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

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

FIGURE 8: SOUND MONITORING LOCATIONS 2003–2011

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

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

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

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

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

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

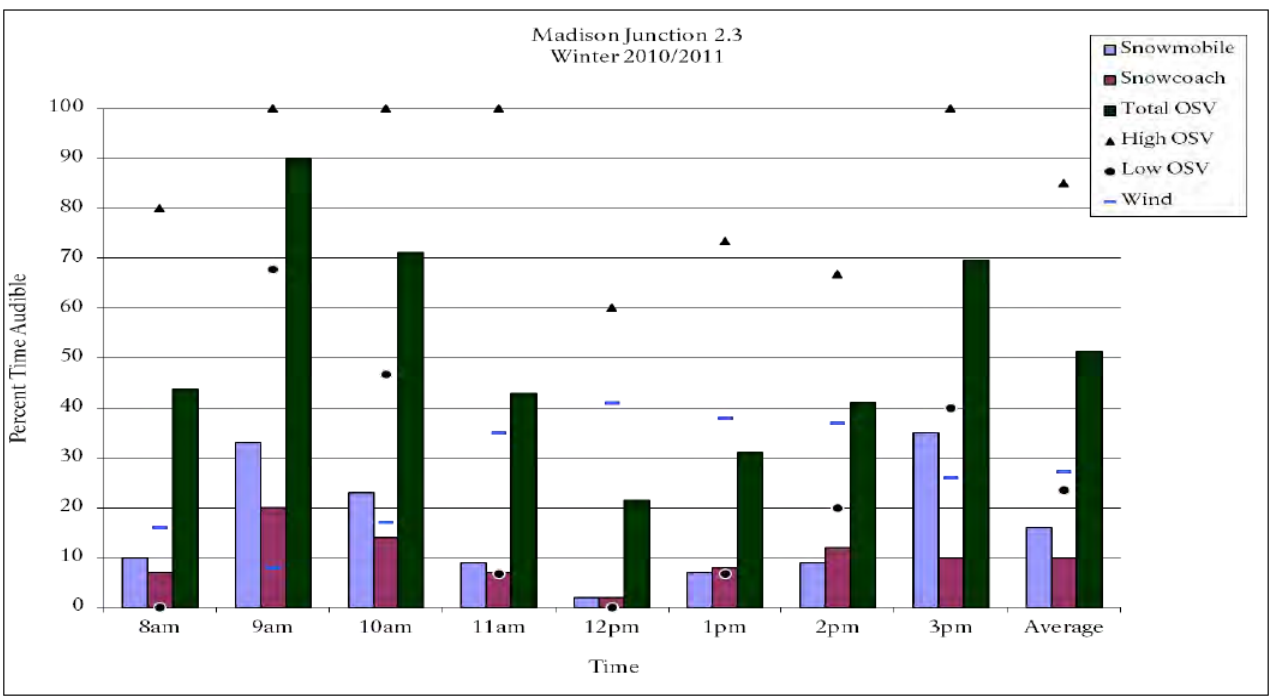
[b] Indicates monitoring for only one or two days (may not represent typical or average acoustic conditions).

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

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

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

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



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

FIGURE 9: AVERAGE OSV PERCENT TIME AUDIBLE BY HOUR

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

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

Length of Time Audible for Discrete OSV Passby Events

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

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

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

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

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

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

Sound Levels

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

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

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

*Median from hourly calculations

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

Observational Study Results

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

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

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

VISITOR USE, EXPERIENCE, AND ACCESSIBILITY

VISITOR ACCESS AND CIRCULATION

Regional Access

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

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

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

Park Roadways, Trails, and Winter Facilities

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

Certain roads within the park are maintained for numerous reasons, including tourism and sightseeing, accessing trailheads, and park management. During the winter, most park roads are closed to wheeled vehicular traffic with the exception of Highway 191, which provides access between West Yellowstone and Bozeman, Montana, and the park road from Gardiner to Mammoth to the Northeast Entrance (Cooke City). The plowing of these roads totals approximately 78 miles, 20 of which are plowed by the state of Montana (NPS 2007c). These roads provide the only wheeled vehicle access through the park and are used by many visitors to view wildlife or access trailheads for cross-country skiing, snowshoeing, and/or hiking. In recent winters, the North Entrance has been the busiest in the winter – about half of the park's winter visitors enter the park through the North Entrance (both in OSVs and wheeled vehicles). The West Entrance was the next busiest, with about 33 percent of winter visitors (OSVs, only). The South Entrance accounted for 16 percent, with the East Entrance admitting 0.5 percent. During the winter, the Northeast Entrance has not been staffed.

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

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

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

Oversnow Modes of Transportation

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

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

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

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

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

Visitation and OSV Transportation Modes

Background

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

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

Data Collection

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

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

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

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

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

Annual OSV Numbers

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

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

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

Source: NPS 2012.

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

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

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

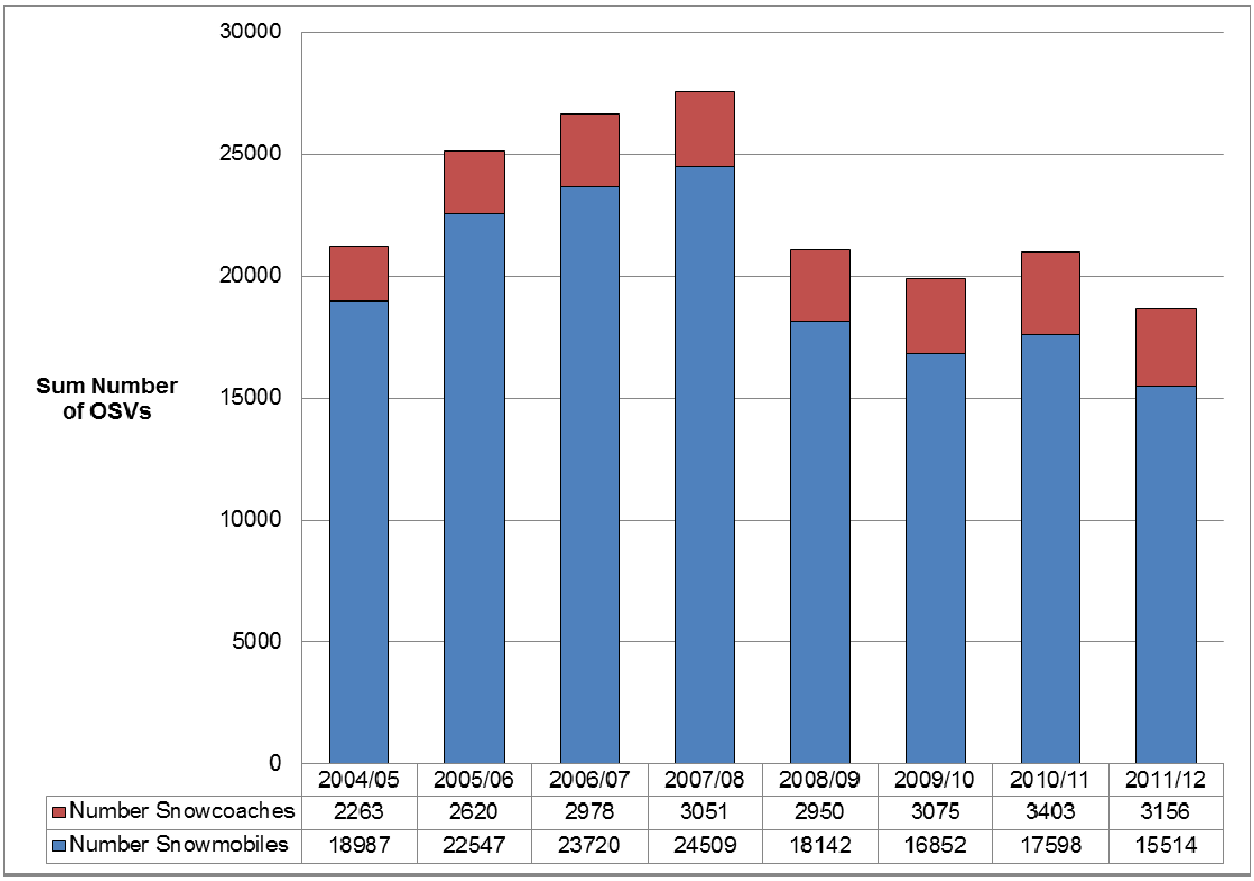
[d] The daily snowmobile limit was reduced to 318 starting during the 2009/2010 season.

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

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

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

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



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

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

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

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

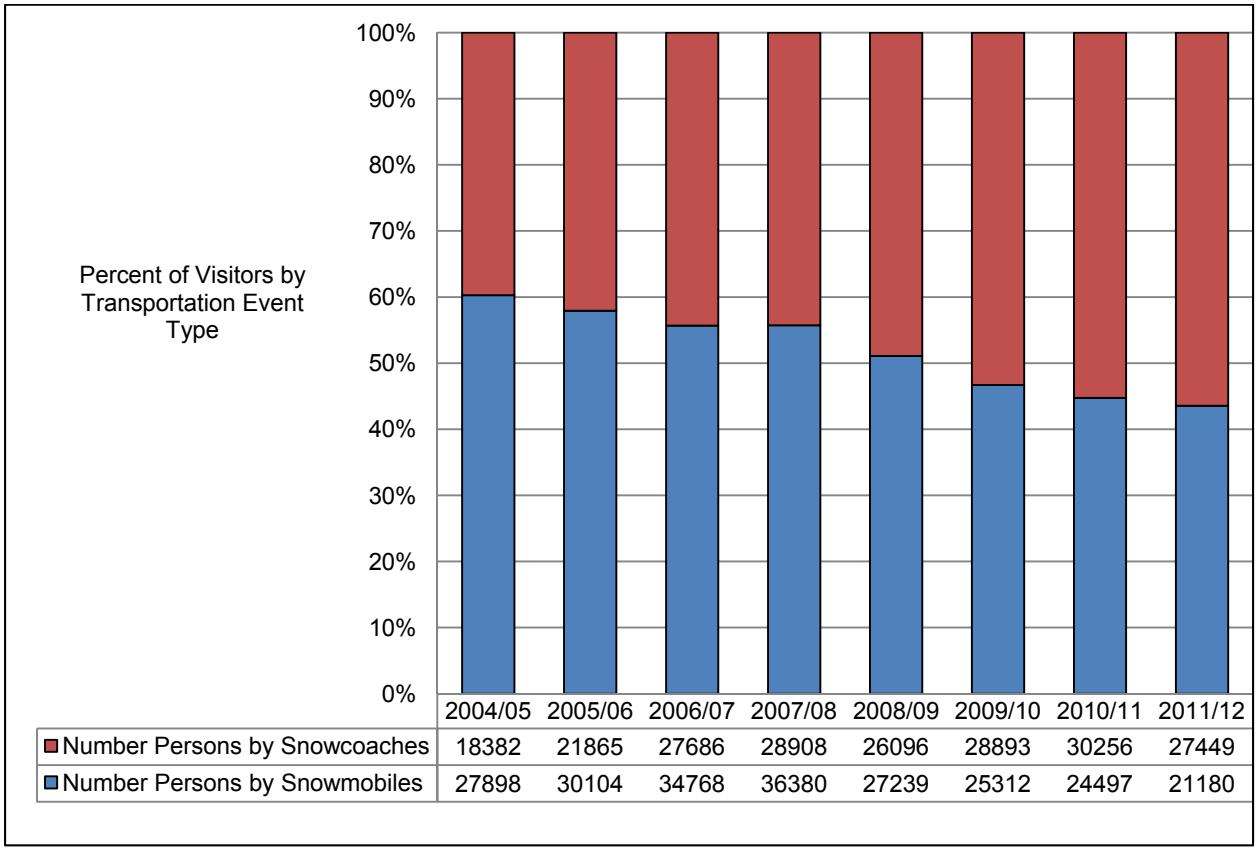


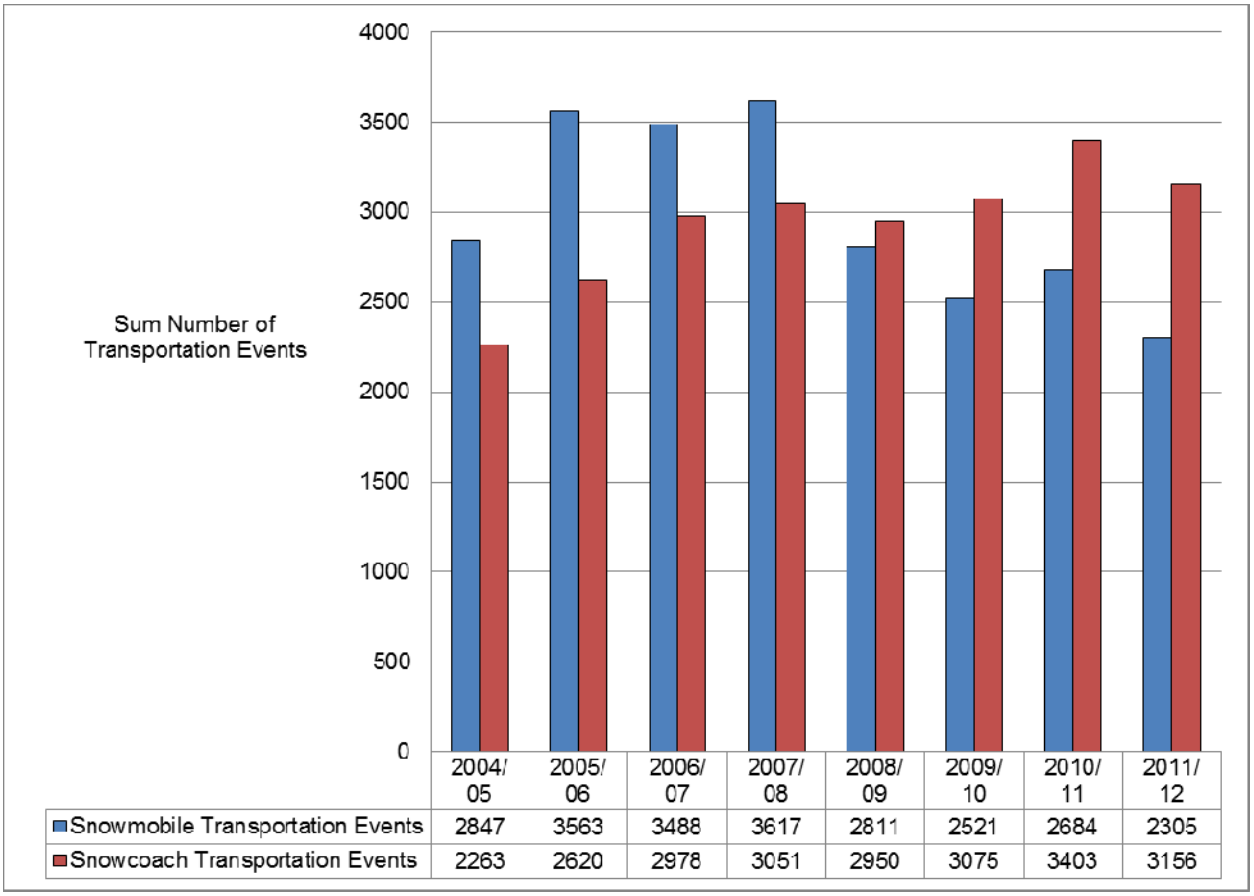
FIGURE 11: PERCENT OF PERSONS USING EACH OSV TRANSPORTATION TYPE

Transportation Events

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

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

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

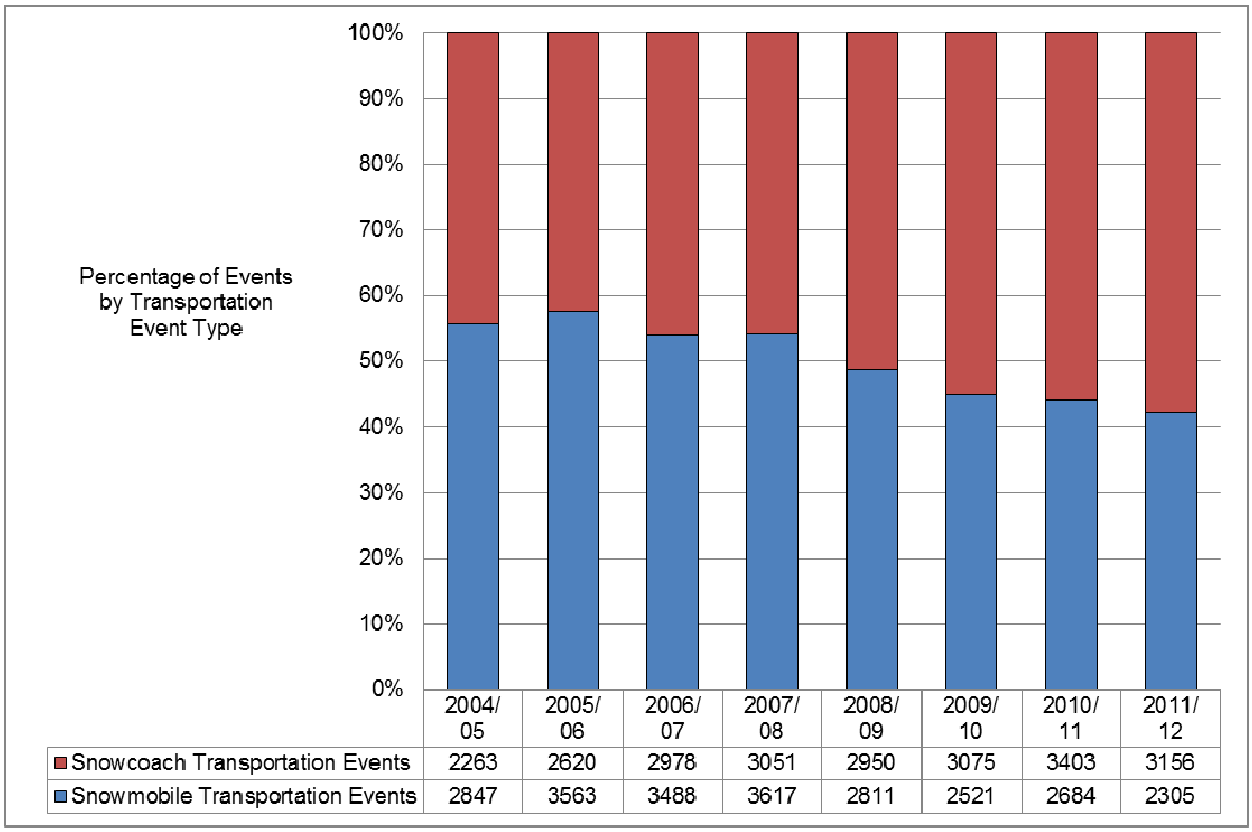


	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12
Snowmobile Transportation Events	2847	3563	3488	3617	2811	2521	2684	2305
Snowcoach Transportation Events	2263	2620	2978	3051	2950	3075	3403	3156

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

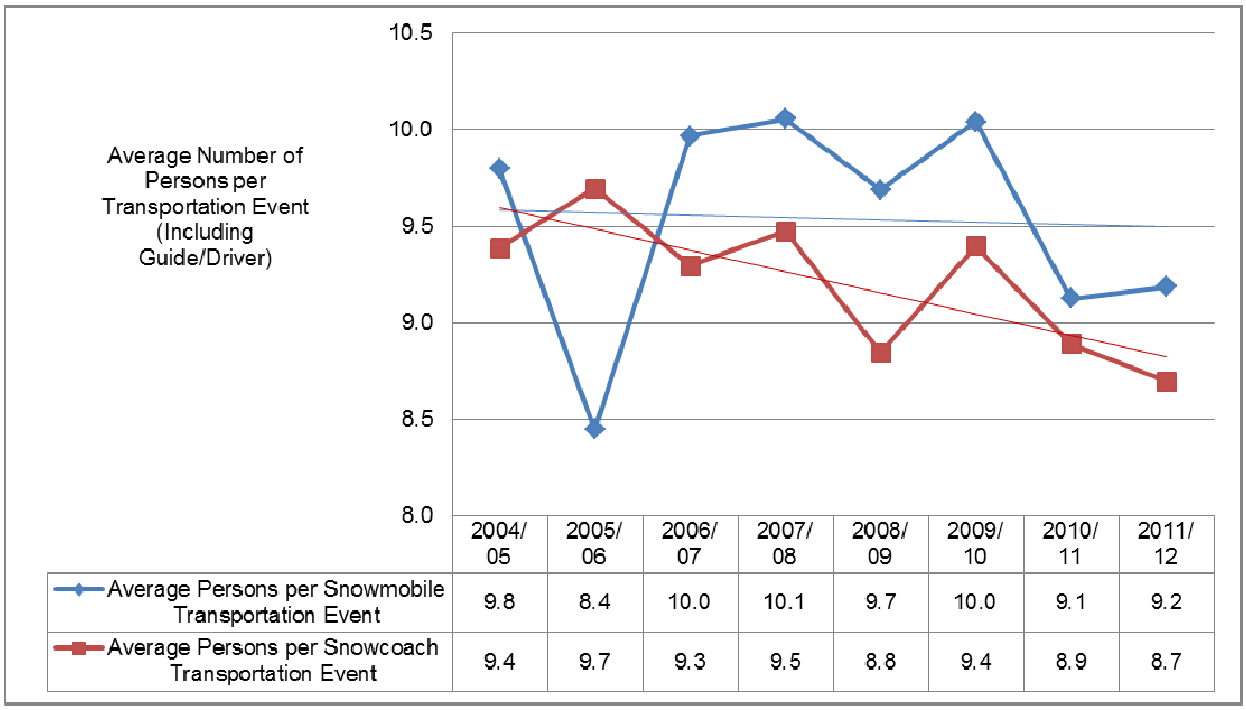
Figure 13 shows the breakdown of transportation events by percentages. In 2004/2005, 55.7 percent of OSV transportation events were snowmobile groups, but by 2011/2012, 42.2 percent of transportation events were snowmobile groups.

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



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

FIGURE 13: PERCENTAGE OF TRANSPORTATION EVENTS BY OSV TYPE



	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12
Average Persons per Snowmobile Transportation Event	9.8	8.4	10.0	10.1	9.7	10.0	9.1	9.2
Average Persons per Snowcoach Transportation Event	9.4	9.7	9.3	9.5	8.8	9.4	8.9	8.7

FIGURE 14: AVERAGE NUMBER OF PERSONS PER TRANSPORTATION EVENT BY TRANSPORTATION EVENT TYPE

Average and Peak Day Use

To understand how snowmobiles and snowcoaches are currently used in the park, it is helpful to understand average daily use, which gives an indication of what a typical day during a season might look like, and peak daily use, which is a snapshot of OSV use on the peak day of the season. The peak use day for a winter season, during which the most OSVs are operating, generally falls near one of three holiday periods during the winter: Christmas/New Year (around December 23 to January 5), Martin Luther King, Jr., Day, and President's Day. During these time periods, operators usually have more clients and use more of their OSV allocations than they do during the rest of the year. Illustrating these trends graphically helps to show the peak possible demand, given the current OSV limits, which can be used to assess visitor numbers and preferences for one transportation type over another.

Both average daily use figures and peak daily use figures can be used to determine average and peak day utilization rates. Utilization rates are calculated by dividing the actual number of OSVs in use for a given day (to determine peak day utilization rate) or season (to determine average utilization rate) by the absolute number of OSVs permitted. Utilization rates under different OSV limits and how these utilization rates change within multiple seasons at a set limit can indicate how appropriate the existing limits are and how operators adjust to these limits.

Table 28 provides the average daily number of snowmobiles and snowcoaches in the park during the previous eight seasons (through 2011/2012) as well as each season's peak numbers of OSVs. The daily limit column shows the maximum number of OSVs permitted daily in the park during that winter season. During the winters of 2004/2004 through 2008/2009, the maximum number of snowmobiles permitted in the park was 720. The daily average during this period ranged from 213 snowmobiles to 303, meaning that average daily utilization rate ranged from 30 percent to 42 percent. Peak use during this period ranged from 429 to 560 snowmobiles (peak utilization rate of 59 percent to 77 percent). During the most recent three seasons (20, 2009/2010 to 2011/2012, the daily limit for snowmobiles was 318 and the daily average ranged from 187 to 197 snowmobiles (59 percent to 62 percent average utilization rate). Peak use of snowmobiles during these years ranged from 258 to 294 (peak utilization rates of 81 percent to 92 percent).

Snowcoach daily limits remained at 78 throughout the managed use era, until the 2011/2012 winter season when they dropped to 76 due to termination of a snowcoach contract with 2 snowcoach allocations at the South Entrance. Daily parkwide averages ranged from 26 to 39 (33 percent to 50 percent average daily utilization rate) during these seasons. Overall, the average daily number of snowcoaches increased by 34.6 percent, from an average of 26 coaches per day in 2004/2005 to an average of 35 coaches per day in 2011/2012. Peak daily snowcoach utilization rates ranged from 56 to 63, with peak daily utilization rates between 72 percent and 81 percent.

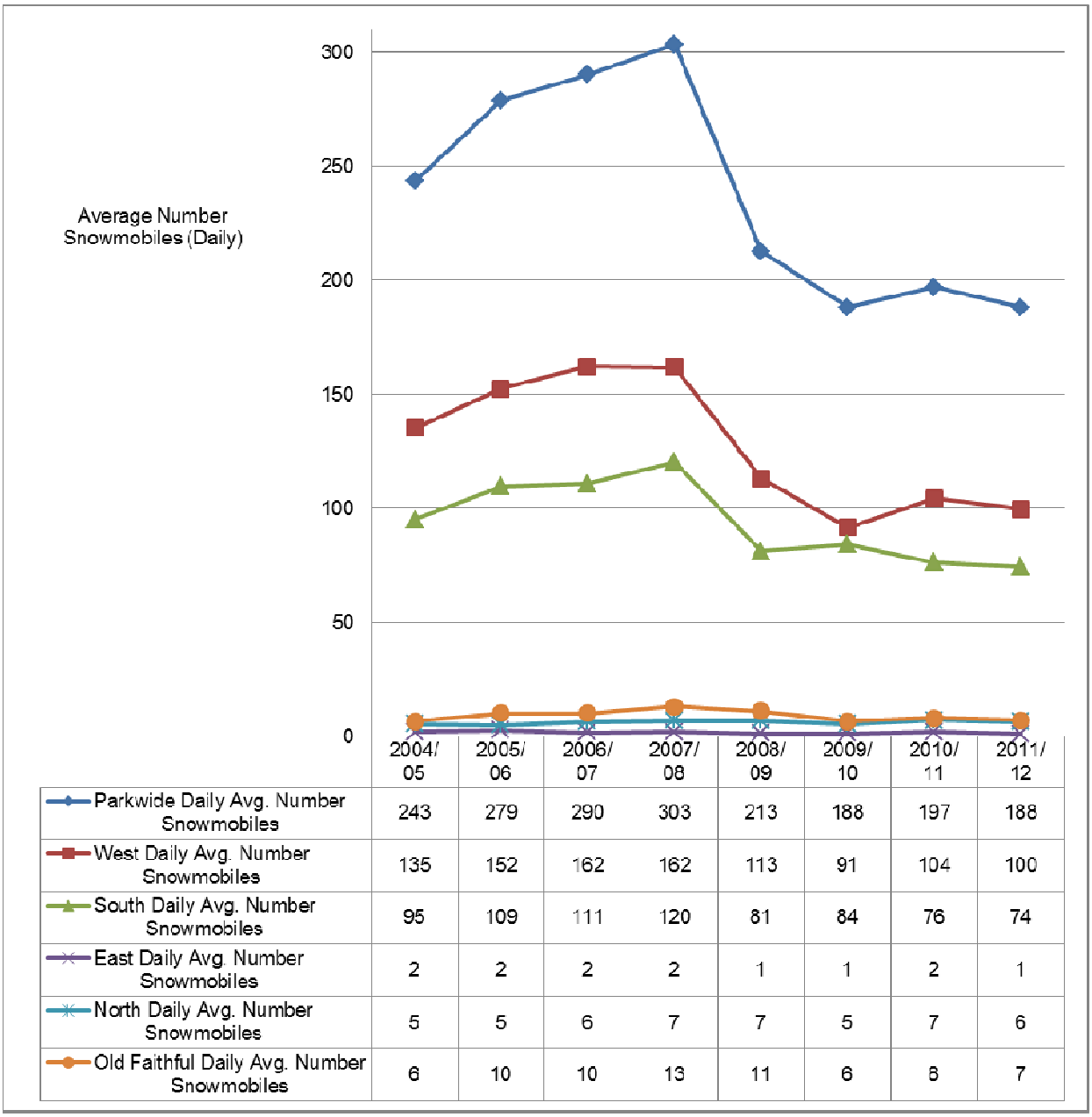
Figure 15 shows the average daily number of snowmobiles operating in the park, both parkwide and by location of origin. Daily averages increased yearly during the 720 snowmobile-limit era until 2008/2009. During the 318 snowmobile-limit era, daily averages stayed fairly constant.

TABLE 28: AVERAGE DAILY NUMBER OF OSVS, WINTER SEASONS 2004/2005 TO 2011/2012

Winter Season	Snowmobiles					Snowcoaches				
	Daily Limit	Daily Average	Daily Average Utilization Rate	Peak	Peak Utilization Rate	Daily Limit	Daily Average	Daily Average Utilization Rate	Peak	Peak Utilization Rate
2004/2005	720	243	34%	430	60%	78	26	33%	58	74%
2005/2006	720	279	39%	494	69%	78	33	42%	60	77%
2006/2007	720	290	40%	552	77%	78	37	47%	58	74%
2007/2008	720	303	42%	560	78%	78	38	49%	63	81%
2008/2009	720 (540)*	213	30% (39%)	429	60% (79%)	78	33	43%	55	71%
2009/2010	318	188	59%	294	92%	78	35	44%	59	76%
2010/2011	318	197	62%	281	88%	78	39	49%	59	76%
2011/2012	318	188	59%	261	82%	76	35	46%	56	74%
Managed-Use Era Average	569	238	46% (47%)	413	76% (78%)	78	34	44%	58	75%
720- Snowmobile Era Average	720	266	37% (39%)	493	68% (73%)	78	33	43%	59	75%
318-Snowmobile Era Average	318	191	60%	279	88%	77	36	47%	58	75%

Source: MN Spreadsheet (concessions data except for peak numbers, which are VSO).

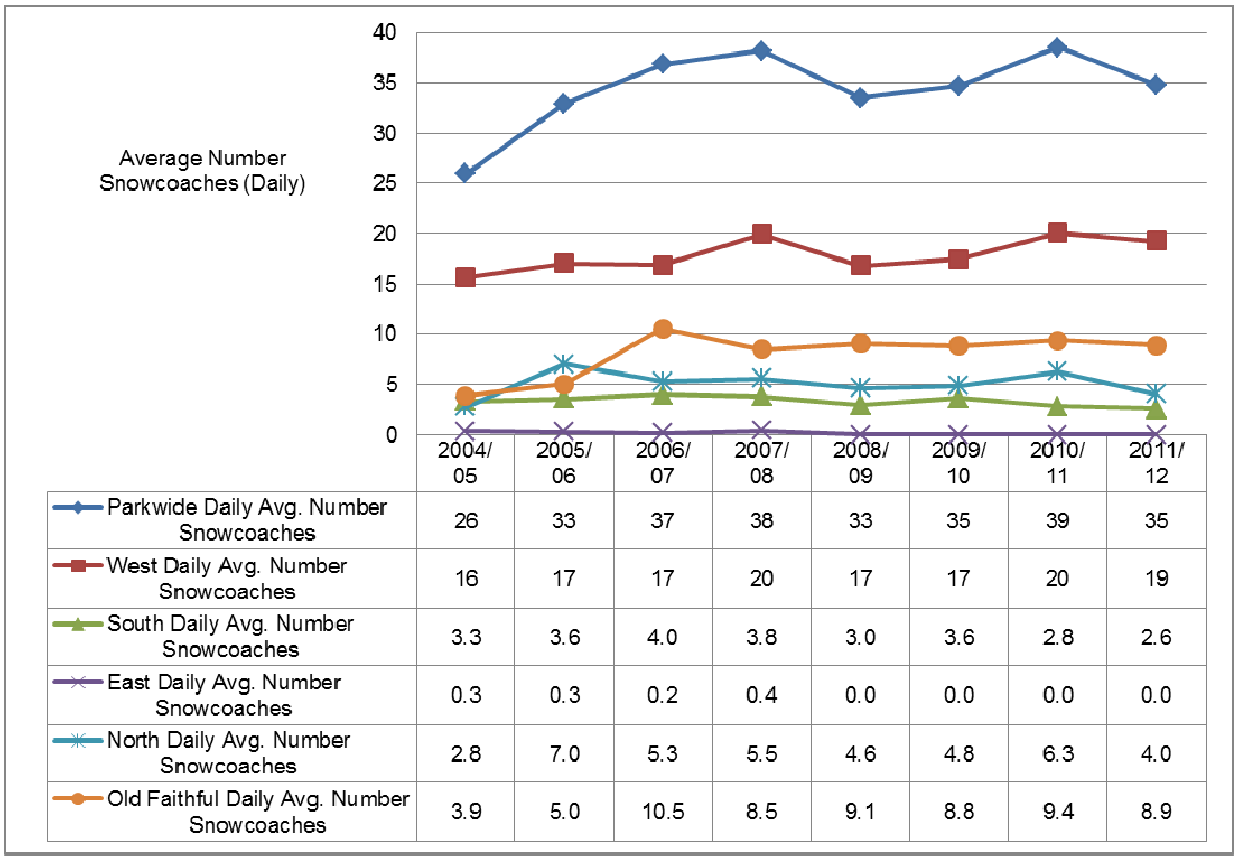
*Although the daily limit was 720, guides and outfitters had planned for a 540 snowmobile limit, based on a winter plan that was overturned in late 2008.



	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12
Parkwide Daily Avg. Number Snowmobiles	243	279	290	303	213	188	197	188
West Daily Avg. Number Snowmobiles	135	152	162	162	113	91	104	100
South Daily Avg. Number Snowmobiles	95	109	111	120	81	84	76	74
East Daily Avg. Number Snowmobiles	2	2	2	2	1	1	2	1
North Daily Avg. Number Snowmobiles	5	5	6	7	7	5	7	6
Old Faithful Daily Avg. Number Snowmobiles	6	10	10	13	11	6	8	7

FIGURE 15: DAILY SNOWMOBILE AVERAGES FROM WINTER SEASONS 2004/2005 TO 2011/2012 (PARKWIDE AND BY GATE)

Figure 16 shows the average daily number of snowcoaches in operation in the park over the past eight seasons. Daily averages increased 46.2 percent from 26 in 2004/2005 to 38 in 2007/2008. During 2008/2009 to 2011/2012, averages ranged from 33 to 39 snowcoaches. The 2008/2009 average of 33 snowcoaches is a decrease from the 2007/2008 daily average of 38 snowmobiles. While this is only slightly more than the fluctuations seen in later years, this drop in 2008/2009 does correspond to the significant drop in snowmobile numbers in this same season, which is likely due to the anticipated snowmobile-limit decrease of that year.

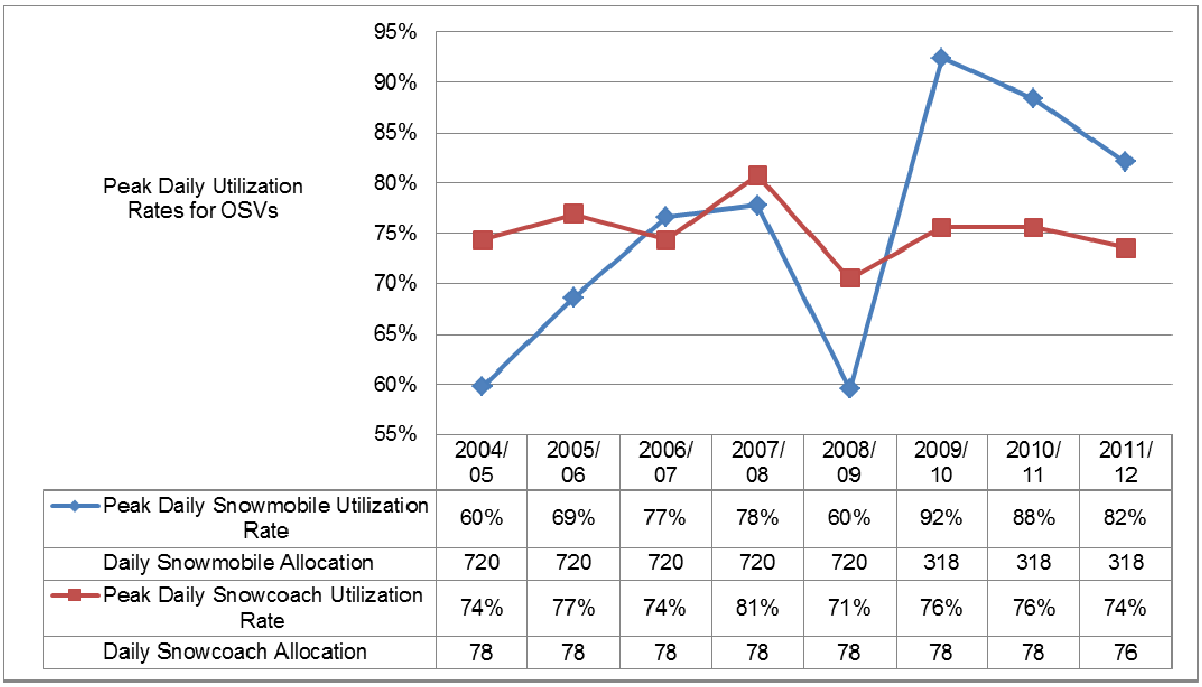


	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12
Parkwide Daily Avg. Number Snowcoaches	26	33	37	38	33	35	39	35
West Daily Avg. Number Snowcoaches	16	17	17	20	17	17	20	19
South Daily Avg. Number Snowcoaches	3.3	3.6	4.0	3.8	3.0	3.6	2.8	2.6
East Daily Avg. Number Snowcoaches	0.3	0.3	0.2	0.4	0.0	0.0	0.0	0.0
North Daily Avg. Number Snowcoaches	2.8	7.0	5.3	5.5	4.6	4.8	6.3	4.0
Old Faithful Daily Avg. Number Snowcoaches	3.9	5.0	10.5	8.5	9.1	8.8	9.4	8.9

FIGURE 16: DAILY SNOWCOACH AVERAGES FROM WINTER SEASONS 2004/2005 TO 2011/2012 (PARKWIDE AND BY GATE)

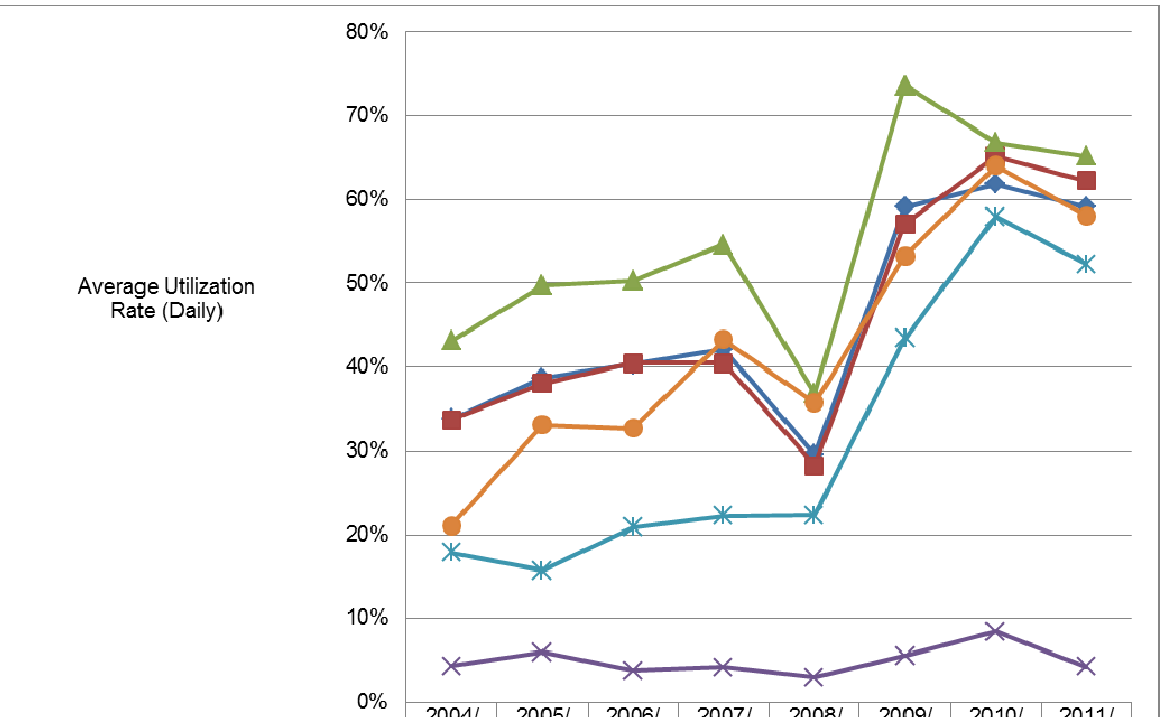
Snowcoach peak daily utilization rates have stayed within a fairly narrow range for the past eight seasons: 74 percent in 2004/2005 (58 coaches) and 74 percent in 2011/2012 (56 coaches), but ranging as high as 81 percent in 2007/2008. Snowmobiles had a peak daily utilization rate of 60 percent in 2004/2005 (430 snowmobiles out of the 720 allowed) and a peak daily utilization rate of 82 percent in 2011/2012 (261 snowmobiles out of the 318 allowed). Peak utilization rates for snowmobiles increased most dramatically between winter seasons 2008/2009 and 2009/2010, going from 60 percent to 92 percent (figure 17).

The average daily utilization rate for snowmobiles has increased over the past eight seasons at almost all gates, as depicted in figure 18. The average daily utilization rate increased steadily throughout most of the 720 snowmobile-limit era (from 2004/2005 to 2007/2008), from 34 percent to 42 percent parkwide except for a drop of 30 percent during 2008/2009 when the snowmobile limit was unexpectedly increased at the last minute. When the 318 snowmobile limit was implemented in 2009/2010, the utilization rates went up drastically, to 59 percent parkwide, and then stayed around that level (or a little higher) during the remaining two 318 snowmobile-limit years. In general, these trends were the same for the individual gates.



	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12
Peak Daily Snowmobile Utilization Rate	60%	69%	77%	78%	60%	92%	88%	82%
Daily Snowmobile Allocation	720	720	720	720	720	318	318	318
Peak Daily Snowcoach Utilization Rate	74%	77%	74%	81%	71%	76%	76%	74%
Daily Snowcoach Allocation	78	78	78	78	78	78	78	76

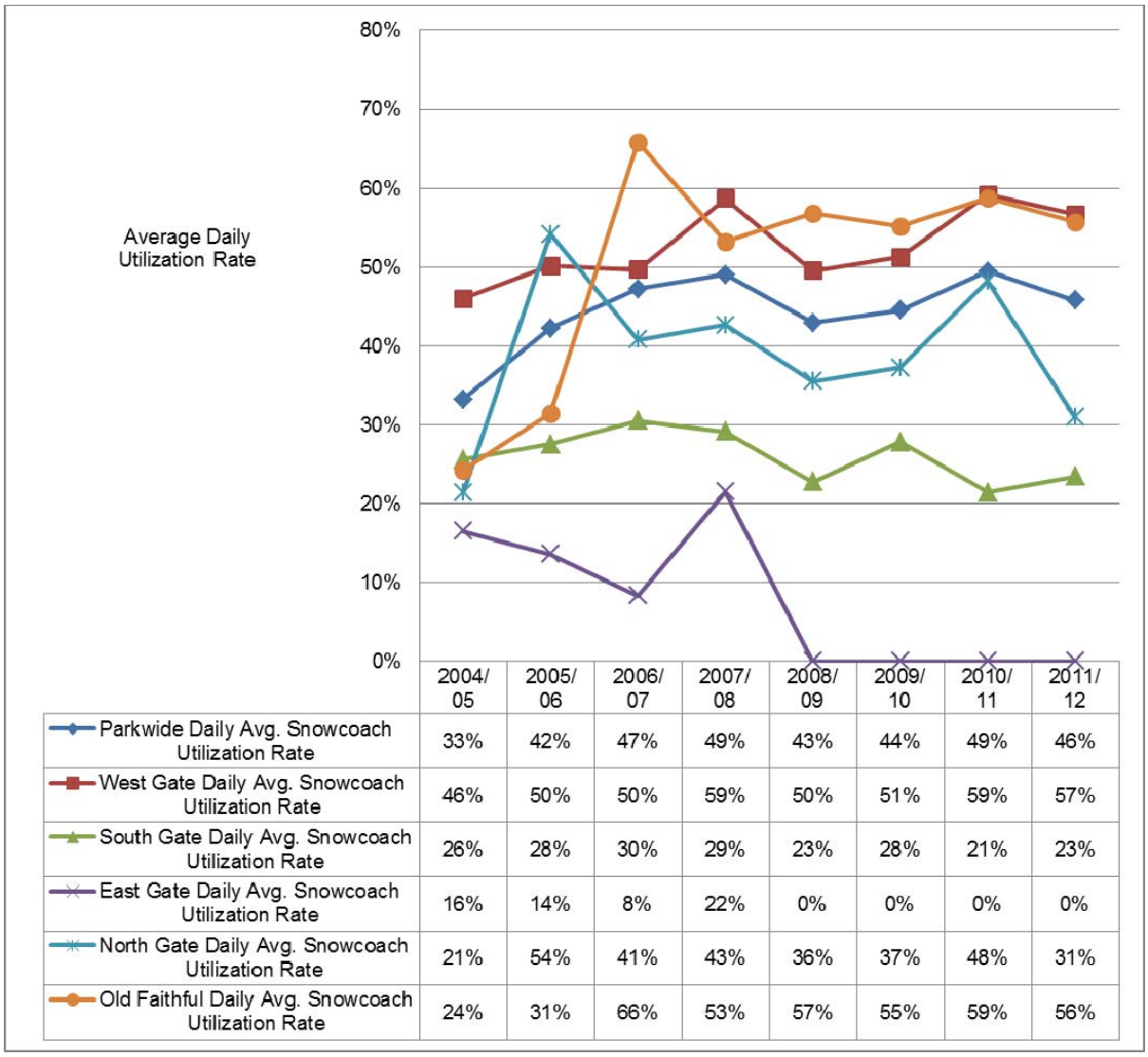
FIGURE 17: PEAK DAILY UTILIZATION RATES OF SNOWMOBILE AND SNOWCOACHES DURING MANAGED USE ERA



	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12
Parkwide Avg. Daily Snowmobile Utilization Rate	34%	39%	40%	42%	30%	59%	62%	59%
West Gate Avg. Daily Snowmobile Utilization Rate	34%	38%	41%	40%	28%	57%	65%	62%
South Gate Avg. Daily Snowmobile Utilization Rate	43%	50%	50%	55%	37%	74%	67%	65%
East Gate Avg. Daily Snowmobile Utilization Rate	4%	6%	4%	4%	3%	6%	8%	4%
North Gate Avg. Daily Snowmobile Utilization Rate	18%	16%	21%	22%	22%	43%	58%	52%
Old Faithful Avg. Daily Snowmobile Utilization Rate	21%	33%	33%	43%	36%	53%	64%	58%

FIGURE 18: AVERAGE DAILY SNOWMOBILE USE RATES THROUGHOUT MANAGED USE ERA

Overall, the average daily snowcoach utilization rates have increased more gradually than snowmobiles, going from 33 percent parkwide in 2004/2005 to 46 percent parkwide in 2011/2012, as shown in figure 19. There was a gradual increase in snowcoach use at most of the gates with the exception of the East Entrance, where operators chose to stop running coaches in 2008/2009 despite the two-snowcoach allotment, and the South Entrance, which stayed between 20 and 30 percent throughout the managed-use era. There was a fairly steep drop in snowcoach utilization rate at the North Entrance in the 2011/2012 season (figure 19).



	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12
Parkwide Daily Avg. Snowcoach Utilization Rate	33%	42%	47%	49%	43%	44%	49%	46%
West Gate Daily Avg. Snowcoach Utilization Rate	46%	50%	50%	59%	50%	51%	59%	57%
South Gate Daily Avg. Snowcoach Utilization Rate	26%	28%	30%	29%	23%	28%	21%	23%
East Gate Daily Avg. Snowcoach Utilization Rate	16%	14%	8%	22%	0%	0%	0%	0%
North Gate Daily Avg. Snowcoach Utilization Rate	21%	54%	41%	43%	36%	37%	48%	31%
Old Faithful Daily Avg. Snowcoach Utilization Rate	24%	31%	66%	53%	57%	55%	59%	56%

FIGURE 19: AVERAGE DAILY SNOWCOACH UTILIZATION RATES THROUGHOUT MANAGED USE ERA

Visitation from Afar

Visitors can also visit the park from afar. Section 1.4.3 of NPS *Management Policies 2006* states, "The fundamental purpose of all parks also includes providing for the enjoyment of park resources and values by the people of the United States. The enjoyment that is contemplated by the statute is broad; it is the enjoyment of all the people of the United States and includes enjoyment both by people who visit parks and by those who appreciate them from afar. It also includes deriving benefit (including scientific knowledge) and inspiration from parks, as well as other forms of enjoyment and inspiration."

The park offers seven webcams for visitors to remotely view the park. These webcams include two at Old Faithful; one each at the Upper Geyser Basin, Mammoth Hot Springs, and the terraces at Mammoth Hot Springs; and two at Mount Washburn. Visitors can view these webcams at any time during the year (NPS 2010l).

VISITOR ACTIVITIES

Activities such as snowmobiling, cross-country skiing, and riding snowcoaches are primary winter uses in Yellowstone. These activities allow visitors to view wildlife, take photographs in various areas throughout the park, and enjoy the sounds of the natural environment. Other popular uses include camping, hiking/snowshoeing, and participating in interpretive programs. These visitor activities are generally available throughout the winter season, but the park superintendent may restrict the use of any area or trail to protect visitors and park resources. Weather conditions may also warrant closing an area.

The ability of visitors to experience Yellowstone by OSV is determined, in part, by the amount of snowpack on designated routes. The variability of snowpack over numerous years helps identify realistic opening and closing dates for OSVs in the park. Rubber-tracked coaches can operate in low snow conditions. Snowmobiles and steel-tracked coaches are not allowed to operate when snow is too thin. Actual opening dates for non-rubber-tracked vehicles is often later than the scheduled dates shown in table 29. For example, snowpack at Madison Junction helps dictate when the road can be opened from Old Faithful to West Yellowstone. Approximately 15 to 18 inches of cumulative snowfall is necessary to open the west-side roads to OSV use. Spring closings closely mirror changes in the snowpack, specifically when the snowpack becomes the same temperature throughout the snowpack, marking the beginning of spring melt. Mid-winter melt can also be a problem for maintaining snow on roads; therefore mid-winter melt affects visitor use (Farnes and Hansen 2005).

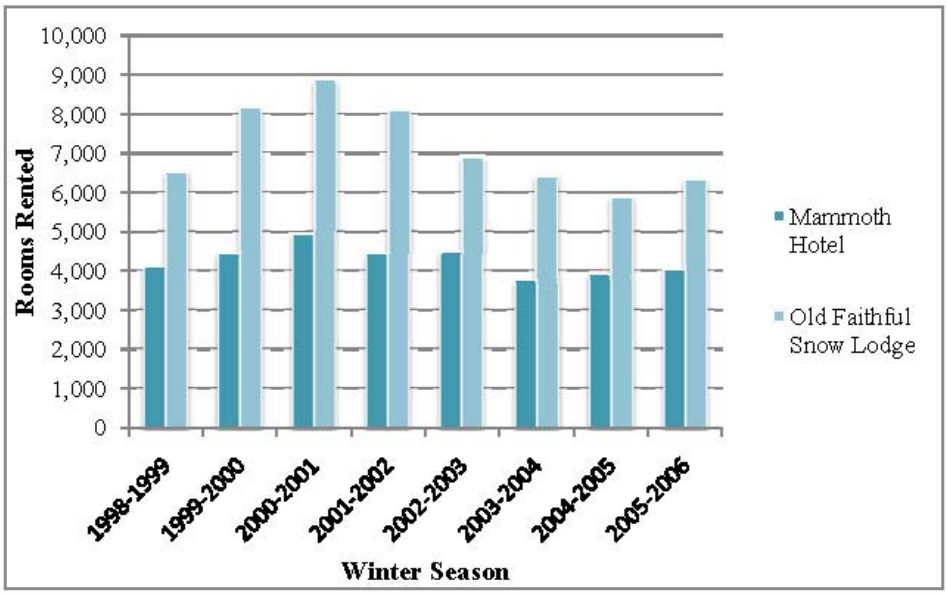
TABLE 29: TARGET OPENING DATES

Entrance	Date of Opening
South Entrance	December 15
East Entrance	December 22
West Entrance	December 15

In addition to parking facilities dispersed throughout the park, there are warming huts at various locations. Warming huts are found at Mammoth, Canyon Village, Indian Creek, Fishing Bridge, Madison, and West Thumb. Small snack bars or vending machines are available at the warming huts at Mammoth, Madison, and Fishing Bridge. NPS interpreters or volunteers staff some of the huts to answer questions and provide information and assistance to visitors. Winter fueling facilities are available at Old Faithful, Fishing Bridge, Mammoth, and Canyon Village (NPS 2007c).

Winter lodging facilities in the park include the Mammoth Hotel and the Old Faithful Snow Lodge. Together, these hotels have 228 rooms with 448 beds (NPS 2007c). In addition to these facilities, Yellowstone Expeditions operates six yurts plus a dining/community yurt and kitchen yurt near Canyon Village. The park also issues winter backcountry camping permits. Overnight stays at the hotels were at their highest during the 1999/2000 to 2001/2002 winter seasons (figure 20). The change in hotel stays closely parallels fluctuations in overall Yellowstone winter visitation. Snowmobile use and recreational visitor numbers were at their highest during these years.

Snow Lodge



Source: NPS 2007c.

FIGURE 20: HOTEL ROOMS RENTED IN YELLOWSTONE NATIONAL PARK, VARIOUS WINTER SEASONS

There are a number of museums in the area that offer a variety of different opportunities to learn about the history and heritage of the park and region. The Heritage and Research Center in Gardiner, Montana, houses the Yellowstone National Park museum collection, archives, research library, historian's office, archeology lab, and herbarium. Other nearby education resources include the Buffalo Bill Historical Center, the Carbon County Historical Society & Museum, the Eagle Rock Art Museum, the Gallatin County Historical Society and Pioneer Museum, the Museum of the Mountain Man, and the Museum of the Yellowstone, among others.

Visitor Accessibility

Yellowstone offers a wide variety of experiences in the park that can be experienced by a range of visitors. Visitors that could have difficulty accessing the park during the winter months include the very young, the elderly, and those who are mobility impaired. Within Yellowstone, visitors with access challenges can drive through the North Entrance of the park and through Lamar Valley and Mammoth in their own vehicles. Additionally, tour companies offer accessibility through the North Entrance of the park through wildlife viewing tours in Americans with Disabilities Act (ADA) accessible vehicles (Xanterra pers. comm. 2010). Visitors can enjoy viewing wildlife and the natural surroundings from a wheeled vehicle. Depending on individual mobility challenges, for some, snowmobiles can provide a way for visitors to enjoy the park in the winter. For others, ADA-accessible snowcoaches are the preferred mode of travel. Companies work with visitors to provide the type of transportation that best meets their needs and desires. Commercial vendors at Yellowstone offer ADA-accessible snowcoaches for those with accessibility issues. According to one company, disabled visitors use the power-lift snowcoaches on average twice a month (Johnson pers. comm. 2010).

Tour companies offer accessibility through the North Entrance of the park through wildlife viewing tours in ADA accessible vehicles (Xanterra pers. comm. 2010). Visitors can enjoy viewing wildlife and their natural surroundings from a wheeled vehicle.

The Old Faithful Visitor Education Center and the Albright (Mammoth) visitor center are wheelchair accessible. Visitors with accessibility needs may require assistance to enter the Madison warming hut (NPS 2010i). Wheelchair accessible rooms are available at the Old Faithful Snow Lodge, which also offers a handicapped-accessible cabin for visitors. Trails, paths, and roads in the park are snow covered in the winter. Routes between the Snow Lodge, the Old Faithful Visitor Education Center, and the geyser basin boardwalks are kept open, but soft or fresh snow may preclude easy access among them. At Canyon, the South Rim Drive at Artist Point offers a view of the Lower Falls (NPS 2010j). At the Mammoth Hotel, two handicapped-accessible rooms are available (NPS 2010k).

VISITOR SURVEYS

Numerous studies have examined visitor use in national parks, including some specific to Yellowstone, in an attempt to understand features and elements of particular importance to different user groups. Managing OSV use can affect visitor experiences in the park directly and indirectly. The NPS directly controls several elements of OSV travel, including limits on the number of OSVs in the park each day, the size of snowmobile tour groups, the relative proportion of snowmobiles and snowcoaches allowed, the grooming of roads, and requirements for visitors to employ licensed guides and use OSVs equipped with BAT. Through these actions, the NPS also manages other aspects of OSV use that can affect the experiences of winter visitors. Much of the research that has been done addresses how noise can impact the visitor experience, however, studies on the role wildlife viewing plays in the visitor experience and the potential for visitor conflicts are also relevant to winter use in the park.

Soundscapes are a key element of the environment and natural ecology of national parks (Borrie, Freimund, and Davenport 2002; Bowles 1995). However, equally important are the ways in which visitors experience a natural soundscape (McCusker and Cahill 2010). Much of the social science research on soundscapes addresses the effects of noticeable natural and anthropogenic (human-caused) sounds on visitor experiences in national parks and other natural areas. This has been an important area of investigation during the last two decades. In general, social science research has found that the majority of visitors to national parks value and enjoy natural sounds, solitude, and quiet (Mace, Bell, and Loomis 2004). At Yellowstone, a 2008 study found that those interviewed believed the natural sounds they heard were part of what made Yellowstone special. Eighty-one percent of respondents indicated that natural sounds had a positive effect on their experience (Saxen 2008).

The visitor survey report summarized below is the most recent available report of its kind. Data below were collected during the 2007/2008 winter season. The report, entitled *Winter Experiences of Old Faithful Visitors in Yellowstone National Park*, was prepared by The University of Montana, Department of Society and Conservation and released in August 2009 (Freimund et al. 2009). The methodology employed for this study was designed to address the following objectives related to noise and the visitor experience: to better understand the dynamics of visitor experiences of natural sounds and to better understand visitor perceptions of the practical need for mechanical noise presence during a park visit. Additionally, the study examined the relationship between visitor experience and wildlife and guiding.

The soundscapes sub-study sought to describe the dynamics of winter visitors' experiences of the soundscape environment in Yellowstone and document how visitors feel natural soundscapes should be protected by park management. Interviews conducted for the survey revealed that the natural soundscape assists in providing a deep connection to nature that is restorative and even spiritual for some visitors. Natural sounds influenced respondents' motivation to visit Yellowstone and were an important part of the experience for more than a third of the visitors interviewed. Specifically, experiencing natural sounds during a visit was rated as "extremely" or "very" important by 85 percent of cross-country skiers, 81 percent of snowshoers, and 75 percent of snowcoach tourists, but only 55 percent of snowmobilers.

Slightly less than half of respondents said the park was particularly attractive as a place free from motorized noise. Overall, snowmobilers and snowcoach riders generally felt strongly or somewhat agreed that Yellowstone is a place for natural quiet. Because they are able to travel in different locations than motorized vehicles, survey respondents participating in non-motorized winter activities, such as cross-country skiing and snowshoeing, had a higher percentage of respondents indicating they believe the park is a place free of motorized noise (even though they all had to use OSVs to access Old Faithful). Overall, Freimund et al. (2009) report that 71 percent of respondents to the soundscape survey said they found the level of natural sound they were looking for half or more of the time they desired it, but only 15 percent of visitors were able to find these experiences all of the time they were in the park. Still, very few respondents (8 percent to 13 percent) in all groups supported closing the roads at Yellowstone to all OSVs. Somewhat greater support existed for closing roads to snowmobiles while allowing snowcoach tours to continue; but fewer than half of all groups strongly or somewhat supported this measure, and only 11 percent of snowmobilers supported it.

The majority of respondents supported requiring BAT vehicles, continuing guide requirements, limiting the total number of OSVs in the park per day, and limiting group size to 11 per guide. The closing of roads to all OSVs or to snowmobiles only was opposed or strongly opposed by the majority of respondents. Plowing the roads for automobile access was also strongly opposed by approximately 71 percent of respondents.

In addition to these most recent studies, the effect of noise on the visitor experience has been examined at the park since the late 1990s. In a study before managed winter use, Davenport et al. (2000) found that most visitors "treasured" their winter experience in the park, with peace and quiet being part of that experience, with a high level of visitor satisfaction. Littlejohn (1996) also conducted a study in the "pre-managed era" and found that in response to an open-ended question about what they liked least about their visits, 134 respondents replied that trails and roads needed grooming, but only 79 respondents replied that noise from snowmobiles was what they liked least. Borrie et al. (1997) also explored the impact of noise on the quality of the winter experience at the park during the pre-managed era. In this study, visitors tended to describe the noise impact as neutral (neither important nor not important). More recent studies (Freimund et al. 2009; Saxen 2008) of visitor satisfaction during the "managed era" at the park reported similar findings, as detailed above and in the Scientific Assessment of Yellowstone National Park Winter Use (NPS 2011f).

Wildlife Viewing and the Visitor Experience

Many studies have noted the importance of wildlife viewing as part of the visitor experience in the park (Freimund et al. 2009), with bison being the most visible animals in the park. A second sub-study of the 2007/2008 survey looked at the visitor experience and bison. This study was conducted to explore snowcoach, snowmobile, and cross-country skiing winter use visitors' opinions of the human/bison interactions witnessed during park visits and to analyze situational and visitor characteristics that might influence those opinions. Surveys were given to 411 park visitors. From these surveys, Freimund et al. (2009) found that 71 percent of winter visitors to the park believed their opportunity to view bison was "very" or "extremely" important to their visit. When comparing cross-country skiers, snowshoers, snowmobilers, and snowcoach users, 70 percent or more of all groups rated the importance of the opportunity to view bison as very important or extremely important.

The majority of respondents indicated that the bison they encountered did not seem to notice the presence of humans or OSVs or, if they did, they quickly resumed their activities. Less than 20 percent of respondents had interactions with bison where they witnessed a defensive charge or felt bison were hurried or put to flight. Specifically, when asked to describe the most significant or "intense" encounter with bison that they witnessed, 43 percent of visitors described responses no more intense than bison

noticing the presence of humans and resuming their activity. Another 36 percent witnessed interactions in which bison appeared to be vigilant, to move away in an unhurried manner, or to have their desired movement blocked. The remaining 21 percent of visitors indicated seeing interactions where bison were hurried, were put to flight, seemed defensive toward humans, or appeared to fight each other as a result of human presence.

The survey found that snowmobilers were more likely to say bison were calm, as compared to cross-country skiers and snowshoers, who indicated that the bison appeared somewhat agitated and somewhat dangerous. Respondents traveling through the park via snowcoach were more likely to report that the bison appeared calm, as compared to reports from respondents using non-motorized transportation modes.

The majority of respondents still believe that bison lead a largely free, unrestricted life and remain an authentic symbol of western culture and heritage. Respondents indicated that they believe the bison appear healthy and they gave a positive endorsement in the case of appropriateness, quality of management, and acceptability of the bison.

Guiding

In addition to visitors, Freimund et al. (2009) also conducted interviews with 22 guides at the park. The study was designed to identify the perceptions snowmobile and snowcoach winter guides in Yellowstone have on the effectiveness of recent policy changes in achieving environmental protection while promoting satisfactory visitor experiences. At the time the study was conducted (2008), the daily limit on the number of snowmobiles in Yellowstone was 720, and it was the fourth winter that guides and BAT requirements had been in place. The number of snowcoaches and their requirements had remained unchanged since 2004.

Overall, guides thought that implementing policies requiring cleaner and quieter technology vehicles was beneficial to the ecology, improved the soundscape, and enhanced visitor experience. The majority of guides felt that the visitor experience was enhanced because the presence of guides resulted in a more interpretive experience while also enforcing regulations and ensuring safety. The change in visitor characteristics observed by guides suggests that people come to Yellowstone to experience the natural environment as opposed to using it as a place to ride OSVs. Few felt that the guide requirement inhibited the visitors' and local residents' ability to enjoy the park in the way they choose.

Guides did not believe that smaller groups had an effect on wildlife, because there are numerous groups in the same area at the same time, negating the purpose of limiting the size of groups. Additionally, they felt that sufficient lands surrounding Yellowstone exist to accommodate unguided snowmobiling, and the park should be a place to be educated and to enjoy nature. The majority of guides felt that the 720 snowmobile-per-day limit was working well. Some snowmobile guides were concerned about road conditions and the 1/3 mile rule, which states that snowmobiles must stay a third of a mile behind the guide, and some snowcoach guides felt that snowmobiles should be removed from Yellowstone all together.

Conflict and the Visitor Experience

Conflicts caused by OSV use in Yellowstone could be due to several impacts: engine or track noise interrupting inspirational visitor experiences, vehicle congestion at popular locations and rest areas, incompatible styles of use, perceived differences between user groups in social status, values, or identity, and conflicts arising from perceived differences in support of or opposition to NPS management actions. In some cases, this conflict could be "symmetrical" (i.e., recognized and experienced by all groups that are involved in the conflict). In other cases, the conflict may be "asymmetrical" in that it is perceived only

by the impacted group, but not by the group or groups causing the impact (Adelman, Heberlein, and Bonnicksen 1982). A well-established definition of behavioral conflict in the recreation social science literature is "goal interference attributed to the behavior of another" (Ruddell and Gramann 1994). Two types of visitor conflicts, noise-based conflicts and those that identify potential conflicts between user groups, have been studied at Yellowstone.

As suggested by previous noise research, the probability of conflicts arising from visitors' annoyance with motorized noises in Yellowstone may be highest in areas where the noises are perceived as incongruent with the setting, such as in backcountry locations accessible only by ski or snowshoe. Expectations for experiencing tranquility, solitude, and low or zero human-produced noises are common to backcountry users, forming an integral part of their anticipated experience and one of their primary reasons for visiting such locations (Manning et al. 2004). Based on noise modeling conducted for past winter use plans, mechanized noise is generally audible within a relatively narrow corridor around the road segments. These corridors are typically between 3.5 and 5 miles wide, but when 100 percent audibility is reached the contour forms a plateau extending about 0.5 to 1.5 miles on either side of the road and then sharply drops to no audibility over a short distance (Hastings, Fleming, and Lee 2006). This means that some non-motorized visitors to the park could encounter OSV noises during their visit, but that impacts are limited to an area around the road corridor. Cross-country skiers or snowshoers, who may travel by OSV to areas inaccessible to wheeled vehicles and then proceed on foot, would be most likely to notice such noise and experience conflict with OSV use (NPS 2008a), especially if they are seeking natural sounds and quiet once they reach their desired destination for skiing or snowshoeing. Active visitors might travel beyond the range of mechanized noise, but most users stay within two miles of travel corridors (NPS 2008a), putting them within the possible audible range of OSVs for a portion of their experience.

According to Jacob and Schreyer (1980), four major factors contribute to conflict between individuals or groups in outdoor recreation: (1) differences in the level of significance attached to using a specific recreation resource; (2) differences in personal meanings assigned to an activity; (3) differences in expectations of the natural environment; and (4) differences in lifestyles. Information on whether winter user groups in Yellowstone believe they are in conflict with other identified groups in the park has not been systematically collected, however, information from other studies such as Freimund et al. (2009) can be used to inform this issue. During this study, similarities between OSV and non-OSV users were found; for example, all user groups believed natural sounds to be important to their experience and there was overall support for the use of snowmobiles and snowcoaches in the park. Similarities continued among user groups for the interpretation of bison-human interactions at the park (Freimund et al. 2009), indicating that conflict did not exist between these groups. Other studies look at visitors based on their primary motivation for visiting the park in winter rather than their mode of transportation. Borrie et al. (1999) found the primary motivations at Yellowstone included "personal growth," "quiet activity," "nature study," and "accidental." The "accidental" category addressed those visitors who did not rank any single motivation highly. The study found differences between these groups in terms of the park entrance they preferred, acceptability of encounters with other OSV users, and tolerance of difference scenarios of OSV use. However, snowmobilers made up a large segment of each group, suggesting a simple "mode of transport" segmentation may not reveal the most meaningful differences between visitors and their experiences at the park.

OTHER SURVEYS

West Yellowstone Snowcoach Study, Visitor Profile of Snowcoach Passengers in West Yellowstone, Montana (Nickerson, Dvorak, and Wilton 2006)

This study by the Institute for Tourism and Recreation Research at the University of Montana profiled West Yellowstone snowcoach passengers in Yellowstone during a two-year study conducted from January to March in 2005 and 2006. Snowcoach passengers from five West Yellowstone companies were given a two-page questionnaire to complete during the last five minutes of their trip back to West Yellowstone. The survey was conducted over a two-year period, resulting in 266 usable questionnaires.

Overall, travel groups were relatively large, with a mean group size of 4.4. Non-resident groups stayed an average of 5.67 nights away from home, while Montana groups stayed 3.23 nights. Those who stayed at least one night in West Yellowstone averaged 4.14 nights in the area. Non-residents' reasons for being in the area were to visit Yellowstone in the winter (50 percent) and to ski at Big Sky (41 percent) compared to Montanans, 69 percent of whom said they came to visit the park and only 8 percent of whom indicated they came to ski at Big Sky. Of those who spent a night in West Yellowstone, 24 percent said snowmobiling was a reason for visiting the area. Primary reasons visitors wanted to visit the park in the winter included viewing wildlife in the winter, seeing winter wonderland scenery, and seeing geothermal activity in the winter. Respondents reported that the snowcoach tour provided them with an appreciation of nature, an educational experience, and a sense of wonderment.

Study of Preferences and Values on the Bridger-Teton National Forest (Clement and Chang 2009)

Bridger-Teton National Forest conducted a survey of preferences and values in relation to the forest. The forest is adjacent to the park and allows for a variety of winter uses. The Study of Preferences and Values on the Bridger-Teton National Forest report was designed to

- Conduct a random sample survey of local residents to explore their values and preferences in relation to the Bridger-Teton National Forest
- Better understand respondents' values associated with geographic aspects of the forest
- Conduct a Q-study, used as a research method to study people's "subjectivity" or their viewpoint, to explore the main values discourses that prevail regarding the Bridger-Teton National Forest with members of local communities who participated in the survey.

Participants in the survey included members of the general public who filled out the survey online, a group of cooperating counties, and soil conservation districts. Mailings were sent to 1,500 random households in the five counties surrounding the forest, with a 32 percent response rate.

Recreational activities in the Bridger-Teton National Forest enjoyed by the greatest percentage of participants include driving, wildlife viewing, fishing, hunting, and nature enjoyment. Participants were allowed to identify all recreational activities in which they participated within the forest. Approximately 87 percent of respondents prefer to experience the forest through non-motorized recreational activities, whereas 44 percent enjoy all-terrain vehicle use, 33 percent like the four-wheel driving experience, and 56 percent like OSVs.

Approximately 42 percent of respondents indicated that they felt that the current level of motorized activity was appropriate, whereas approximately 37 percent felt there was a need to create more motorized road access either by opening roads that were closed or through the construction of new roads.

Approximately 15 percent of respondents indicated that they believed the level of motorized road access should be reduced or eliminated. Additionally, 65 percent of respondents indicated that the current level of outfitter guide use (i.e., fishing, hunting, hiking, and snowmobiling) should be maintained. Approximately 48 percent of respondents indicated that no other areas should be designated as wilderness area.

Shoshone National Forest Study (An Economic Profile of the Shoshone National Forest, Taylor, Foulke, and Coupal 2008)

Shoshone National Forest conducted a survey of public values and preferences for the counties bordering the forest in 2006 (Taylor, Foulke, and Coupal 2008). The forest is adjacent to the park and offers a variety of visitor activities. The survey inquired about the following:

- Familiarity with the Shoshone National Forest
- Forest use preferences
- Attitudes to important topics on the Shoshone National Forest
- What values respondents attach to the Shoshone National Forest, the intensity with which those values are held, and, using a map, places on the Shoshone National Forest that represent those values
- Demographic information.

A four-phase mailing was sent to 1,300 random households in Fremont, Hot Springs, Teton, and Park counties. The surveys sent were split evenly between the counties according to zip codes. The mailing resulted in a response rate of 3 percent; of those responses, 69 percent included mapping data regarding valued places in the Shoshone National Forest. The survey results provided

- The forest values that residents around the Shoshone National Forest have in relation to the forest
- The preferences and attitudes associated with uses and issues in relation to the Shoshone National Forest
- The places in the Shoshone National Forest associated with these resident preferences, attitudes, and values.

Responses were weighted according to the relative county population numbers. First, county populations were divided by the number of respondents from that county and that number was used to weight results. Recreational activities in the Shoshone National Forest enjoyed by the greatest percentage of participants include driving, nature enjoyment, wildlife viewing, fishing, hiking/backpacking, and hunting. Participants were allowed to identify all recreational activities in which they participated in the forest. Approximately 37 percent of respondents prefer to experience the forest through non-motorized recreational activities, whereas 40 percent enjoy all-terrain vehicle use, 37 percent like the four-wheel driving experience, and 28 percent like OSVs.

Approximately 39 percent of respondents believed the level of existing road access was appropriate (recognizing that roads may be relocated or rehabilitated to protect resources), whereas 19 percent believed there was a need for more motorized road access and 8 percent commented that the level of motorized open roads should be reduced. Of all respondents, 34 percent of respondents replied as being “very satisfied” with winter recreation experiences in the forest. Additionally, 72 percent of respondents indicated that the current level of outfitter guide use (i.e., fishing, hunting, and snowmobiling) should be maintained.

PREVIOUS STUDIES

Other studies have been conducted related to visitor use and experience in the winter at Yellowstone. However, most of these occurred prior to the managed use era and have limited applicability for impact analysis. These studies are further described in the Scientific Assessment of Yellowstone National Park Winter Use (NPS 2011f).

HEALTH AND SAFETY

Three primary health and safety issues regarding winter visitor use were identified and are addressed in this plan: the effect of motorized vehicular emissions and noise on employees and visitors, avalanche hazards, and safety problems where different modes of winter transport are used in the same place or in close proximity.

In the last 15 years, the NPS (both nationally and in Yellowstone) has become increasingly concerned about providing safe work environments for all employees. In part, the agency's concern was heightened after the Occupational Safety and Health Administration (OSHA) found more than 600 safety violations in Yellowstone in 1997. Yellowstone's injury rate was two to three times as high as that of industries known to be risky, such as oil and gas drilling. In response to this problem, Yellowstone partnered with OSHA to improve employee safety. With OSHA's assistance, the NPS has improved workplace safety, an improvement reflected in an overall drop in employee injuries. The NPS remains committed, as does the Department of the Interior, to providing safe work places, with a goal of no lost-time accidents for its employees.

PERSONNEL AND OCCUPATIONAL EXPOSURE TO CONTAMINANTS

Air Quality

Although managed use of OSVs has reduced health and safety issues related to OSV accidents over the years, health and safety issues related to the noise and air emissions from OSV use remain. Historically (pre-four-stroke engine technology), snowmobiles in national parks have been a major source of air pollution, including CO, which is emitted as a byproduct of incomplete combustion of carbonaceous fuels (e.g., gasoline, diesel) (Flachsbart 1998). After inhalation into the body, a CO molecule binds with hemoglobin (Hb) in the blood to form carboxyhemoglobin (COHb), which can cause headaches, nausea, and irritation when exposure is over the NIOSH peak level (Flachsbart 1998; NPS 2005c). In a summer 2005 study at Yellowstone, peak CO levels were associated with older, un-tuned vehicles and/or motorcycles that were idling for several minutes at the entrance station window (NPS 2005c). Formaldehyde, another contaminant associated with snowmobiles and snowcoaches, is classified as a proven carcinogen (group 1) by the International Agency for Research on Cancer. NIOSH has a recommended exposure limit (REL) of 0.016 ppm (8-hour time-weighted average (TWA)) but also recommends that exposure to carcinogens be as low as technologically feasible (USDOI 2009).

Numerous occupational air quality studies have been conducted at Yellowstone, focusing on the West Entrance, the busiest winter access point to the park for OSV access. The major objective of these studies was to evaluate NPS employee exposure to PM, other air contaminants, and noise emitted by snowmobiles. The studies were performed during anticipated peak levels of snowmobile use in an attempt to obtain worst-case measurements during winter use work activities. Most sampling was completed during the busiest winter weekends in the park, for example the Martin Luther King three-day weekend and the Presidents' Day three-day weekend.

Some of these studies, conducted when unlimited two-stroke machines were allowed, indicated concerns regarding employee safety and health, particularly on days with atmospheric inversions. Because snowmobiles entering the West Entrance are now BAT with reduced numbers, exposure levels to a variety of chemicals have dropped appreciably, as shown in tables 30 and 31. In 1997, personnel exposure measurements for CO were conducted at the West Entrance (Radtke 1997). The 8-hour TWA for CO was between 2 and 4 ppm. The OSHA permissible exposure limit (PEL) is 50 ppm and the threshold limit value (TLV) is 25 ppm. The more restrictive 8-hour NAAQS is 9 ppm. The study concluded that CO did not appear to be an important hazard for employees at the West Entrance.

TABLE 30: AVERAGE PERSONNEL EXPOSURE TO NOISE LEVELS

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

Dosimeter settings set to evaluate compliance with OSHA Hearing Conservation Amendment (threshold = 80 dBA; exchange rate = 5 dBA Criterion Level = 90 dBA; Time Constant = slow).

TABLE 31: MAXIMUM EXPOSURE TO NOISE LEVELS

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

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

A 2001 study included personnel exposure monitoring for respirable PM, CO, formaldehyde, acetaldehyde, and benzene. The study recorded an average benzene level of 0.035 ppm and an average overexposure of 0.029 ppm to benzene (Kado, Kuzmicky, and Okamoto 2001). Measured levels of benzene were below OSHA PEL and NIOSH REL levels. For formaldehyde and acetaldehyde, concentrations of 0.072 ppm and 0.024 (respectively) for a 170-minute sampling period were measured, which is also below OSHA PEL and NIOSH REL levels. Average particulate levels were measured at 0.1 mg/m^3, also below OSHA PEL and NIOSH REL levels. In 2004, after the managed OSV program was in place, occupational exposures to aldehydes, VOCs, respirable PM, CO, and noise were evaluated. This study concluded that concentrations of all airborne contaminants were well below current standards and RELs (IHI Environmental 2004).

A 2005 study evaluated exposures at the West Entrance for aldehydes, VOCs, total hydrocarbons, elemental and organic carbon, oxides of nitrogen, CO, and respirable PM. All employee exposures to the above air contaminants and noise were below OSHA PELs and other RELs. During this study, a ventilation survey was performed in kiosks A and B at the West Entrance. The survey showed that both kiosks were under strong positive pressure. At the time of the survey both kiosks were achieving slightly over one air exchange per minute with the window open 30 inches (Spear and Stephenson 2005).

Spear, Hart, and Stephenson conducted a similar study in 2006 (Spear, Hart, and Stephenson 2006). Although there were some minor variances, the 2006 report confirmed employee exposures below all current standards set by regulatory agencies except for 2 of 13 benzene samples (mean concentration of 0.0032 ppm). The minimal risk level for chronic-duration inhalation exposure (365 days/year) is 0.003 ppm for benzene; the intermediate-duration inhalation exposure is 0.006 ppm and the PEL is 1.0 ppm. Although the two benzene samples averaged slightly higher than the minimal risk level, employees would have to be exposed to these levels every day of the year (which they are not) for a concern to be present. Rather, the two samples that were higher than 0.003 ppm were short-term samples collected to minimize dilution effects and thereby portray potential worst-case exposures.

In addition, one of the tradeoffs in converting to BAT is that four-stroke machines produce more benzene (and some other hazardous air pollutants) than the two-stroke engines used historically (Air Resource Specialists, Inc. 2006). Although Spear, Hart and Stephenson found no correlation between VOC concentrations and the number of vehicles entering during their 2005 and 2006 studies, there were fewer than 250 snowmobile entries on the days with higher benzene exposures. However, recent benzene exposure levels are an order of magnitude lower than they were when two-stroke machines were allowed in the park—a decrease possibly attributable to lower numbers of snowmobiles. Overall, emissions are well below federal safety levels; monitoring and adaptive management activities will continue.

In 2009, air monitoring for snowmobile and snowcoach exhaust was conducted at the West Entrance station over President's Day weekend. Monitoring showed CO slightly elevated from 2008 readings, but still below occupational exposure limits. On one sample day, snowcoaches and snowmobiles were separated. The exposure results showed that CO was slightly higher over the sampling period for snowmobiles; however, the peak reading for CO was higher for the snowcoaches (the sample period included 19 snowcoaches and 221 snowmobiles). The elevated levels of CO were likely due to the absence of ventilation in the booths (USDOI 2009). Otherwise, exposure levels to other pollutants measured were similar. An exposure assessment of the entrance station employees was also conducted in 2008. Results of VOC testing showed most levels were below detection limits, with the relative highest

exposure being to benzene, which was approximately 2 percent of the OSHA PEL. Three of the nine aldehyde samples had detectable levels of formaldehyde. These measurements were only approximately 2 percent to 3 percent of the OSHA PEL. Maintaining adequate positive pressure ventilation and minimizing time outside of the kiosk when snowmobiles and snowcoaches are idling will keep these exposures low (USDOI 2008).

Noise Exposure

Noise associated with OSV use can also have adverse effects on both park staff and visitors. Noise has a range of effects on performance, and the effects are dependent on the type of noise and the demands made by the task. Exposure to noise has other effects, such as the potential to contribute to cardiovascular disease. Noise can disrupt sleep and the functions that sleep provides in modulating cardiovascular function. Studies have also shown that noise exposure can result in changes in heart rate, blood pressure, vasoconstriction, stress hormones, and electrocardiogram (ECG) readings. Animal studies of long-term exposure to high noise levels shows permanent changes in heart muscle. Epidemiological studies of noise exposure have found an increased risk for hypertension and myocardial infarction in environments dominated by road traffic or aircraft noise (Babisch 2011; Jarup et al. 2008). In contrast to the airport and road noise studies, railroad noise has not been shown to increase cardiovascular disease risk (Bluhm and Eriksson 2011). As a result of the road and airport studies, the World Health Organization (WHO) Night Noise Guidelines for Europe established an interim target nighttime noise level (as measured outside) of 55 dBA and a night noise guideline of 40 dBA (WHO 2009). The interim target noise level is intended for situations where the 40 dBA night noise guideline is not practicable. The evidence of noise-related cardiovascular effects is limited because of the relatively small number of studies, inconsistencies between studies, and difficulties in accurately measuring indoor noise exposure (Stansfeld and Crombie 2011). Further studies are needed to fully understand the underlying causal relationship observed in the epidemiological data and to establish a dose-response relationship to allow the prediction of cardiovascular health impacts from noise exposure (Ndrepepa and Twardella 2011). No studies specific to snowmobile or snowcoach noise and health impacts have been conducted.

Noise exposure was measured for both snowmobile riders and employees working at the West Entrance in studies conducted between the years 1997 and 2005. The exposure measured included noise from all sources, including snowmobiles and other equipment. One way to measure employee exposure to noise, as below, is to compute the 8-hour TWA (time-weighted average, or the average exposure to noise that workers may experience without adverse effects over a specific period, such as over an 8-hour day or 40-hour week), with hearing protection required when the TWA is above 85 dBA.

In 1997, personnel exposure measurements for noise were conducted at the West Entrance. The 8-hour TWA for the noise samples ranged from 70.9 dBA to 82.0 dBA. These levels are below the action level of 85 dBA and the OSHA PEL of 90 dBA. The study concluded that noise did not appear to be a major hazard for employees at the West Entrance (Radtke 1997). A 2000 OSHA study conducted personnel and area sampling for noise. The study concluded that exposures were below PELs and TLVs, but the express lane employee was overexposed to the American Conference of Governmental Industrial Hygienists (ACGIH) action level and NIOSH standard for noise of 85 dBA. The only noise overexposures to West Entrance employees occurred when two-stroke snowmobiles were allowed.

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

A recent study found that employee noise exposures at the West Entrance averaged 60.6 dBA for the winter 2004/2005 and 65.2 for the following winter, or 3.5 percent and 5.5 percent of the allowable noise exposure, respectively. Peak 8-hour TWAs for those two winters were 75 and 80 dBA, or 12.5 percent and 26.0 percent of the allowable exposure, respectively (Jensen and Meyer 2006). Clearly, although employees are exposed to some noise, those exposures are well within safeguards.

Since the change to four-stroke technology, employee exposure at the West Entrance has been below 85 dBA. Snowmobile rider exposure levels have also decreased with the use of four-stroke technology, but rider exposure levels remain over the OSHA action level when snowmobiles operated for more than four hours. As noted earlier, 98 percent of loud OSV noises are from coaches, which tend to be louder at closer range, than snowmobiles, which tend to be louder at longer ranges. Even new coaches can have high interior and exterior noise levels. A 2010 Glaval coach was tested in March 2010. At cruising speed (21 mph), it measured 73 dBA on the outside and 83 to 84 dBA on the inside. At top speed, 28 mph, the Glaval measured 77 dBA on the outside and 86 dBA on the inside (Burson pers. comm. 2010b). Noise exposure while riding on or in OSVs can be controlled with standard ear plugs, which are provided by snowmobile and snowcoach operators to users entering the park. All commercially available NIOSH-rated foam plugs provide enough attenuation to protect employee hearing. An estimated exposure of 77 dBA for 8 hours when wearing earplugs falls within acceptable exposure limits set forth by OSHA, NIOSH, and ACGIH.

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

Additional noise studies were conducted during the winter 2011/2012 to assess the noise levels experienced by OSV users in the park. OSV noise levels were measured to assess their impact on visitor experience, including communication between guides and clients, as well as for the health and safety considerations of those traveling by OSV in the park. Noise exposure was measured in the interior of snowcoaches and near the ears of operators during snowmobile travel.

For snowcoaches, interior noise levels were measured in five different vehicles operating at typical cruising speeds of approximately 20 to 25 mph on snow-covered groomed roads in the interior of Yellowstone National Park (table 32). These five vehicles ranged from a repowered and retrofitted Bombardier with skis and long tracks to a 32-passenger bus. These vehicles were selected because they represent a cross-section of relatively late-model snowcoaches currently in operation in the park. Noise levels inside snowcoach cabins were measured using a calibrated Larson Davis Type 1 sound level meter and microphone. Measurements were taken in the front seat and the back seat of each snowcoach at approximate ear level as the snowcoach traveled at typical cruising speed on a snow-covered road. Average dBA was calculated as the logarithmic mean of the front and back seat measurements. Measurements were taken over a three-day period during the week of March 5, 2012.

TABLE 32: AVERAGE INTERIOR SNOWCOACH NOISE MEASURED IN DBA AT INDICATED CRUISING SPEEDS

Snowcoach	Average dBA	Cruising Speed (mph)
2011 Ford F-F550 32 Passenger, Grip Tracks	70	22
2011 Ford Vanterra, Mattracks	74	24
2008 Chevy Express Van, Mattracks	77	24
2011 Ford F-450 Glaval, Mattracks	81	27
1956 Bombardier B-12, V8 Motor, Skis & Tracks	84	26

On February 20, 2006, noise levels were measured on a 2006 Arctic Cat T660 four-stroke machine on packed (groomed) snow at the West Entrance of Yellowstone. On February 27, 2006, additional noise level measurements were conducted on a 2004 Arctic Cat T660 on unpacked snow at Mammoth, Montana. The average overall sound pressure level was measured near the operator's ear while the machine was idling and at up to six traveling speeds. These measurements were performed with a Quest Sound Pro DXL Type 1 real-time analyzer and a Quest Model 2700 Type 2 sound level meter fitted with a Quest Model OB-50 octave filter (NPS 2006d).

In relation to visitor use, noise can obscure the human voice by *masking* the sound of the voice, covering the voice and making it difficult to hear (Truax 1999a). When noise masks human speech, *speech interference* is occurring (Truax 1999b). Speech interference causes a listener to miss some proportion of what is being said in conversation. In response to speech interference, speakers raise the volume of their voices.

People with average voice strengths discussing unfamiliar material face-to-face raise their voices when background noise reaches 50 dBA (Truax 1999b, Figure 1). In telephone conversations with the phone against the ear, speech interference begins at background noise levels of 60 dBA.

Snowcoach noise measurements appear in table 32.[1] Results for snowmobiles appear in table 33. These noise levels were measured at the operator's ear and do not account for wind, wearing a helmet, or other similar factors. The actual level of noise the rider is exposed to is likely significantly less given the rider wears a helmet and other coverings and may wear ear plugs.

TABLE 33: SOUND LEVEL MEASUREMENTS IN DBA MEASURED AT OPERATOR'S EAR

Speed (mph)	dBA 2006 Arctic Cat T660 packed snow	dBA 2004 Arctic Cat T660 unpacked snow
0 (Idle)	69	67
15	87	84
20	—	85
25	91	89
30	—	97
35	92	92
40	—	91
45	97	92

Findings indicate that speech interference for snowcoach passengers is highly likely while the vehicle is at typical cruising speed. Without amplification, operators and passengers may be able to successfully communicate only when the OSV is traveling slower than typical cruising speed. Interior snowcoach noise in tested snowcoaches would interfere with spoken communication inside the snowcoach. The average snowcoach interior noise of the quietest snowcoach was 70 dBA, similar to being in the same room with a running vacuum cleaner. Two of five were louder than average city traffic. The noise inside the 2008 Chevy Express Van snowcoach (77 dBA average) was louder than the comparison sounds found

[1] Average dBA combines measurements taken in the front and rear of each vehicle.

in table 22 such as for a typical conversation (50-65 dBA), the inside of a Ford F-150 pickup truck traveling at 55 mph (63 dBA), and a vacuum cleaner (70 dBA); but quieter than average city traffic (80 dBA). Figure 21 graphically presents the loudness of one snowcoach and several comparison sources. The bar chart in figure 21 shows dBA measurements for reference sounds (quiet office, vacuum cleaner, Ford truck at 55 mph) and the measured interior noise of five measured snowcoaches.

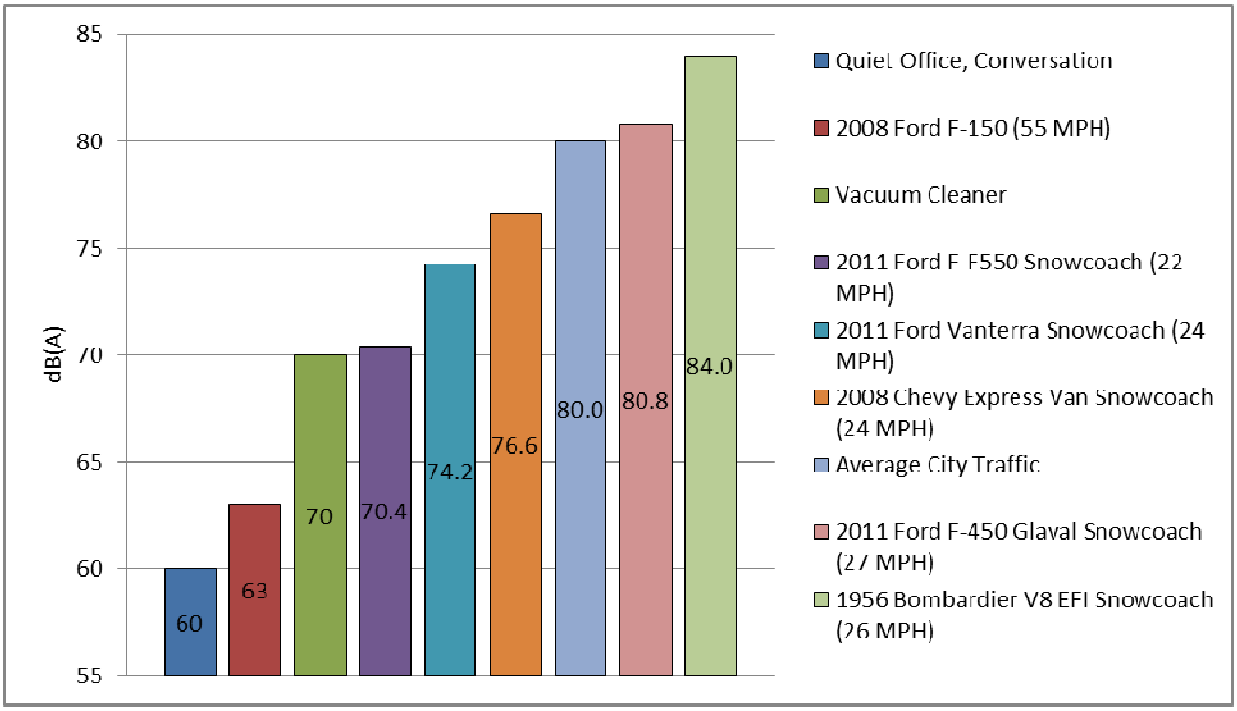


FIGURE 21: COMPARISON OF SNOWCOACH NOISE RELATIVE TO OTHER SOURCES

The OSV noise of all tested OSVs would interfere with spoken communication (table 32). In the snowcoach with the quietest measured sound level (70 dBA), passengers and guide would have to raise their voices or voices would need to be amplified in order to be heard. Communication with raised voices would remain difficult between guide and passengers because passengers would not be able to see the guide's face, limiting the possibility of reading lips to assist communication. Interior noise may reach levels where communication between snowcoach passengers is impossible while the vehicle is at cruising speeds. Many current snowcoaches have amplification systems from the guide to the passengers, but not from passengers to the guide or among passengers. Conditions for spoken communication in the louder snowcoaches would be worse. These elevated sound levels may contribute to increased fatigue and reduced visitor comfort.

Because of the higher operator noise exposure levels for snowmobile operators (table 33), verbal communication between two riders on one snowmobile or between two snowmobiles would be more difficult than within a snowcoach. Snowmobile operators and passengers wear helmets, further reducing hearing ability.

Speech interference occurs with all measured OSVs. In addition to raising voices, approaches to improving communication might include amplification equipment, noise mitigation efforts including sound dampening materials, and quieter OSV equipment. In their absence, communication at cruising speeds on all types of OSVs is difficult.

Further information on the impact of noise and its impacts on motor abilities is provided in the Scientific Assessment of Yellowstone National Park Winter Use (NPS 2011f). Average and maximum exposure levels at the West Entrance are summarized in tables 30 and 31.

AVALANCHE HAZARDS

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

Avalanche control at Sylvan Pass has long represented a safety concern to the NPS. Sylvan Pass is an approximately 1-mile-long portion of the East Entrance Road that splits the Absaroka Mountain Range near the eastern edge of the park. The pass connects the park's East Entrance with Lake Village and goes between Top Peak on the south and Hoyt and Avalanche peaks to the north. Sylvan Pass is situated at an elevation of 8,530 feet and receives a great deal of snow in the fall, winter, and spring. It is extremely windy and its nearly 45-foot slopes are prone to avalanches (Comey 2007). There are approximately 20 avalanche paths that cross the road at Sylvan Pass. They average over 600 feet of vertical drop, and the East Entrance Road crosses the middle of several of the paths, putting travelers at risk of being hit by an avalanche and swept down the slope.

Since 1973, avalanche hazard mitigation work has been conducted on Sylvan Pass to accommodate snowmobile and snowcoach traffic (Yochim pers. comm. 2005). Historically, Sylvan Pass has been closed multiple times during a season for several hours to a full day during the winter to allow avalanche management to occur. That is, the pass has almost never been open for the entire season. Most reasonable avalanche mitigation techniques would result in the pass being closed for at least some days in the winter to conduct avalanche mitigation. Past winter planning documents concluded that the health and safety risks of operating an avalanche control program in Yellowstone at Sylvan Pass are considerable. These risks have become better known in recent years, with at least two agencies (OSHA 2001; State of Montana, Department of Military Affairs 2004) examining and explaining some of the risks the NPS incurs in its avalanche control program. Use levels have always been relatively low at Yellowstone's East Entrance. Even during the highest winter use years in the 1990s, total use for the season rarely exceeded 5,000 people, less than 5 percent of Yellowstone's total winter visitation.

These concerns led the NPS, in its 2007 winter planning decision, to close Sylvan Pass. However, in that decision, the NPS agreed to work with the City of Cody; Park County, Wyoming; and the state of Wyoming to determine the future of OSV travel over Sylvan Pass. These three entities and the NPS formed the Sylvan Pass Study Group and met a number of times in 2008. The meetings resulted in the Sylvan Pass Agreement in June 2008.

The Sylvan Pass Study Group recommended to the Intermountain Regional Director of the NPS that Sylvan Pass be kept open in future winter use seasons to motorized and non-motorized oversnow travel between December 22 and March 1. The group recommended continued use of a combination of avalanche mitigation techniques, including forecasting and helicopter and howitzer dispensed explosives.

This recommendation to operate within a defined core season would reduce risk, improve safety, and maximize visitor access. The Sylvan Pass Study Group reached agreement based on the following guiding principles:

- That the safety of visitors, guides, and NPS employees is the first priority in any avalanche mitigation operation on Sylvan Pass.
- That snowmobile and snowcoach motorized oversnow winter use access should be as regular and predictable as possible given weather constraints.
- That regular communications between the park, the City of Cody, Park County, the state of Wyoming, and the Cody community is a key ingredient of any future winter operations on Sylvan Pass.

The City of Cody, Park County, and the state of Wyoming agreed, in good faith, to work cooperatively to explore funding of safety and access improvements. The members of the Sylvan Pass Study Group agreed to establish consistent ongoing communications regarding Sylvan Pass winter use operations. The NPS agreed to make funding for safety and access improvements on Sylvan Pass a priority.

The agreement guided the management of Sylvan Pass during the 2009 to 2013 interim regulations. Under the agreement, the park may use a combination of techniques that have been used in the past (howitzer and helicopter), as well as techniques that may be available in the future. Area staff may use whichever tool is the safest and most appropriate for a given situation, with the full understanding that safety of employees and visitors comes first. Park staff members the operational determination when safety criteria have been met and operations can be conducted with acceptable levels of risk. The NPS will not take unacceptable risks (figure 22). When safety criteria have been met, the pass will be open; when they have not been met, the pass will remain closed. Extended closure of the pass may occur.

Sylvan Pass Avalanche Forecasting and Hazard Mitigation Program

For avalanche mitigation activities at the park, an operational profile exists that defines standards for communication, safe travel, and all operations at Sylvan Pass. The pass (and the East Entrance) is closed from 9:00 p.m. until 8:00 a.m. or until the determination is made about whether the pass is open or closed. This closure applies to park staff (except those conducting avalanche mitigation activities) as well as visitors. Avalanche mitigation measures include the use of a howitzer (cannon) to deliver explosives that trigger snow release or the use of a helicopter to deliver the explosives.

Prior to and since the Sylvan Pass Agreement, the NPS has adopted several mitigation measures to reduce the dangers of avalanches and avalanche mitigation activities to its employees and visitors:

- Installing a radio repeater on Top Notch Peak to improve communications in the pass area
- Providing additional, extensive, ongoing avalanche and howitzer training so that skilled staff perform control missions
- Conducting additional avalanche forecasting on site
- Constructing a berm above the howitzer platform to catch rock and cornice fall from the cliff behind it
- Realigning the East Entrance Road to reduce avalanche danger from some of the paths
- Modifying access to the gun mount, where the howitzer is located, to be farther from avalanche paths

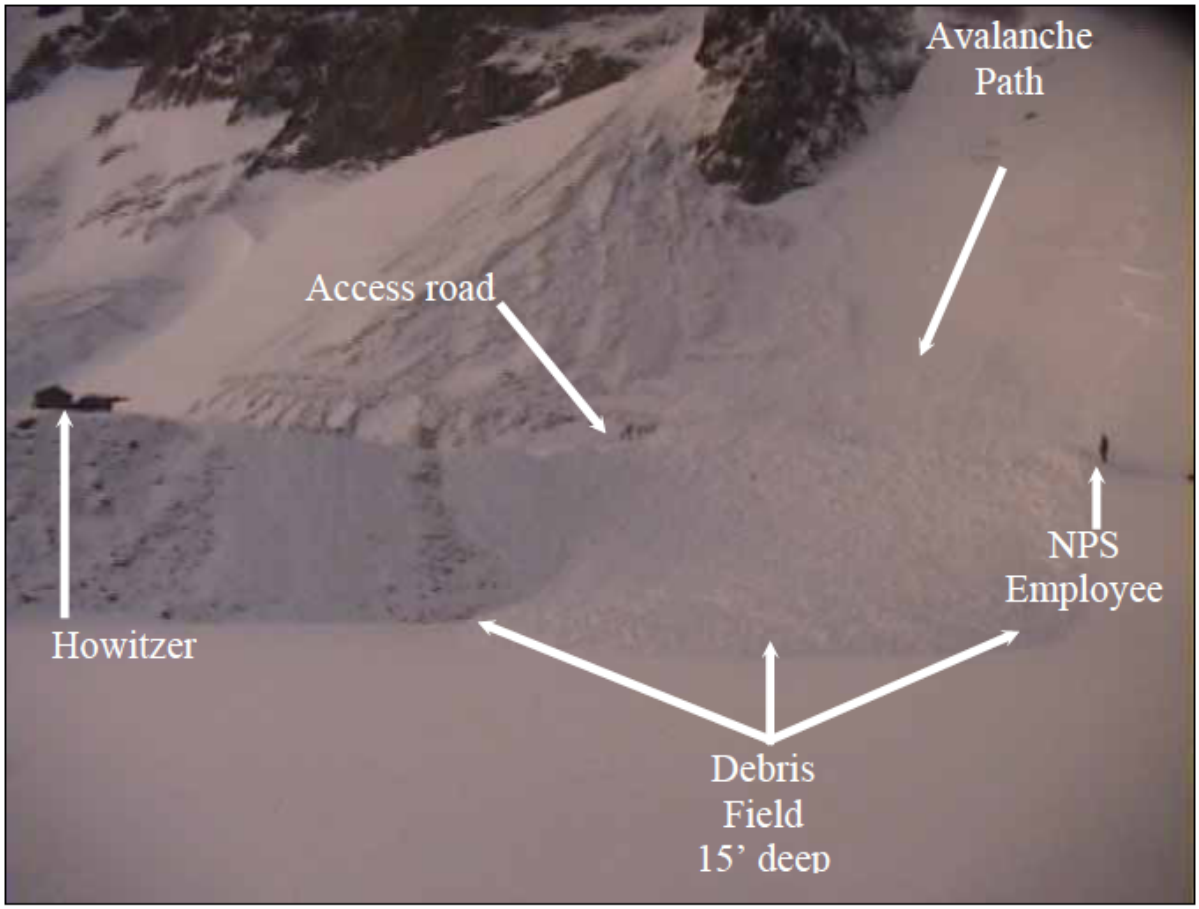


FIGURE 22: AVALANCHE THAT CROSSED THE ACCESS ROAD TO THE HOWITZER PLATFORM

- Acquiring a second howitzer (with the help of Wyoming)
- Having an enclosed vehicle available on site to support avalanche operations (again through assistance from Wyoming)
- Adding staff
- Adding additional weather equipment to improve forecasting (NPS 2010n).

The following is a discussion of the avalanche mitigation procedures summarized from the recent Operational Risk Management Assessment (ORMA) report (NPS 2010n).

Communication and Documentation

Road conditions are reported daily to the Yellowstone Communications Center. Changes in road status are sent via email and forecasters brief the Sylvan Pass staff on potential changes in weather. Following daily avalanche briefings, the weather forecast is updated. Discussions are posted for review by all staff working at Sylvan Pass. Forecasters complete documentation of avalanche hazard mitigation missions, natural avalanche occurrences, and snow observations. Regional Avalanche Forecast Centers provide the park with general condition reports and advisories. Forecasters for Sylvan Pass contribute site specific observations to regional centers.

Weather Forecasting

The Sylvan Pass Avalanche Forecasting and Hazard Mitigation Program begins and ends with weather forecasting. Each day a weather forecaster and an assistant check the weather for wind speeds, 24-hour snowfall, and air temperature. They also check for snowpack instability, visibility for driving, road conditions, weather factors, and any changes from the last observation. Weather factors include recent strong winds, recent heavy snow or rain, water content exceeding one inch from last observation, sudden warming (+12°F to 15°F (+6.7 to 8.3) over 12 hours), recent wind loaded slopes, and localized areas of convexity, especially with thin snowpack and rocks underneath. The team practices open communication, teamwork, and safe travel practices. Forecasters use remote automated weather stations and SNOTEL (SNOwpack TELemetry) sites that provide hourly updated information to track weather influences on avalanche formation. The most useful stations are placed near a potential avalanche location.

Loaded slopes can occur when rain or snow has fallen in the past 48 hours or when one inch of snow per hour for the past 6 hours has fallen on or near the pass. Both terrain features and high winds can contribute to a higher chance of an avalanche. If the team decides to close the pass, the road will remain closed until the avalanche hazard has decreased or been mitigated, signs indicate increased stability, and visibility improves. After avalanche mitigation is complete, a road groomer smooths the road surface to allow for OSV travel. At this point the forecaster will make the determination whether to re-open based on current and predicted conditions.

The Process of Avalanche Mitigation

When a decision is made to conduct an avalanche mission, avalanche mitigation begins with ensuring that current, trained staff members are available. If it is a howitzer mission, artillery training, hazardous material training, and proper experience of all team members is required. A crew is assembled from Lake and the East Entrance, and other districts, and the avalanche hazard is assessed by an avalanche forecaster. This assessment is used to determine the potential effectiveness of using the howitzer and the ability of personnel to safely access the gun mount. The Go/No Go decision may be based on the potential for avalanches to reach or cross the road along the west side of the avalanche zone. The decision to proceed is determined by the forecaster with the consensus of the howitzer crew. The method of accessing the gun mount will vary based on the evaluation of the avalanche hazard, conducted by the avalanche forecaster.

Prior to the howitzer mission, a briefing is conducted outside the avalanche zone, and the access route and other operational considerations are reviewed with the howitzer team. During the howitzer mission, approximately 20 rounds are fired into the starting zones of the avalanche paths, depending on snow conditions and observed results. At the conclusion of a mission, if conditions are safe, a groomer rebuilds the snow road to make it passable for OSVs. The groomer operator also has basic avalanche safety training, and the forecasters and other staff maintain a close watch during the grooming to watch for unexpected releases of snow. A single avalanche control mission requires a 10-hour work day for five to seven specially trained employees.

The park works closely with other regional avalanche forecasters to compare Sylvan conditions with those being observed in the vicinity of the park. The park is also a member of the Avalanche Artillery Users of North America Committee, has adopted their M101-A1 Howitzer Avalanche Control Firing Manual, and attends the annual Avalanche Artillery Users of North America Committee meeting to stay current on nationwide avalanche management.

The howitzer is on loan from the U.S. military, and the Wyoming National Guard assists with annual maintenance and training.

A contract helicopter may be used instead of a howitzer, especially when access to the howitzer is unsafe. NPS employees are not aboard the helicopter and do not drop the explosive charges. That is the role of the contractor. NPS employees brief the pilot and crew, and the pilot and crew make the decisions about where to drop the charges. As with howitzer missions, an NPS groomer rebuilds the road, and the East Entrance Road may be re-opened for public and administrative travel. Figure 23 shows avalanche paths at Sylvan Pass.

Unexploded Ordnance

Unexploded ordnance (ammunition that remain unexploded, whether by malfunction, design, or any other cause) at Sylvan Pass presents concerns, both for public safety and regarding homeland security. Over the years, unexploded ordnance has accumulated, primarily from past use of a 75-mm recoilless rifle for control work. The total number of unlocated unexploded ordnance is estimated at 300. Six unexploded ordnance have occurred in the past two winters from both helicopter and howitzer operations; three were recovered and three have not been recovered. The ammunition used contains a mixture of explosives that is highly toxic to humans and the environment. Both exploded and unexploded ordinance have the potential to release toxic materials (State of Montana, Department of Military Affairs 2004). The fate of the partially unexploded and unexploded ordnance and its toxic filler is unknown but of concern in the Sylvan Pass area. Visitors may come into contact the unexploded ordnance; for example, in 1997 a visitor picked up a round and transported the live shell into the Fishing Bridge Visitor Center to give to a ranger. Unexploded shells have also fallen onto the road (Comey 2007). When one did so in 2006, the road had to be closed for 24 hours while a military team was brought in to remove the hazard. On a larger scale, before the July 2004 mud and rock slide on Sylvan Pass could be removed from the road, the 10,000 cubic yards of material had to be laboriously searched for unexploded ordnance.

OSV Use in Sylvan Pass

Commercial OSV operators receive an orientation on safe travel practices through Sylvan Pass. Visitors can access the park website to check the status of open or closed roads, check for daily winter weather reports (including minimum and maximum temperatures, new snow accumulation, snow depth, weather, and an avalanche danger rating), and learn more about avalanche forecasting and hazards. A closure of Sylvan Pass occurs from 9:00 p.m. each night until 8:00 a.m. the next morning, when staff can make the operational determination for opening the pass.

Talus Slope

The “Talus Slope” area on the South Entrance Road also contains some avalanche zones. In contrast to those at Sylvan Pass, there are only seven avalanche zones, averaging less than a 200-foot vertical drop within a 1,700-foot section of the road. The South Entrance Road does not cross the avalanche paths, but rather the run-out zones attributed to the avalanches. If a vehicle were pushed off the road by a slide, it would drop about five to ten feet. In cases where a vehicle has been caught in a slide at the Talus Slope, the slide has merely moved around the vehicle without moving it or coming close to covering it (Johnson pers. comm. 1999; NPS 2007b; Mossman pers. comm. 2003).

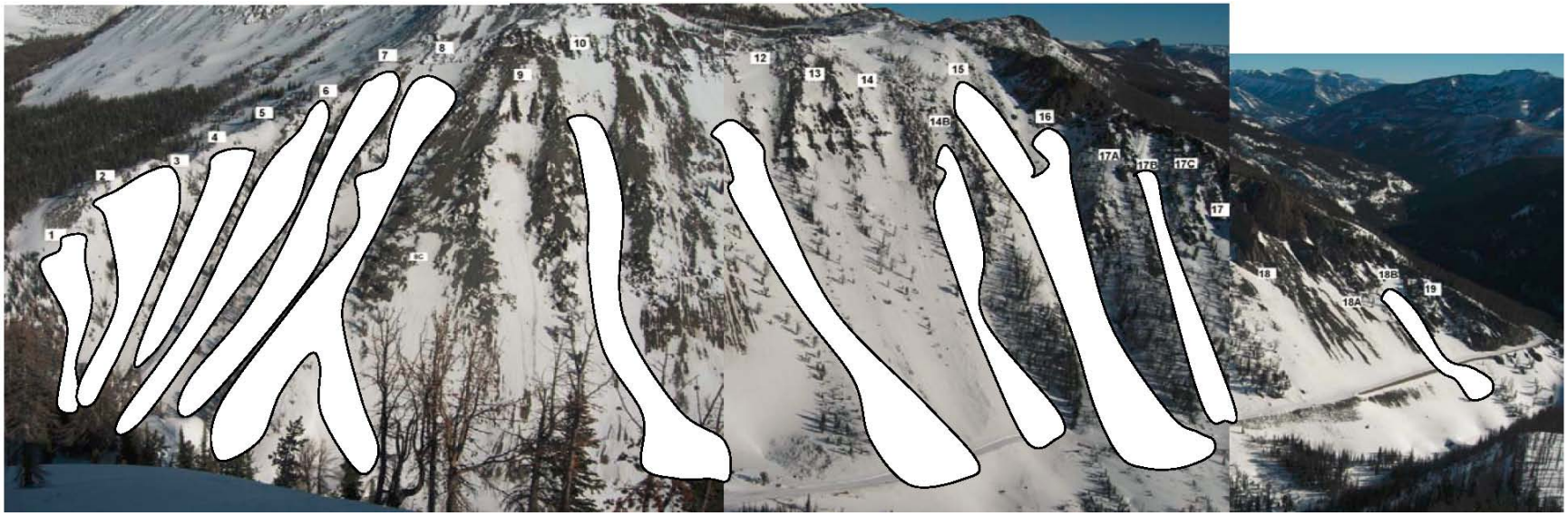


FIGURE 23: MAP OF SYLVAN PASS (AVALANCHE PATHS INDICATED BY NUMBER)

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

For these reasons, park staff determined that avalanches in the Talus Slope area do not pose the same level of real and substantial risk to park employees and visitors as those at Sylvan Pass (Keator pers. comm. 2004; NPS 2007b). Even so, Yellowstone park staff members monitor the Talus Slope area just as regularly, and with just as much vigilance, as they do other infrequent slide zones in the park. Should a heavy storm produce severe avalanche conditions, or should such conditions develop in other ways (as was documented in the 1999 report by Alan Sumeriski), park staff would close the roads until conditions improve or until such avalanches could be discharged. The same policy applies to the numerous other roadside slopes in the park that are prone to slides given the right snow and wind conditions. Park policy is uniform for all locations: monitor (using both regional and site-specific information), close the road if conditions are unsafe, control for avalanches (currently with howitzer- or helicopter-dispensed explosives), and reopen when safe (NPS 2003a). No management changes are proposed for the Talus Slope, Dunraven Pass, other road segments, or for park backcountry areas with avalanche hazards.

SAFETY CONCERNS AMONG DIFFERENT MODES OF WINTER TRANSPORTATION

Winter use in Yellowstone occurs mainly on groomed park roads for cross-country skiers, snowshoers, snowmobilers, and snowcoaches. Past planning efforts have raised safety concerns regarding conflict between non-motorized use and motorized use, including the concern that the use of a snowcoach or snowmobile on the same road as a cross-country skier or snowshoer could pose a threat to health and safety. There are several established trails that are groomed specifically for non-motorized uses and are not accessible to motorized users, which could reduce this perceived conflict. Safety concerns are addressed in part, by the requirement for OSV use to be guided within the park.

Since the winter of 2004/2005, all snowmobilers have been led by guides. Some visitors to Yellowstone have never ridden a snowmobile, and guides help teach them how to safely travel through the park. Guides are experts at snowmobile and/or snowcoach driving in Yellowstone and know the conditions that may be encountered with such travel. All guides are trained in basic first aid and cardiopulmonary resuscitation. In addition to first-aid kits, they often carry satellite or cellular telephones and radios for emergency use. They also carry shovels and equipment necessary to respond to avalanches and to vehicles that may need to be pulled from a soft road shoulder. Guides use a “follow-the-leader” approach, stopping often to talk with their group. They lead snowmobiles single-file through the park, using hand signals to pass information down the line from one snowmobile to the next. Signals are effectively used

and warn group members about wildlife and other road hazards, indicate turns, and indicate when to turn the snowmobile on or off.

As shown in figure 24, the introduction of guided snowmobile tours has reduced the number of law enforcement incidents since 2003/2004. Based on these raw numbers, OSV related incidents are down 90 percent from 2002/2003(282 incidents) to 2009/2010 (27 incidents). Although the number of violations related to OSV travel has been reduced, violations still occur, mostly unrelated to winter visitor recreation use. In 2009, four snowmobilers were apprehended when park rangers caught them riding in Yellowstone's backcountry. The offenders were operating rented machines off trail, more than a mile inside the park boundary near West Yellowstone. The use of OSVs in the backcountry, on trails, and off-road has always been prohibited. Despite this prohibition, rangers have observed off-road snowmobile tracks up to 2.5 miles inside Yellowstone's backcountry. Rangers regularly patrol the boundary and have the option to ticket, arrest, and confiscate the snowmobiles of the violators, who can expect to face aggressive prosecution (NPS 2009c).

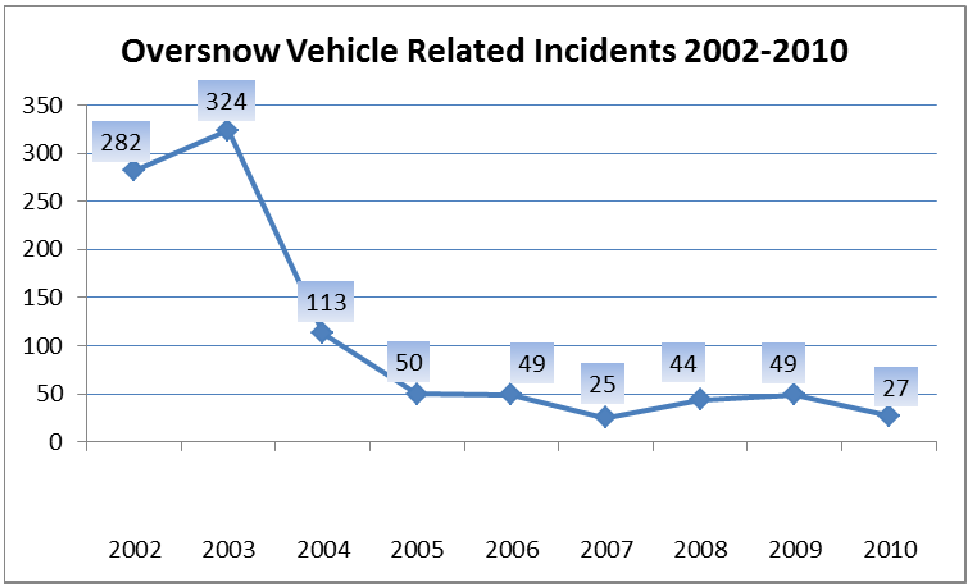


FIGURE 24: WINTER LAW ENFORCEMENT STATISTICS, 2002–2010

Severe Weather Conditions

According to industry standards established by the ACGIH, all non-essential work should stop at a temperature of -25°F (-31.7°C) if there is a 20 mph wind. With no noticeable wind, the temperature at which non-essential work should cease is -45°F (-42.8°C). Travel by snowmobile may produce wind-chill factors of -40 °F (-40°C).

Current Yellowstone employee procedures state that snowmobile travel is not advised for non-essential work at temperatures below -20°F (-28.9°C). Non-essential work includes activities such as travel to meetings, training, and other administrative travel; avalanche control procedures; interpretive programs and roving interpretation; resource monitoring; and research fieldwork. Temporary park closures may be enacted as necessary to provide for the safety of the public and employees during severe weather.

SOCIOECONOMIC VALUES

EXISTING AND HISTORIC SOCIOECONOMIC CONDITIONS

Economy of the Greater Yellowstone Area

The affected environment for socioeconomics of the greater Yellowstone area is described at three different levels: the state level (Idaho, Montana, and Wyoming), the county level (Fremont County in Idaho, Gallatin and Park counties in Montana, and Park and Teton counties in Wyoming), and the community level (Cody and Jackson, Wyoming, and West Yellowstone, Montana) where data is available. These three levels provide context for the magnitude of the impacts (both absolutely and relatively) at multiple geographic levels. These were also the levels used in analysis in the previous EIS (NPS 2000b), SEIS (NPS 2003c), EA (NPS 2004a), and EIS (NPS 2007c) for winter planning. The three communities at the local scale (Cody, Jackson, and West Yellowstone) provide a representative example of the possible effects at the city or town level. Also, these communities have been previously identified as most likely to be affected by changes in winter use policies.

Visitors also use other gateway communities or areas. For example, skiers and snowboarders at Big Sky, Montana, often spend part of their winter trip taking a snowmobile or a snowcoach tour into Yellowstone. Similarly, Livingston, Cooke City, and Gardiner, Montana, are important gateway communities to Yellowstone's North and Northeast Entrances. Dubois, Wyoming, is a gateway community to both Yellowstone and Grand Teton. Island Park and other Idaho communities are gateways to Yellowstone. Other areas, within the counties or states but outside the communities can also be affected by the winter use alternatives. The effects on these smaller areas may be apparent, even when looking at a smaller area, such as within a zip code. Where these effects cannot be see within a zip code, qualitative measures were used.

Table 34 presents the relative sizes of the economies of the five counties in the affected region. The range of total economic output among these areas ranges from $534 million annually in Fremont County to $8.7 billion in Gallatin County. This range suggests that a change in visitor activity that is generally small in the context of the five-county area has the potential to be substantial in the context of the smaller economy of a community like Fremont County. However, this does not mean that individuals and businesses in the area have not been affected by changes in visitor activities. Some businesses that relied specifically on snowmobile access have reported being adversely affected. Others have noted that their ability to retain highly qualified, year-round workers has been diminished (Ecosystem Research Group 2006). In a 2009 study, the NPS looked at the economic benefits to local communities from national park visitation. Using the Money Generation Model version 2 (MGM2) this study found that the nearly 3.3 million visitors in 2009 spent around $297 million year-round in the local communities year-round (NPS 2009d).

TABLE 34: ECONOMIC OUTPUT AND EMPLOYMENT LEVELS FOR THE GREATER YELLOWSTONE AREA, 2008

County	Total 2008 Output in $(2012)	Total 2008 Employment
Gallatin County, MT	8,697,185,428	67,737
West Yellowstone, MT	195,295,238	1,740
Park County, MT	1,049,197,379	8,730
Fremont County, ID	534,172,959	4,418
Park County, WY	2,689,466,448	19,448
Cody, WY	1,598,036,298	11,876
Teton County, WY	4,504,893,629	30,458
Jackson, WY	3,405,209,913	22,562
Five-County Area Total	17,474,915,469	130,791
Three-State Area Total	307,639,982,309	1,942,947

Source: IMPLAN Database and Model 2008.

Note: All numbers are exported from IMPLAN for each study area. The output for each of the five counties does not sum to the output for the 5-county study area in IMPLAN.

Table 35 illustrates the breakdown of employment by industry for the five-county affected region. The four largest industries are government and government enterprises, accommodation and food services, construction, and retail trade (BEA 2012).

Looking specifically at the travel industry, Taylor, Foulke, and Coupal (2008) presented information for the three Wyoming counties that contain most of the Shoshone National Forest (table 36). Park County had the highest earnings between 1997 and 2006. Taylor, Foulke, and Coupal also present information in their report on the counties surrounding Bridger-Teton National Forest. After adjusting for inflation, total visitor spending in Fremont, Lincoln, Sublette, and Teton counties in Wyoming (the counties surrounding Bridger-Teton National Forest) increased from $467.4 million in 1997 to $605.4 million in 2005 (+29.5 percent) (Taylor, Foulke, and Coupal 2008).

TABLE 35: EMPLOYMENT BY MAJOR INDUSTRY AND GEOGRAPHIC REGION, 2009

Industry	Five-county Area (Employees)	% of total Employees
Government and government enterprises	17,786	14.1%
Accommodation and food services	15,547	12.3%
Retail trade	13,755	10.9%
Construction	12,302	9.7%
Real estate and rental and leasing	9,459	7.5%
Professional, scientific, and technical services	9,069	7.2%
Health care and social assistance	8,350	6.6%
Other services, except public administration	6,808	5.4%
Finance and insurance	5,691	4.5%
Arts, entertainment, and recreation	4,952	3.9%
Manufacturing	4,019	3.2%
Administrative and waste services	3,914	3.1%
Farm employment	3,457	2.8%
Transportation and warehousing	2,482	2.0%
Wholesale trade	2,065	1.6%
Mining	1,668	1.3%
Information	1,603	1.3%
Educational services	1,728	1.4%
Forestry, fishing, and related activities	1,140	0.9%
Utilities	230	0.2%
Management of companies and enterprises	191	0.2%
Total	126,234	100%

Source: BEA 2012.

Note: Totals by industry may be low to avoid disclosure of confidential information. As a result, the total employment may not be equal to the sum of employment by industry.

TABLE 36: TRAVEL INDUSTRY EARNINGS FOR SHOSHONE NATIONAL FOREST AREA (FREMONT, HOT SPRINGS, AND PARK COUNTIES), 1997–2006

Year	Deflated Fremont	Deflated Hot Springs	Deflated Park	Deflated Three-county Area
1997	$22,009,349	$4,506,676	$44,018,697	$70,534,722
2001	$24,316,644	$4,882,860	$49,023,916	$78,223,420
2002	$24,475,222	$4,703,082	$51,062,033	$80,240,337
2003	$24,905,079	$4,793,053	$52,441,638	$82,139,769
2004	$26,867,472	$4,752,070	$52,638,313	$84,257,855
2005	$27,433,628	$5,221,239	$53,274,336	$85,929,204
2006	$28,481,474	$6,262,493	$49,928,367	$84,672,334
Total Change 1997 to 2006	29.4%	39.0%	13.4%	20.0%
Annual Change 1997 to 2006	2.9%	3.7%	1.4%	2.0%

Source: Taylor, Foulke, and Coupal 2008.

RECENT TRENDS IN PARK VISITATION

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

RECENT TRENDS IN THE GREATER YELLOWSTONE AREA ECONOMY

Analyses for previous winter use planning efforts in the park have predicted that restrictions on some types of winter use (primarily snowmobiles) would be at least partially offset by winter visitors still recreating in the greater Yellowstone area but using other recreational opportunities outside of the park. As a general example, it was predicted that restricting access to the park for some uses, such as snowmobiling, could lead to offsetting increases in use of other greater Yellowstone area recreational opportunities, such as snowmobiling in the national forests; however, there have been declines in both snowmobile visits and total winter visitation to Yellowstone in the past six years. An examination of key tourism-targeted tax collections in the greater Yellowstone area counties bordering the park provides information on the degree to which the economies of these counties and communities are economically dependent on park winter visitation.[2]

[2] All the tax information reported in the tables and figures is as reported by the respective states and does not include an inflation factor. Lodging costs typically increase as a result of inflation; thus, lodging tax revenue (which is a percentage of the cost of lodging) will also increase. When inflation is included, the inflation-adjusted tax revenue may be lower, even though the tax dollars stay the same or increase (Taylor 2007). The NPS chooses to present lodging tax information without an inflation adjustment because there are a variety of possible indices, but notes through the reference to Taylor 2007 that such adjustments can be made. Also, another similar report examining tourism in Wyoming (Dean Runyan Associates 2006) and cited by Taylor 2007 does not (except for one table in a 71-page report) take inflation into account.

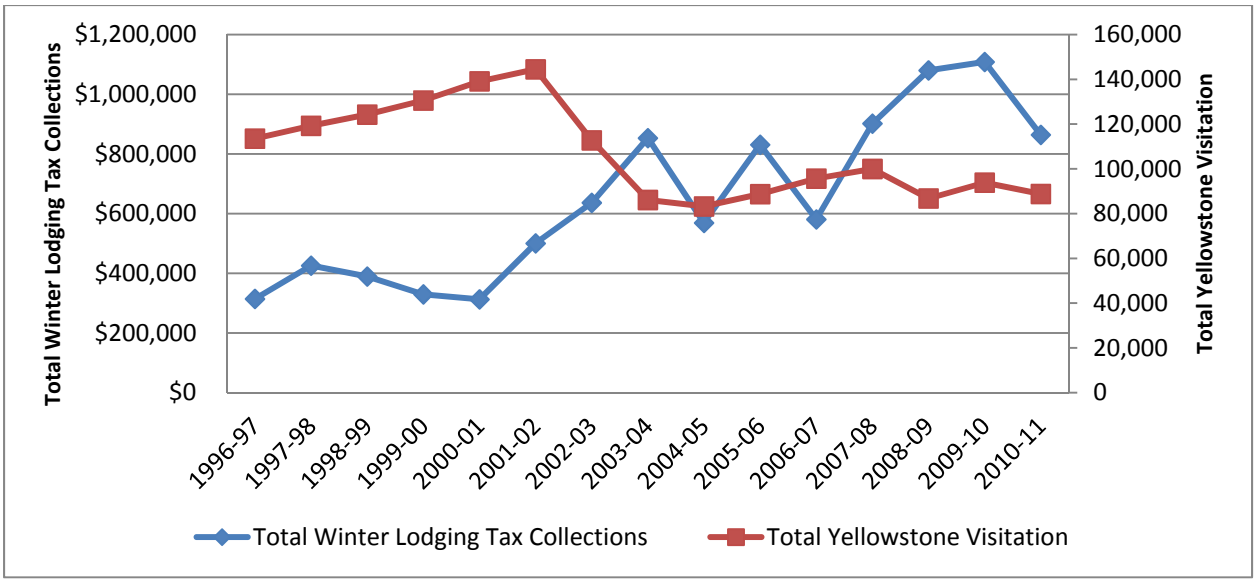
Table 37 and figure 25 present winter lodging collections for Fremont County, Idaho. In general, during the period when winter visitation to Yellowstone was decreasing (2002/2003 through 2005/2006), winter lodging tax collections in Fremont County trended upwards—the opposite of Yellowstone visitation trends. Fremont County winter lodging tax collections in 2005/2006 were more than double the level in the four years prior to 2002 (and the management changes that began in 2003). As table 37 shows, between 2003/2004 and 2009/2010 total sales for lodging in Fremont County for the months of December through March increased by almost 30 percent. Over the same period, annual tax collections for lodging for the State of Idaho increased 18 percent. However, many other factors affect lodging tax revenues in different parts of the state. Therefore, the NPS is unable to draw conclusions or determine causality about differences across different parts of the state.

TABLE 37: FREMONT COUNTY, IDAHO, WINTER LODGING TAX COLLECTIONS COMPARED WITH YELLOWSTONE NATIONAL PARK WINTER VISITATION, 1996/1997 THROUGH 2010/2011

Winter Season	December	January	February	March	Winter Fremont County Lodging Tax Collections	Total Yellowstone Winter Visitation
1996/1997	$42,441	$44,183	$83,866	$143,806	$314,296	113,504
1997/1998	$204,652	$34,754	$114,365	$71,945	$425,716	119,271
1998/1999	$93,591	$55,816	$180,620	$59,299	$389,326	124,275
1999/2000	$76,263	$70,473	$112,822	$69,865	$329,423	130,563
2000/2001	$80,688	$58,952	$101,676	$71,411	$312,727	139,122
2001/2002	$123,261	$76,855	$144,869	$155,416	$500,401	144,490
2002/2003	$61,374	$131,383	$239,068	$204,393	$636,218	112,741
2003/2004	$246,769	$107,345	$406,135	$92,864	$853,113	86,107
2004/2005	$116,323	$4,661	$335,441	$112,605	$569,030	83,235
2005/2006	$221,627	$261,024	$236,964	$111,201	$830,816	88,718
2006/2007	$56,010	$274,561	$101,271	$148,902	$580,744	95,675
2007/2008	$101,340	$366,934	$169,966	$263,416	$901,656	99,975
2008/2009	$199,351	$586,581	$23,043	$271,072	$1,080,047	86,784
2009/2010	$200,363	$185,892	$196,378	$525,717	$1,108,350	93,838
2010/2011	$159,999	$77,092	$358,843	$268,090	$864,024	88,807

Source: Idaho State Tax Commission 2012.

Note: Not adjusted for inflation.



Source: Idaho State Tax Commission (2012).
Note: Lodging collections not adjusted for inflation.

FIGURE 25: COMPARISON OF FREMONT COUNTY, IDAHO, WINTER LODGING COLLECTIONS AND YELLOWSTONE NATIONAL PARK WINTER RECREATIONAL VISITATION, 1996/1997 THROUGH 2010/2011

Park County, Wyoming, on the east side of Yellowstone has similar winter lodging tax information during this same period (table 38 and figure 26). The main community in Park County is Cody. In addition, Park County encompasses the northern portion of Yellowstone, including the Mammoth Hot Springs Hotel, which is open during the winter (Snow Lodge, at Old Faithful, is in Teton County, Wyoming). This table shows both total recreational winter visitation levels for Yellowstone and total winter lodging tax collections for the county. As is the case in Fremont County, winter lodging tax collections did not follow the decrease in Yellowstone OSV visitation between 2002 and 2006. The Mammoth Hot Springs Hotel accounts for 41 percent of the Park County lodging tax in the winter.

Table 39, from Taylor, Foulke, and Coupal (2008), shows local tax revenue collections for the entire year, adjusted for inflation, for Fremont, Hot Springs, and Park counties. Between 1997 and 2006, tax revenues increased in a similar manner to the winter lodgings tax revenue displayed in table 39. Park County has higher travel-related tax revenue than Fremont and Hot Springs. The report by Taylor, Foulke, and Coupal (2008) also presented information on local tax receipts for the counties surrounding Bridger-Teton National Forest (Fremont, Lincoln, Sublette, and Teton counties in Wyoming). Local tax receipts from travel spending, adjusted for inflation, increased from $9.5 million in 1997 to $11.3 million in 2005 (+19.0 percent, and a compound average growth rate of 2.2 percent per year).

Recent lodging and tax data for Fremont and Park counties indicate that declines in snowmobile entries in winter visitation in the park in general, and into Yellowstone in particular, have not detectably impacted the overall winter tourist economy in the counties as measured by monthly lodging tax collections. This is despite the fact that the economies of these counties are relatively small. Visitation to Yellowstone can also be compared to other local attractions. The Buffalo Bill Historic Center is in Cody, Wyoming. Figure 27 indicates that overall Yellowstone winter visitation and Buffalo Bill Historic Center winter visitation seem to move together.

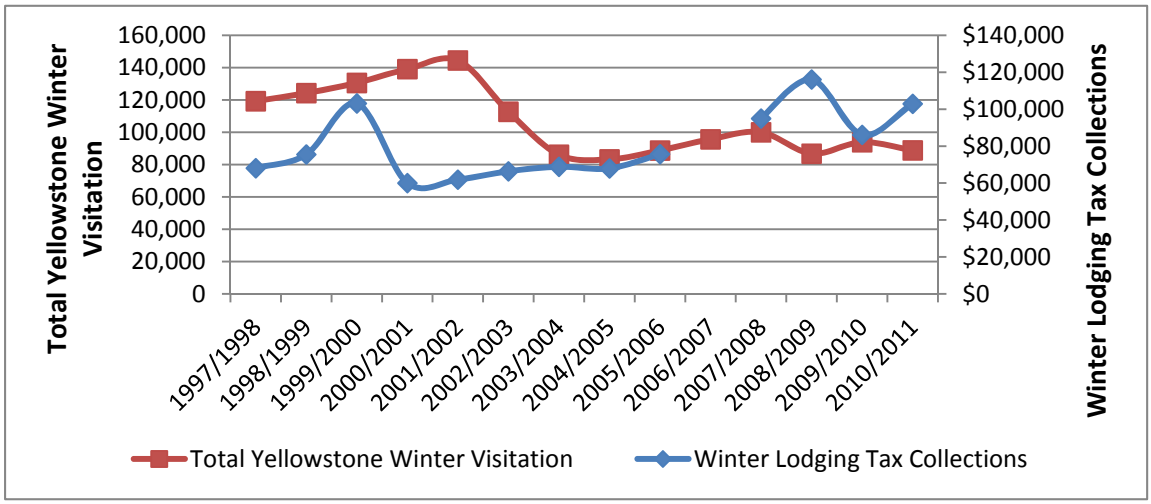
TABLE 38: PARK COUNTY, WYOMING, WINTER LODGING TAX COLLECTIONS, IN TAX YEAR DOLLARS, COMPARED WITH YELLOWSTONE NATIONAL PARK OSV VISITATION, 1997/1998 THROUGH 2010/2011

Winter Season	Dec	Jan	Feb	Mar	Winter Lodging Tax Collections	Total Yellowstone Winter Visitation
1997/1998	$33,155	$8,498	$13,458	$12,965	$68,075	119,271
1998/1999	$24,258	$9,523	$12,509	$29,218	$75,509	124,275
1999/2000	$59,379	$14,971	$10,617	$18,184	$103,151	130,563
2000/2001	$20,467	$9,384	$16,200	$13,955	$60,006	139,122
2001/2002	$26,971	$9,477	$12,352	$13,072	$61,872	144,490
2002/2003	$27,486	$14,217	$10,417	$14,256	$66,376	112,741
2003/2004	$28,765	$12,527	$9,455	$18,090	$68,837	86,107
2004/2005	$27,841	$13,210	$13,313	$13,556	$67,919	83,235
2005/2006	$20,520	$21,382	$20,532	$13,244	$75,679	88,718
2006/2007	(data not available)					95,675
2007/2008	$28,909	$14,111	$25,512	$26,425	$94,957	99,975
2008/2009	$46,397	$18,128	$29,360	$22,199	$116,084	86,784
2009/2010	$31,478	$16,577	$13,463	$24,625	$86,143	93,838
2010/2011	$26,345	$29,678	$23,509	$23,420	$102,952	88,807

Source: Wyoming Department of Revenue 2012.

Notes: Not adjusted for inflation.

The report, "Economic Trends in the Winter Season for Park County, Wyoming" by David T. Taylor (2007) presents different winter lodging tax information (excluding December and lagged two-months) for five of the nine years presented above (from 1997 to 2006). However, the general lodging tax trends (without regard to inflation) are the same in both reports. Additionally, 2007/2008 tax collection data were not available.



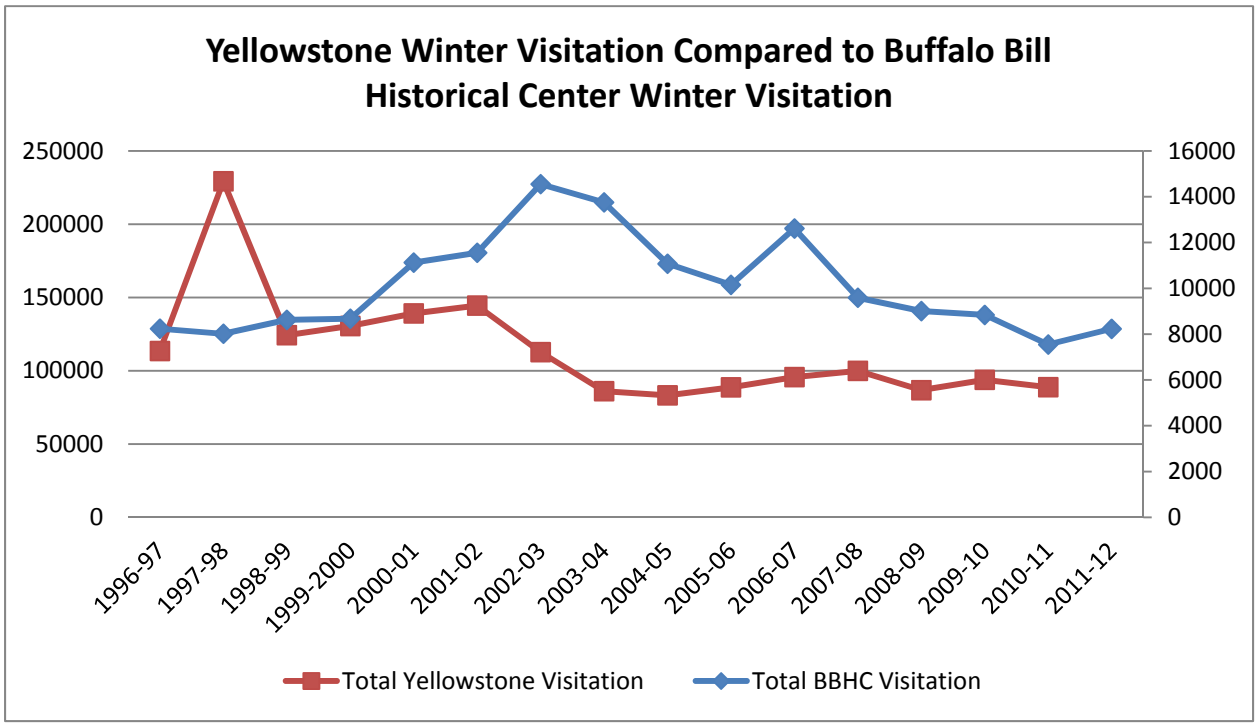
Source: Wyoming Department of Revenue 2012.
Note: Data for 2007/2008 are not available. Lodging tax collections not adjusted for inflation.

FIGURE 26: COMPARISON OF PARK COUNTY, WYOMING, WINTER LODGING TAX COLLECTIONS, AND YELLOWSTONE NATIONAL PARK OVERSNOW VISITATION, 1997/1998 THROUGH 2009/2010

TABLE 39: TRAVEL INDUSTRY LOCAL TAX REVENUE FOR SHOSHONE NATIONAL FOREST AREA (FREMONT, HOT SPRINGS AND PARK COUNTIES), 1997–2006

Year	Deflated			
	Fremont	Hot Springs	Park	Three-county Area
1997	$524,032	$209,613	$1,781,709	$2,515,354
2001	$585,943	$292,972	$2,050,801	$2,929,716
2002	$671,869	$287,944	$2,207,569	$3,167,382
2003	$657,870	$281,944	$2,255,554	$3,195,369
2004	$639,702	$274,158	$2,193,263	$3,107,123
2005	$707,965	$353,982	$2,389,381	$3,451,327
2006	$772,088	$428,938	$2,316,264	$3,517,290
Total Change 1997 to 2006	47.3%	104.6%	30.0%	39.8%
Annual Change 1997 to 2006	4.4%	8.3%	3.0%	3.8%

Source: Taylor, Foulke, and Coupal 2008.



Source: BBHC 2012.

FIGURE 27: COMPARISON OF BUFFALO BILL HISTORICAL CENTER WINTER VISITATION WITH YELLOWSTONE NATIONAL PARK OVERALL WINTER VISITATION (WHEELED AND OVERSNOW), 1996/1997 THROUGH 2009

Two other adjoining counties, Gallatin County in Montana (including Bozeman) and Teton County in Wyoming (including Jackson) have relatively large economies where even substantial changes in Yellowstone and Grand Teton National Park winter visitation would not be detectable. For example, the observed change in visitation at the South Entrance in response to the 2004 Temporary Winter Use Plan was estimated to have an expenditure impact on the order of $4 million per year. By comparison, the five-county greater Yellowstone area economy (largely driven by Gallatin and Teton counties) was on the order of $6 billion in 1999 and in 2008 (the most recent data available for modeling) had grown to about $8 billion. Similarly, impacts from changes in the park's winter visitation levels for the three-state economy would not be detectable.

However, the size of the economic impacts relative to the size of the county economies masks impacts on some individual businesses, which have indicated a considerable reduction in their winter operations. Other employment patterns have changed (year-round work for some employees is no longer available) as a result of changing visitation patterns (Ecosystem Research Group 2006).

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

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

The remaining major gateway community for Yellowstone is West Yellowstone, at the West Entrance to Yellowstone. Table 40 provides time series data for this entrance, shown graphically in figure 28. Included in the table are winter resort tax collections for the town of West Yellowstone, winter entries through the West Entrance to Yellowstone, winter snowmobile visits to the Hebgen Lake District of the Gallatin National Forest, which abuts the town to the west, and the number of skiers at the Rendezvous ski trail. Unlike the cases of Park and Fremont counties discussed above, reductions in winter park visits through the West Entrance and to the national forests between 2002/2003 and 2005/2006 are correlated with declines in resort tax collections. However, the decline was not in proportion to the decrease in West Entrance visits. Specifically, comparing average levels for the four years immediately before and after management changes (2002/2003 through 2005/2006 to the four years immediately preceding this period) shows that although park visitation fell 48.5 percent on average, winter tax collections only fell 19.7 percent. Montana's statewide lodging tax rose 17 percent during the same period; however, many other factors affect lodging tax revenues in different parts of the state so it is difficult to draw conclusions about differences across different parts of the state.

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

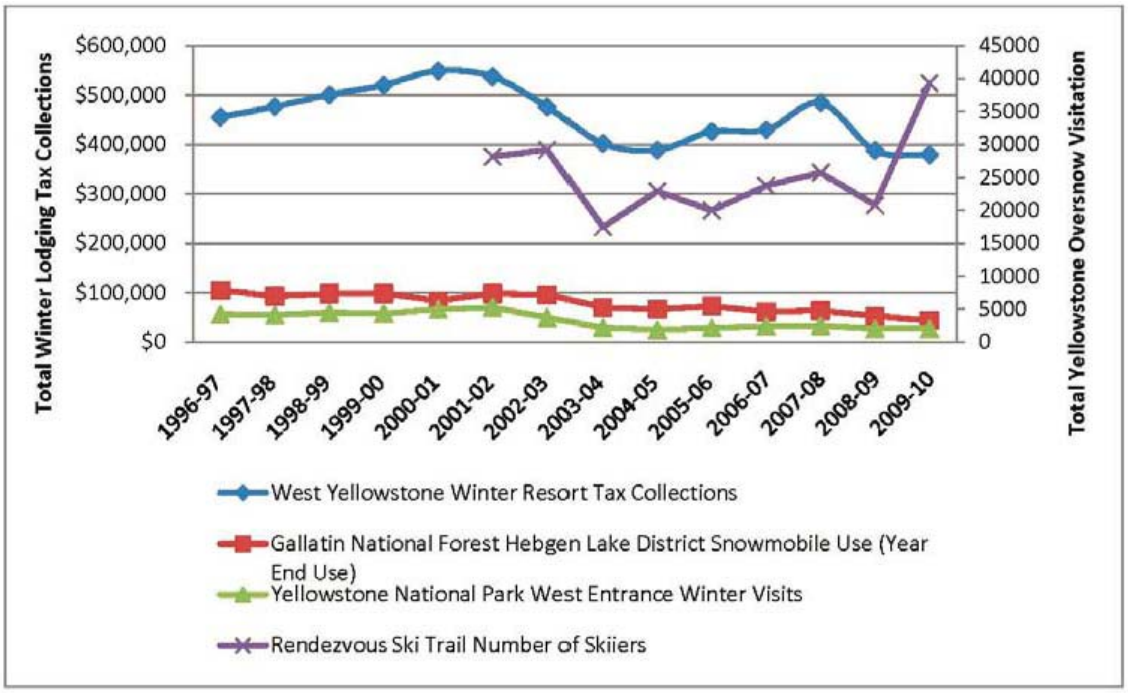
resort tax collections. This could possibly be snowmobile use on the adjacent national forest lands, as discussed below.

Table 40 and figure 28 present data for snowmobile use in the Hebgen Lake District of the Gallatin National Forest. This district includes many miles of groomed snowmobile trails that are accessible primarily from the West Yellowstone area. In the last three winters, snowmobile use in this national forest area adjacent to West Yellowstone has declined at the same time as park visits through the West Entrance declined. Causation; however, is complicated by the short time series and a drought and relatively low snow pack in recent years, including the winter of 2004/2005. These data do suggest that restrictions on snowmobile access at the West Entrance have not led to noticeably increased use in the adjacent national forest.

Table 40 and figure 28 indicate that even in West Yellowstone, a community located at a park entrance and with an economy heavily dependent on tourism spending, changes in park winter use management may impact local economic activity but the economy is not wholly dependent on winter park snowmobile access. Among other activities, snowmobiling in the adjacent national forests is also important for the West Yellowstone economy. That hypothesis was tested by estimating a second linear regression model of winter West Yellowstone tax receipts, this time including snowmobile counts in the Hebgen Lake District as an explanatory variable in addition to Yellowstone West Entrance winter visits. In this model, both park visits and forest visits are statistically important factors explaining tax receipts. Additionally, this model now accounts for most if not all of the resort tax collections. The results strongly support the hypothesis that, in addition to Yellowstone West Entrance visits, snowmobiling in the adjacent national forests is also important for the West Yellowstone economy (Duffield and Neher 2006).

TABLE 40: WEST YELLOWSTONE WINTER RESORT TAX COLLECTIONS, HEBGEN LAKE DISTRICT SNOWMOBILE USE, YELLOWSTONE WEST ENTRANCE WINTER VISITS, AND RENDEZVOUS SKI TRAIL VISITS 1996/1997 THROUGH 2009/2010

Winter Season	West Yellowstone Winter Resort Tax Collections	Gallatin National Forest Hebgen Lake District Snowmobile Use (Year End Use)	Yellowstone National Park West Entrance Winter Visits	Rendezvous Ski Trail Number of Skiers
1996/1997	$455,035	105,182	56,212	n/a
1997/1998	$476,508	93,208	54,859	n/a
1998/1999	$500,473	98,326	59,928	n/a
1999/2000	$520,566	98,838	58,154	n/a
2000/2001	$549,182	83,721	66,302	n/a
2001/2002	$536,996	98,595	70,371	28,139
2002/2003	$476,037	95,924	49,703	29,139
2003/2004	$401,664	69,996	28,880	17,461
2004/2005	$388,222	66,889	24,510	22,912
2005/2006	$425,933	73,065	28,243	19,974
2006/2007	$429,336	61,240	31,686	23,741
2007/2008	$484,278	64,019	32,942	25,714
2008/2009	$387,444	52,791	26,830	20,799
2009/2010	$378,687	44,031	26,527	39,322



Note: Sales tax receipts not adjusted for inflation.

FIGURE 28: WEST YELLOWSTONE WINTER RESORT TAX COLLECTIONS, HEBGEN LAKE DISTRICT SNOWMOBILE USE, YELLOWSTONE WEST ENTRANCE WINTER VISITS, AND RENDEZVOUS SKI TRAIL VISITS 1996/1997 THROUGH 2009/2010

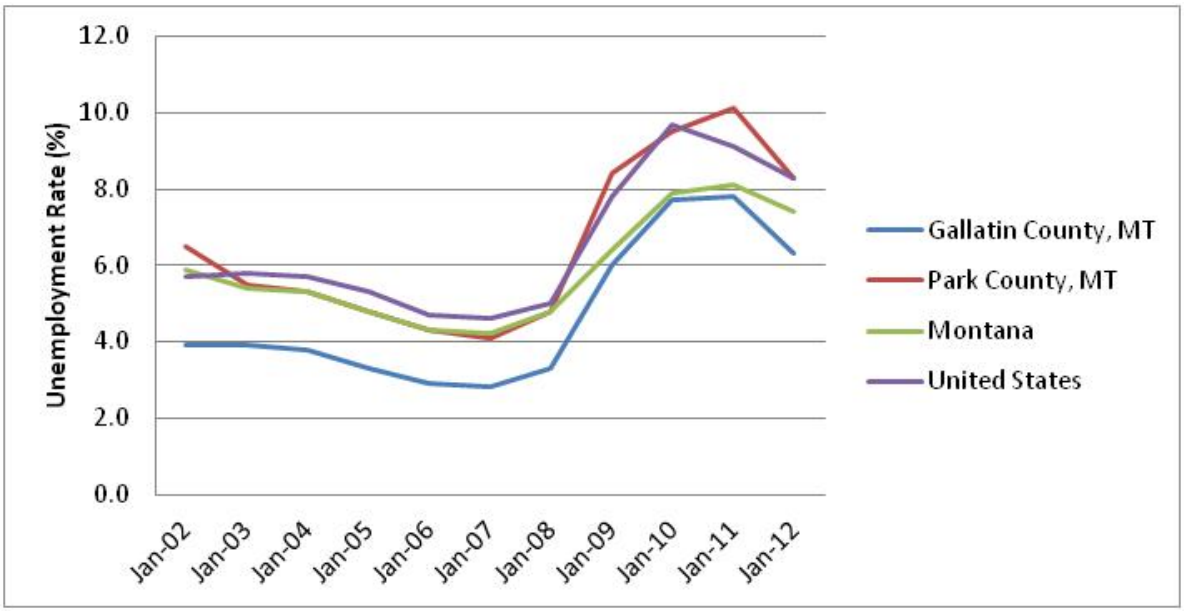
Of the five regional economic areas examined in this analysis, there is a detectable impact on West Yellowstone's economy from winter use in Yellowstone (and in the surrounding national forests). These results are consistent with the predicted impacts from the socioeconomic impacts section of the SEIS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

It is notable that winter access by autos, recreational vehicles and buses, all of which in a normal winter would be through the North Entrance, has been relatively stable. This seems to indicate that visitors are not substantially substituting access between entrances in response to changes in winter use management. Also, because access through the West, South, and East Entrances to Yellowstone is all oversnow under current and historic management, there does not seem to be a shift in access modes between cars and OSVs. To conclude, the main changes with respect to visitor use levels brought about by current park management are the reduction in total snowmobile use and the partial substitution within motorized OSV use from snowmobiles to snowcoaches. Snowmobile visitation dropped by some 60,000 and snowcoach visitors increased by approximately 10,000.

The Recent Economic Downturn

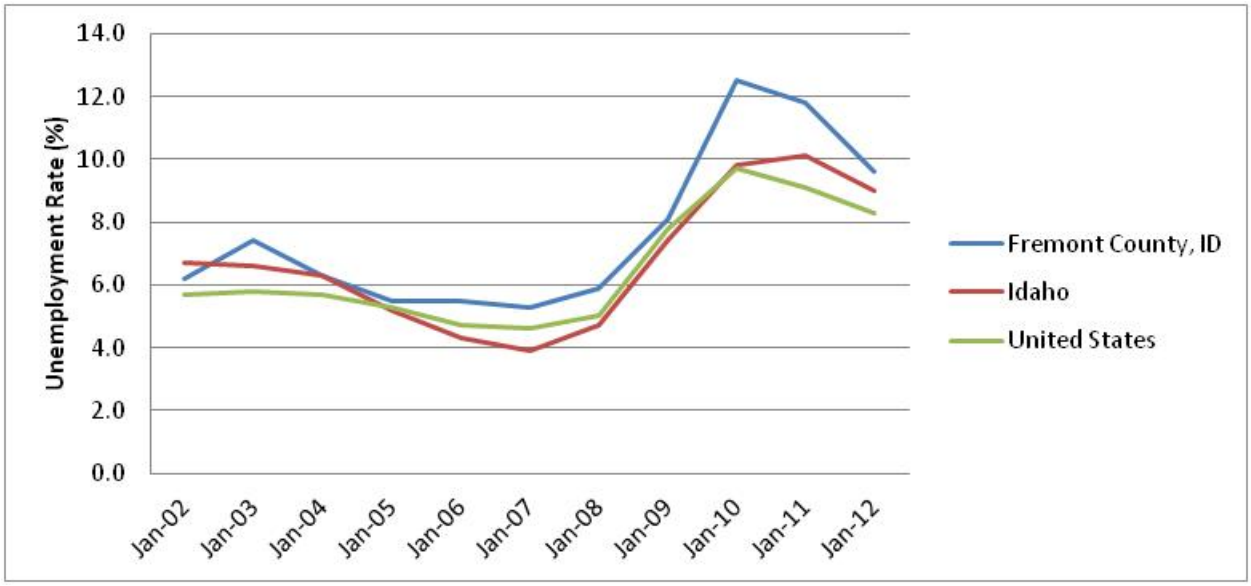
Economic conditions have worsened considerably since September 2008. The economic downturn has most likely impacted visitation to the greater Yellowstone area and spending by visitors who come to the area. Figures 29 to 31 compare the unemployment rates in each of the affected counties to those of their respective states as well as the United States as a whole. In Montana (figure 29), unemployment in Gallatin and Park counties has remained below that of the United States for the most part, although Park County's unemployment rate surpassed the national rate in 2010. After a spike near the end of 2009 and continuing into 2010, unemployment in Idaho's Fremont County (figure 30) declined back toward the

statewide rate in 2011. In Wyoming, Park County generally mirrored the statewide unemployment rate until 2008 when the rate began growing more steeply. In Teton County, although staying below both the national and statewide rates, the unemployment rate grew steeply from 2008 to 2010 then began to grow less steeply 2011 (figure 31). As of December 2011, all counties in the affected area except for Park County, Montana, and Fremont County, Idaho, had unemployment rates below the national average. However, all counties continue to experience unemployment rates well above levels seen prior to 2008. As the economy improves, visitor spending should increase through the area. Montana, Idaho, and Wyoming, and the counties contained in these states, experience much more seasonal variation in unemployment rates than observed at the national scale.



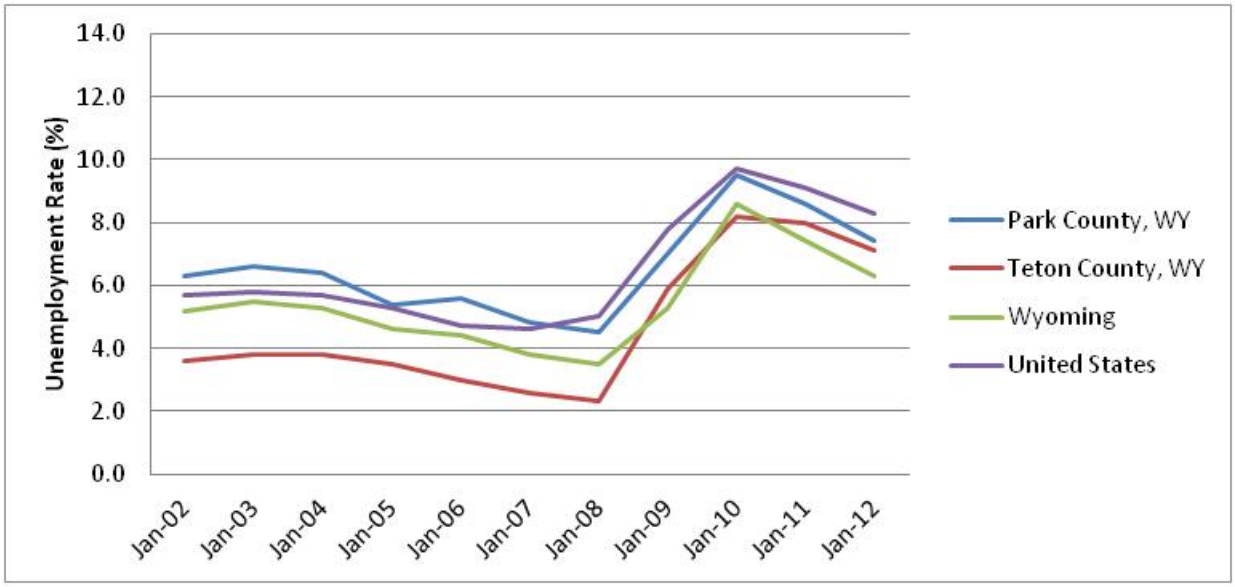
Source: Bureau of Labor Statistics 2012 (Series LAUCN30031006, LAUCN30067006, LAUST30000006, LNS14000000).

FIGURE 29: UNEMPLOYMENT RATES IN GALLATIN COUNTY, PARK COUNTY, MONTANA, AND THE UNITED STATES, JANUARY 2002–JANUARY 2012



Source: Bureau of Labor Statistics, 2010, (Series LAUCN16043006, LAUST16000006, LNS14000000).

FIGURE 30: UNEMPLOYMENT RATES IN FREMONT COUNTY, IDAHO, AND THE UNITED STATES, JANUARY 2002–JANUARY 2012



Source: Bureau of Labor Statistics 2010, (Series LAUCN56029006, LAUCN56039006, LAUST56000006, LNS14000000).

FIGURE 31: UNEMPLOYMENT RATES IN PARK COUNTY, TETON COUNTY, WYOMING, AND THE UNITED STATES, JANUARY 2002–JANUARY 2012

PARK OPERATIONS AND MANAGEMENT

The NPS, park concessioners, contractors, researchers, and other duly permitted parties depend on snowmobiles and snowcoaches for their administrative functions. These uses of the park are not within the purpose and need of this plan, but are within the scope of analysis in this plan/SEIS because as shown in the analysis for some impact topics, such as soundscapes, winter operations have an effect on park operations and management.

NPS EMPLOYEES AND CONCESSIONS

Approximately 82 permanent and seasonal NPS employees, including those at the West Entrance, plus their family members, have overwintered in the interior of Yellowstone in recent years. Additionally, Xanterra Parks & Resorts have stationed approximately 150 employees in the interior during the winter season, almost exclusively at Old Faithful (Regula pers. comm. 2010). These NPS and Xanterra employees not only provide critical law enforcement, interpretive, and guest services to winter visitors, but they also maintain and protect Yellowstone's natural and cultural resources. For example, some employees clear accumulating snow from the park's wide array of historic buildings, including national historic landmarks such as the Old Faithful Inn and the Fishing Bridge, Madison, and Norris museums.

The employees living in the park's interior occupy a unique environment because they have no wheeled vehicle access to their homes. Their only access to groceries, supplies, and medical care is by OSVs. Almost nowhere else in the United States, outside Alaska, are whole communities of people living and working in an oversnow environment such as the interior of Yellowstone. Due to their unique situation, using snowmobiles for both work-related and personal use is clearly appropriate under executive orders and policy.

Other NPS and concessions employees, as well as permitted researchers and authorized contractors, have conducted similar work and personal activities by OSV. Park guides and outfitters have also been authorized to use snowmobiles and snowcoaches in the park for administrative access to repair or tow disabled vehicles. These and other administrative uses are necessary for the park to carry out its mission in accordance with the NPS Organic Act, and are focused on ensuring the health and safety of visitors and park residents, providing for public enjoyment of the park, and protecting park resources.

Guests of any employees have been required to use BAT OSVs when authorized to enter the park. Permitted researchers have also been required to use BAT vehicles as a condition of their permit unless special circumstances exist.

The vast majority of the NPS administrative OSV fleet in Yellowstone is now BAT. For the 2011/2012 winter season, Yellowstone had 118 snowmobiles (both leased and owned) in its administrative fleet, of which 93 percent met BAT requirements. The non-BAT snowmobiles (8 in total) are needed for specialized use, such as law enforcement (boundary patrol, search and rescue) and other administrative purposes on a limited basis where the heavier weight and lower horsepower of current BAT machines do not perform adequately.

In addition to administrative snowmobiles, Yellowstone operates 14 other OSVs. These include groomers, two OSVs on loan from the state of Wyoming, ambulances, fire trucks, vans, and trucks, which are seasonally tracked and converted to OSV use.

The NPS has been shifting to a leased snowmobile fleet, rather than purchasing snowmobiles, to save on maintenance costs. An average of 1,700 miles is put on each snowmobile per winter. The park has used about 23,000 gallons of biodiesel (primarily for grooming equipment) and about 14,000 gallons of

ethanol blend gasoline per winter in its oversnow fleet (average of the winters 2002/2003 through 2005/2006).

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

COST TO OPERATE SYLVAN PASS

Winter operational expenses include the cost of grooming snow roads, leasing and maintenance of park OSVs (snowmobiles and tracked vehicles), fuel, supplies and material, Sylvan Pass management, operation of the warming huts, utilities, and the employees needed during this time. In determining the cost to operate Sylvan Pass in winter, data from Fiscal Year 2011 was used by the Yellowstone National Park Budget Focus Group as the baseline year for this analyses. The costs of spring opening were not included.

The following costs were estimated:

- In Fiscal Year 2011
  - Total winter operational expenses were $5,586,858 (base and non-base sources).
  - Lake/East Entrance operations expenses were $1,607,145 including all costs associated with Sylvan Pass operations.

The following parameters were used for analysis:

- The East Entrance Road would close the first Monday following the first full week in November.
- The East Entrance Road would open the first Friday of May. Yellowstone staff most familiar with Sylvan Pass operations estimated that, based on historical conditions, this would be the average opening date should avalanche mitigation efforts not be undertaken during the winter season or to facilitate spring opening.
- No motorized travel would be permitted over the pass between the fall closure and spring opening dates except in emergency situations (closed means closed).
- Avalanche Forecasting would be at a reduced frequency commensurate with maintaining information relevant to understanding the snowpack for spring opening. The park would still need to maintain a fairly high level of forecaster ability, with a minimum of four people that would meet current forecaster requirements to support spring opening forecasting and backcountry forecasting throughout the winter.
- There would be no use of explosives to mitigate avalanches on the pass, including howitzer or helicopter dispensed explosives except in emergency situations (SAR). The costs of the unexploded ordinance program are outside the bounds of this cost projection exercise and were not included in the analyses. For budget estimation, there were zero costs associated with avalanche mitigation. This includes personnel costs and explosives, etc.
- Four individuals would be required to staff East Entrance from fall closure until spring opening (dates defined above). No staff from other divisions would be required at the East Entrance. Lake would be staffed similar to other interior locations, and staffing levels were allocated to be

> commensurate with needs for grooming, life/safety, educational, grooming, and other responsibilities in the District.

It would cost approximately $1,482,277 to operate the Lake/East Entrance District with Sylvan Pass closed to all OSV use from the first Monday following the first full week in November through the first Friday of May. The net cost savings for Yellowstone National Park should Sylvan Pass be closed would be $124,868 ($1,607,145 (FY2011 costs for Lake/East Entrance) less $1,482,277 (projected cost to operate Sylvan Pass)).

CHAPTER 4

Environmental Consequences

CHAPTER 4: ENVIRONMENTAL CONSEQUENCES

The "Environmental Consequences" chapter analyzes both beneficial and adverse impacts that would result from implementing any of the alternative elements described in this Winter Use Plan / Supplemental Environmental Impact Statement (plan/SEIS). In addition, this chapter includes a summary of laws and policies relevant to each impact topic, impact intensity definitions (negligible, minor, moderate, and major) and methods used to analyze the direct, indirect, and cumulative impacts. As required by the Council on Environmental Quality (CEQ) regulations implementing the National Environmental Policy Act (NEPA), a summary of the environmental consequences for each alternative is provided in table 11, which can be found in the "Alternatives" chapter. The resource topics presented in this chapter, and the organization of these topics, correspond to the resource discussions contained in the "Affected Environment" chapter.

For a complete discussion of guiding authorities, refer to the section titled "Related Laws, Policies, Plans, and Constraints" in the "Purpose of and Need for Action" chapter.

In addition to the related laws, plans and constraints discussed in chapter 1, Section 4.5 of the Director's Order 12 Handbook (NPS 2001) adds to this guidance by stating, "when it is not possible to modify alternatives to eliminate an activity with unknown or uncertain potential impacts, and such information is essential to making a well-reasoned decision, the National Park Service (NPS) will follow the provisions of the CEQ regulations (40 CFR 1502.22)." In summary, the NPS must state in an environmental assessment or impact statement (1) whether such information is incomplete or unavailable, (2) the relevance of the incomplete or unavailable information to evaluating reasonably foreseeable significant adverse impacts on the human environment, (3) a summary of existing credible scientific evidence that is relevant to evaluating the reasonably foreseeable significant adverse impacts on the human environment, and, (4) an evaluation of such impacts based on theoretical approaches or research methods generally accepted in the scientific community. Collectively, these guiding laws and corresponding regulations provide a framework and process for evaluating the impacts of the alternatives considered in this plan/SEIS.

GENERAL ASSUMPTIONS

Several guiding assumptions were made to provide context for this analysis. These assumptions are described below.

ANALYSIS PERIOD

For all alternatives, the analysis period is 20 years. Because the level of winter use permitted has varied over the years, the analysis of the alternatives discusses various levels of use when referring to past use levels. Table 41 provides the average and peak use levels for oversnow vehicles (OSVs) during these periods.

TABLE 41: OSV USE LEVELS REFERRED TO IN THE ANALYSIS

	Snowmobiles	Snowcoaches
Historical (pre-2004) Average	765	15
Historical (pre-2004) Peak	1457	35
Recent Use (2004–2009) Average	258	30
Recent Use (2004–2009) Peak	557	60
2011/2012 Season Average	188	35
2011/2012 Season Peak	261	56
Use Limits by Alternative		
Alternative 1	0	0
Alternative 2 (also referred to as recent maximum allowable use)	318	78
Alternative 3	318 until phaseout, 0 after phaseout	78 until phaseout, 120 after phaseout
Alternative 4	480 maximum 342 average	106 maximum (if no events are used for guided snowmobiles) 60 (if maximum snowmobile events are used)
Alternative 4: All Snowmobiles and Snowcoaches Meeting voluntary enhanced-BAT (E-BAT) standards	480 maximum 368 average	212 maximum (if no events are used for guided snowmobiles) 120 (if maximum snowmobile events are used)

Historical average and peak (1992–2000) was from the 2000 Environmental Impact Statement (EIS) page G-3 (NPS 2000b).

GEOGRAPHIC AREA EVALUATED FOR IMPACTS

The general geographic study area for this plan/SEIS is Yellowstone National Park in its entirety. However, the area of analysis is based on the affected resource topic and may vary in area including areas beyond the boundaries of the park as applicable.

TYPE OF IMPACTS

The following general assumptions are used for all impact topics.

- Direct: Impacts would occur as a direct result of winter use management actions.
- Indirect: Impacts would occur from winter use management actions but would occur later in time or farther removed in distance.
- Beneficial: A positive change in the condition or appearance of the resource or a change that moves the resource toward a desired condition.
- Adverse: A negative change to the appearance or condition of the resource.
- Cumulative: Impacts that occur from past, present, and reasonably foreseeable future actions.

DURATION OF IMPACTS

Where the duration varies for an impact topic, it has been noted in the section "Assumptions, Methodology, and Intensity Definitions."

- Short term: Impacts would be temporary (i.e., they would occur for a matter of hours up to weeks at a time), and would generally last no longer than one season, without lasting effects.
- Long term: Impacts would be continuous throughout the life of the plan, potentially occurring every winter, with potentially lasting effects.

INTENSITY DEFINITIONS

The terms "impact" and "effect" are used interchangeably throughout this document. The impacts are qualitatively and quantitatively assessed using definitions that provide the reader with an idea of the intensity of a given impact on a specific topic. The intensity definition is determined primarily by comparing the effect to a relevant standard based on applicable or relevant/appropriate regulations or guidance, scientific literature and research, or best professional judgment. Because intensity definitions vary by impact topic, they are provided separately for each impact topic analyzed in this document. Intensity definitions provided throughout the analysis are characterized as negligible, minor, moderate, or major. The intensity definitions are provided for adverse impacts only; beneficial impacts are addressed qualitatively.

FORMAT OF THE ANALYSIS

For each impact topic, the assumptions, methodology, and intensity definitions (described above) for that topic are presented first to provide context for how the resource topic was evaluated. This framework for analysis is followed by a summary of impacts that provides an overview of the analysis that was performed. Each alternative was analyzed against a condition with no winter use, or alternative 1 (no action). The summary is then followed by the detailed impact analysis for each alternative.

Comparisons among alternatives are based on the maximum allowed (authorized) use under each alternative, rather than an average expected use. Alternative 2 represents the maximum use levels allowed under the 2009-2013 interim regulations. Average use levels have fluctuated within and between winter use seasons and have never equaled maximum allowed use and are therefore not a reliable metric for comparing alternatives. Furthermore, per NEPA, it is necessary to disclose the maximum level of impact that could be experienced under each alternative. Toward that end, for alternative 4 (specifically 4a and 4c), which allows up to 10 snowmobiles per transportation event on any given day for commercially guided events but mandates a seasonal average of no more than 7 snowmobiles per transportation event (8 if voluntary E-BAT standards are met), the modeling scenarios and impact analysis are based on a groups of 10 snowmobiles. For all scenarios under alternative 4, non-commercially guided groups are a maximum of 5 snowmobiles per transportation event.

All alternatives include administrative use, which was accounted for in the modeling conducted for the analysis of alternatives. The impact of administrative use would be the same across all action alternatives (110 administrative snowmobiles and 13 administrative snowcoaches in the park per day), which all allow for public OSV use; therefore, while the impact analysis takes into account administrative use and the results of the modeling for air and soundscapes include the emissions expected from administrative use, the discussion of the impacts of each alternative focuses on public OSV use.

NUMBER OF TRANSPORTATION EVENTS

For purposes of comparing the alternatives, the discussion of the maximum number of OSVs allowed under alternatives 2 and 3 includes not only the numbers of OSV allowed daily, but the number of transportation events that those use levels could result in. The following assumptions were made regarding the number of transportation events under each alternative.

- Alternative 2 would allow for up to 318 snowmobiles and 78 snowcoaches each day. Based on average group size over the past three winter seasons of 6.7 snowmobiles per group, on average this would result in 123 transportation events daily (45 snowmobile groups consisting of approximately 7 snowmobiles each + 78 snowcoaches). Because there is no minimum group size under alternative 2, the maximum number of transportation events daily could be as many as 237. This would occur if each snowmobile group entering the park consisted of one visitor and one guide and all 78 snowcoach allocations were used.
- Alternative 3 would initially have the same number of snowmobiles and snowcoaches as alternative 2, and therefore the same number of transportation events (average of 123, maximum of 237). After the transition to all snowcoaches (completed by start of the 2020/2021 winter season), there would be up to 120 transportation events each day: one event for each snowcoach permitted.
- Alternative 4 would permit up to 110 transportation events daily, of which up to 50 daily transportation events may be comprised of snowmobiles. A transportation event is defined as one snowcoach or a group of seven snowmobiles (averaged seasonally; daily maximum number of ten snowmobile per event). Should OSVs meet additional voluntary environmental performance standards, known as E-BAT, the sum number of vehicles permitted per group would increase from one snowcoach per event to up to two snowcoaches per event and from a seasonal average of up to seven snowmobiles per event to a seasonal average of up to eight snowmobiles per event, but the overall total number of transportation events (110) allowed daily would remain the same and the maximum group size would remain ten snowmobiles per transportation event.

CUMULATIVE IMPACTS

The CEQ regulations for implementing NEPA require the assessment of cumulative impacts in the decision-making process for federal projects. Cumulative impacts are defined as “the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions” (40 CFR 1508.7). Cumulative impacts are considered for all alternatives, including the no-action alternative.

Cumulative impacts were determined by combining the impacts of the alternative being considered with other past, present, and reasonably foreseeable future actions. Therefore, it was necessary to identify other ongoing or reasonably foreseeable future projects and plans at the park and, if applicable, the surrounding region. Past actions are those that have been occurring since winter use planning efforts began in 1990 and reasonably foreseeable future projects are those that would occur within the life of the plan. Following CEQ guidance, past actions were included, "to the extent that they are relevant and useful in analyzing whether the reasonably foreseeable effects of the agency proposal for the actions and its alternatives may have a continuing, additive, and significant relationship to those effects" (CEQ 2005).

Table 42 summarizes the actions that could affect the various resources at the park. These actions are described in more detail in the "Related Laws, Policies, Plans, and Constraints" section of this document (see chapter 1).

The analysis of cumulative impacts was accomplished using four steps:

Step 1 — Identify Resources Affected

Fully identify resources affected by any of the alternatives. These include the resources addressed as impact topics in chapters 3 and 4 of this document.

Step 2 — Set Boundaries

Identify an appropriate spatial and temporal boundary for each resource. The temporal boundaries are noted above and the spatial boundary for each resource topic is listed under each topic.

Step 3 — Identify Cumulative Action Scenario

Determine which past, present, and reasonably foreseeable future actions to include with each resource. Reasonably foreseeable future actions include those federal and non-federal activities not yet undertaken, but sufficiently likely to occur, that a reasonable official of ordinary prudence would take such activities into account in reaching a decision. These activities include, but are not limited to, activities for which there are existing decisions, funding, or proposals identified. Reasonably foreseeable future actions do not include those actions that are highly speculative or indefinite (43 CFR 46.30).

Past, present and reasonably foreseeable future actions are listed in table 42 and described in chapter 1.

Step 4 — Cumulative Impact Analysis

Summarize impacts of these other actions plus impacts of the proposed action (the alternative being evaluated, to arrive at the total cumulative impact. This analysis is included for each resource in chapter 4.

TABLE 42: CUMULATIVE IMPACT SCENARIO

Impact Topic	Study Area	Past Actions	Present Actions	Reasonably Foreseeable Future Actions
Wildlife and Wildlife Habitat, including Rare, Unique, Threatened, or Endangered Species, and Species of Concern	Park boundary, plus adjacent land	Reconstruction of East Entrance Road (completed 2010) Construction of West Entrance Road (completed 2008) Development (2000) and implementation of the Interagency Bison Management Plan (IBMP) Development and implementation of the Northern Rockies Lynx Management Direction FEIS and Amendments (2007) Development and implementation of the Gallatin National Forest Travel Plan revision (2006) Timber harvest on national forest lands Consolidation of checkerboard lands in the Gallatin National Forest Development and implementation of the Beartooth District of Custer National Forest Travel Management Plan (2008) Reclamation of historic mines above Cooke City Active population management of bison and elk herds by the NPS Reintroductions of gray wolves to the greater Yellowstone area	Operation of new facilities at the West Entrance Implementation of the IBMP Implementation of the Northern Rockies Lynx Management Direction FEIS and Amendments (2007) Implementation of the Gallatin National Forest Travel Plan revision (2006) Timber harvest on national forest lands Consolidation of checkerboard lands in the Gallatin National Forest Implementation of the Beartooth District of Custer National Forest Travel Management Plan (2008) Gardiner Basin and Cutler Meadows restoration (currently in progress) Reclamation of McClaren Mine tailings (currently in progress) (MTDEQ 2010b) Development of the EIS for remote vaccine delivery for bison	Operation of new facilities at the West Entrance Implementation of the IBMP Implementation of the Northern Rockies Lynx Management Direction FEIS and Amendments (2007) Implementation of the Gallatin National Forest Travel Plan revision (2006) Timber harvest on national forest lands Implementation of the Beartooth District of Custer National Forest Travel Management Plan (2008) Implementation of remote vaccine delivery EIS for bison
Air Quality	Park boundary, plus adjacent land	Reconstruction of East Entrance Road (completed 2010) Development and implementation of the Gallatin National Forest Travel Plan revision (2006) Consolidation of checkerboard lands in the Gallatin National Forest. Development and implementation of the Beartooth District of Custer National Forest Travel Management Plan (2008) Oil and gas leasing	Implementation of the Gallatin National Forest Travel Plan revision (2006) Consolidation of checkerboard lands in the Gallatin National Forest Implementation of the Beartooth District of Custer National Forest Travel Management Plan (2008) Oil and gas leasing	Implementation of the Gallatin National Forest Travel Plan revision (2006) Implementation of the Beartooth District of Custer National Forest Travel Management Plan (2008) Oil and gas leasing

Impact Topic	Study Area	Past Actions	Present Actions	Reasonably Foreseeable Future Actions
Soundscapes and the Acoustic Environment	Park boundary	Reconstruction of East Entrance Road (completed 2010) Development and implementation of the Gallatin National Forest Travel Plan revision (2006) Development and implementation of the Beartooth District of Custer National Forest Travel Management Plan (2008) Consolidation of checkerboard lands in the Gallatin National Forest Overflights	Implementation of the Gallatin National Forest Travel Plan revision (2006) Implementation of the Beartooth District of Custer National Forest Travel Management Plan (2008) Consolidation of checkerboard lands in the Gallatin National Forest Overflights	Implementation of the Gallatin National Forest Travel Plan revision (2006) Implementation of the Beartooth District of Custer National Forest Travel Management Plan (2008) Overflights
Visitor Use, Experience, and Accessibility	Park boundary, plus adjacent land	Construction of new West Entrance (completed 2008) Reconstruction of East Entrance Road (completed 2010)	Operation of new facilities at the West Entrance Other winter use (outside of OSV use) activities occurring in the park	Operation of new facilities at the West Entrance Other winter use (outside of OSV use) activities occurring in the park
Health and Safety	Park boundary	Construction of new West Entrance (completed 2008) Reconstruction of East Entrance Road (completed 2010) Consolidation of checkerboard lands in the Gallatin National Forest	Operation of new facilities at the West Entrance Consolidation of checkerboard lands on the Gallatin National Forest	Operation of new facilities at the West Entrance

Impact Topic	Study Area	Past Actions	Present Actions	Reasonably Foreseeable Future Actions
Socioeconomic Values	Park boundary	Construction of new West Entrance (completed 2008) Reconstruction of East Entrance Road (completed 2010) Development and implementation of the Gallatin National Forest Travel Plan revision (2006) Development and implementation of the Beartooth District of Custer National Forest Travel Management Plan (2008) Consolidation of checkerboard lands in the Gallatin National Forest Timber harvest on national forest lands Oil and gas leasing Reopening of the Sleeping Giant Ski Area near Yellowstone's East Entrance (reopened in 2009)	Operation of new facilities at the West Entrance Implementation of the Gallatin National Forest Travel Plan revision (2006) Implementation of the Beartooth District of Custer National Forest Travel Management Plan (2008) Consolidation of checkerboard lands in the Gallatin National Forest Operation of the Sleeping Giant Ski Area	Operation of new facilities at the West Entrance Implementation of the Gallatin National Forest Travel Plan revision (2006) Implementation of the Beartooth District of Custer National Forest Travel Management Plan (2008) Operation of the Sleeping Giant Ski Area Rendezvous Ski Trail development plan
Park Operations and Management	Park boundary	Construction of new West Entrance (completed 2008) Reconstruction of East Entrance Road (completed 2010)	Operation of new facilities at the West Entrance	Operation of new facilities at the West Entrance

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

GUIDING REGULATIONS AND POLICIES

Servicewide NPS regulations and policies, including the NPS Organic Act of 1916, NPS *Management Policies 2006* (NPS 2006a), and the NPS Natural Resource Management Reference Manual 77 (NPS 2011c), direct national parks to provide for the protection of park resources. The Organic Act directs national parks to conserve "wild life" unimpaired for future generations and is interpreted to mean that native animal and plant life is to be protected and perpetuated as part of a park unit's natural ecosystem.

The NPS *Management Policies 2006* state that the NPS "will maintain as parts of the natural ecosystems of parks all plants and animals native to park ecosystems. The term 'plants and animals' refers to all five of the commonly recognized kingdoms of living things and includes such groups as flowering plants, ferns, mosses, lichens, algae, fungi, bacteria, mammals, birds, reptiles, amphibians, fishes, insects, worms, crustaceans, and microscopic plants or animals" (NPS 2006a). The NPS will achieve this by

- Preserving and restoring the natural abundances, diversities, dynamics, distributions, habitats, and behaviors of native plant and animal populations and the communities and ecosystems in which they occur
- Restoring native plant and animal populations in parks when they have been extirpated by past human-caused actions
- Minimizing human impacts on native plants, animals, populations, communities, and ecosystems, and the processes that sustain them (NPS 2006a).

Section 4.1 of NPS *Management Policies 2006* states,

> Natural resources will be managed to preserve fundamental physical and biological processes, as well as individual species, features, and plant and animal communities. The Service will not attempt to solely preserve individual species (except threatened or endangered species) or individual natural processes; rather, it will try to maintain all the components and processes of naturally evolving park ecosystems, including the natural abundance, diversity, and genetic and ecological integrity of the plant and animal species native to those ecosystems. (NPS 2006, Section 4.1)

The NPS adheres to the North American Wildlife Conservation Model, which focuses on the health and management of wildlife populations. Overall, the goal of the NPS is to minimize human impacts (including impacts on individual wildlife) and avoid significant effects from disturbance to the abundance, diversity, dynamics, distributions, habitats, and behaviors of wildlife populations and the communities and ecosystems in which they occur, pursuant to 36 CFR 2.18 and NPS *Management Policies 2006*, Section 4.4.1. Although the focus of the impact analysis is predominantly the impacts on wildlife populations, the NPS acknowledges that adverse impacts on individual animals would likely occur and seeks to minimize them. In addition to NPS management policies, federally listed species in national parks are protected by the Endangered Species Act (ESA). The ESA (16 USC 1531 et seq.) mandates all federal agencies to consider the potential effects of their actions on species listed as threatened or endangered. If the NPS determines that an action may affect a federally listed species,

consultation with the U.S. Fish and Wildlife Service (USFWS) is required to ensure that the action would not jeopardize the species' continued existence or result in the destruction or adverse modification of critical habitat. NPS *Management Policies 2006* state that the NPS will survey for, protect, and strive to recover all species native to national park system units that are listed under the ESA, and proactively conserve listed species and prevent detrimental effects on these species (NPS 2006a, Section 4.4.2.3). NPS *Management Policies 2006* also state that "[the NPS will] manage state and locally listed species in a manner similar to its treatment of federally listed species to the greatest extent possible" (NPS 2006a, Section 4.4.2.3).

ASSUMPTIONS, METHODOLOGY, AND INTENSITY DEFINITIONS

Assumptions and Methodology

The impact analysis for wildlife and wildlife habitats was conducted separately for species that represent prominent aspects of the winter experience of Yellowstone, and for other species of special management interest. Other species that may be impacted, but at no more than negligible to minor level, are discussed under "Issues and Impact Topics Considered but Dismissed from Further Analysis." For each species, specific assumptions are provided and the impacts on each species are detailed. Impact findings for all species draw from the Scientific Assessment of Yellowstone National Park Winter Use (available at the Yellowstone Winter Use website at http://www.nps.gov/yell/planyourvisit/winteruse.htm and the Planning, Environment, and Public Comment (PEPC) website at http://parkplanning.nps.gov/yell) as well as other available literature.

When determining impacts under the following alternatives, the data used were generally collected from monitoring of wildlife in Yellowstone rather than through modeling or simulation. However, modeling and simulation are useful tools by which to discuss the long-term implications of certain alternatives, and therefore modeling results are included when useful or applicable.

Intensity Definitions

Negligible: There would be no observable or measurable impacts of consequence to individual native species, populations, or their habitats.

Minor: Impacts on individual native species, populations, or their habitats would occur but would not be readily apparent. Responses by relatively few individuals could be expected. Some impacts might occur during feeding, reproduction, or other critical periods for a species, but would not result in injury or mortality. Small changes to local population numbers, population structure, and other demographic factors might occur but would be difficult to discern from natural population fluctuations. Sufficient habitat in the park would remain functional to maintain a sustainable population in the park.

Moderate: Impacts on individual native species, populations, or their habitats would be small but readily apparent. Responses by individuals could be expected, with some negative impacts during feeding, reproduction, or other critical periods or in key habitats in the park and result in harassment, injury, or mortality to one or more individuals. However, sufficient population numbers and habitat in the park would remain functional to maintain a sustainable population in the park.

Major: Impacts on individual native species, populations, or their habitats would be large-scale and readily apparent. Responses by many individuals would be expected, with negative impacts during feeding, reproduction, or other critical periods or in key habitats in the park. Impacts would occur during critical periods of reproduction or in key habitats in the park and result in direct mortality or loss of habitat. Local population numbers, population structure, and other demographic factors might experience large-scale changes.

Study Area

The study area for assessment of the various alternatives is the park. The study area for the cumulative impacts analysis is the park plus the lands adjacent to the park's boundaries.

SUMMARY OF IMPACTS (ALL SPECIES)

The impacts on wildlife species from actions under each alternative were analyzed below based on four major concerns: displacement impacts (e.g., animals being forced from preferred feeding areas); behavioral responses of wildlife to OSVs and associated human activities; physiological responses of individuals to OSVs and associated human activities; and demographic effects at the population level. Each wildlife species section starts with an overall summary of each of the major concern topics and corresponding effects on wildlife, followed by a detailed impact analysis of each alternative.

- Alternative 1 would greatly reduce OSV use in the park compared to recent maximum allowable use (alternative 2), allowing only administrative OSV use. With the reduction in use, no observable impact would occur on the wildlife species analyzed (bison, elk, trumpeter swans, eagles, lynx, wolverines, and wolves); therefore, impacts would be short- and long-term, negligible, adverse for all species under alternative 1. Long-term beneficial impacts on lynx and wolverines would also occur due to the absence of OSV use through Sylvan Pass and only occasional backcountry skier use at the East Entrance.
- Alternative 2 would allow use levels similar to those allowed under the 2009 to 2013 interim regulations (up to 318 snowmobiles and 78 snowcoaches – an average of 123 daily transportation events, with a possible maximum of 237 daily transportation events) with best available technology (BAT) requirements, guiding regulations, speed limits, and restrictions on OSV access to park roads only. Overall impacts under alternative 2 would be short- and long-term minor to moderate adverse for bison and elk, because encounters with OSVs would occur, but would not cause population-level impacts. Impacts on lynx and wolverines would be long-term minor adverse because OSV use near the East Entrance would be limited to 20 commercially guided OSVs a day (resulting in approximately 3 groups using the recent average of 6.7 snowmobiles per event), limiting the potential for encounters with OSVs, where these two species are known to occur. If these species were to travel to other parts of the park, outside of the eastern sector, impacts could be long-term moderate adverse due to the possibility of more frequent encounters with OSVs. Trumpeter swans, eagles, and wolves would experience short- to long-term negligible to minor adverse impacts because OSV management, including guiding requirements and use restrictions, would limit encounters between OSVs and these species. Overall, alternative 2 would have greater adverse impacts to wildlife than alternative 1, due to the fact that OSV use would be authorized for visitors.
- Under alternative 3, daily use levels would initially be the same as under alternative 2, but would transition from 318 guided snowmobiles and 78 guided snowcoaches to 0 snowmobiles and 120 guided snowcoaches after a 3-year phase-out period of snowmobiles beginning in the winter

season of 2017/2018. Initially, the number of transportation events under alternative 3 would be the same as alternative 2, and then reduced to a maximum of 120 transportation events daily. The existing data suggest that a snowcoach may elicit stronger bison and elk behavioral responses than snowmobiles. Therefore, restricting OSVs to just guided snowcoaches would not eliminate adverse effects on wildlife. Under alternative 3, impacts on bison and elk would be short- and long-term minor to moderate adverse. Impacts on lynx and wolverines would be short-and long-term negligible to minor adverse because the level of OSV use would be expected to have few impacts on reproductive success, dispersal, and overall genetic sustainability of the species, with long-term beneficial impacts from the absence of human presence at Sylvan Pass. Trumpeter swans and eagles would experience short- to long-term negligible adverse impacts and wolves would experience short- to long-term negligible to minor adverse impacts, because OSV management, including guiding requirements and low use limits, would limit encounters between OSVs and these species. Overall, alternative 3 would have greater adverse impacts to wildlife than alternative 1, due to the fact that OSV use would be allowed for park visitors, but would have less of an impact to wildlife than alternative 2 because it would allow a lower number of transportation events and would close Sylvan Pass, thus decreasing the potential impacts to wildlife.

- Alternative 4 would allow for a maximum of 110 transportation events each day; however, no more than 50 events could be snowmobile transportation events. The daily make-up and number of OSVs in the park could range from 0 to 480 snowmobiles and 60 snowcoaches to 106 snowcoaches. At maximum daily snowmobile use, OSVs could increase to a maximum of 540 OSVs (480 snowmobiles and 60 snowcoaches), an increase over recent maximum allowable use (alternative 2). Should OSVs meet additional voluntary environmental performance standards, known as E-BAT, the size of each transportation event would be able to increase from one snowcoach per event to up to two snowcoaches per event and from a seasonal average of up to seven snowmobiles per event to up to a seasonal average of up to eight snowmobiles per event, but the overall total number of transportation events (110) allowed daily would remain the same as would the maximum group size of ten snowmobiles per transportation event. Allowing two E-BAT snowcoaches per transportation event would double the visitor capacity while reducing impacts from OSV noise. The snowcoaches would travel 2 to a group in close proximity and act as one "event." This one event would result in the same level of disturbance to wildlife or less, since with E-BAT the one event with two snowcoaches would emit less sound energy. Alternative 4 would allow for up to 4 non-commercially guided snowmobile groups daily. Non-commercial guides would receive guide training; therefore, it is assumed that there would be no difference in impacts between commercial and non-commercial guides. Non-commercial guides would be clearly marked and would be required to comply with all park requirements and regulations. Compliance with park regulations would be monitored by park law enforcement. Should impacts on the resource increase or infractions occur under the non-commercially guided program, this program would be altered or discontinued.

  Continued monitoring and assessment (adaptive management) would allow for additional changes to use if impacts greater than those predicted in this plan/SEIS are observed, and could be used over time to alter management in order to improve resource conditions. Overall, alternative 4 would result in short- and long-term minor to moderate adverse impacts on bison and elk because there would be encounters between the animals and OSVs. Alternative 4 would result in long-term minor adverse impacts on lynx and wolverine because of continued OSV use at Sylvan Pass in the eastern sector, and would have similar impact as recent maximum allowable use. If these species travel outside the eastern sector of the park, long-term moderate adverse impacts could result from the possibility of more frequent encounters with OSVs. Trumpeter swans, eagles, and wolves would experience short- to long-term negligible to minor adverse impacts because OSV management, including commercial guiding requirements and use restrictions would limit

encounters between OSVs and these species. Overall, alternative 4 would have greater adverse impacts to wildlife than alternative 1, due to the fact that OSV use would be allowed for park visitors, but would have less of an impact to wildlife than alternative 2 because it would allow a lower number of transportation events, thus decreasing the potential impacts to wildlife.

DETAILED IMPACT ANALYSIS

BISON AND ELK

Bison and elk are large ungulates with herds that winter in the park. These two species are more frequently encountered by OSV users than other wildlife species in the park. Both species are readily observed by OSVs and provide ample opportunities for wildlife viewing. These species are combined for analysis because they are similar in habitat preference, winter in Yellowstone's north and central ranges, are herbivorous, are active and mobile during winter, and have been extensively analyzed in relation to winter use.

General Description of Potential Impacts

Displacement of Bison and Elk

As discussed in chapter 3, elk and bison displacement due to OSV use in the park appears to be localized and short term. Even during the highest historical OSV use levels in the park, bison and elk continued to occupy their historical winter range in the Madison and Firehole drainages of Yellowstone. Consequently, the following analysis assumes that increases in OSV use would cause short-term localized displacement, but not long-term displacement, in large part because the winter use season lasts less than 90 days. Also, as discussed in chapter 3, particularly in regard to bison, this analysis proceeded with the understanding that groomed roads are not a primary factor influencing bison population dynamics or westward range expansion of bison.

When wildlife is frequently disturbed, animals may demonstrate fewer visible responses to disturbance. It can be difficult to assess whether this represents a diminished impact, because the animals have become "habituated" or accustomed to the disturbance, or if impacts are still occurring but the animals are unable to do anything about it. Animals may tolerate disturbance without response because the activity is too important to interrupt, or because their energy supplies are so limited that they cannot afford a response. Behavioral responses depend upon species, sex, age, behavioral context, nutritional status, resource availability, time of year, animal group size, and predation pressure. An animal's decision to move from a disturbed area depends on a number of factors including the quality of the site, 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.

Behavioral Responses of Individual Bison and Elk

Bison and elk behavioral responses to OSVs in Yellowstone suggest some level of habituation. The level and frequency of observed responses to OSVs are lower than those demonstrated by bison, elk, and other ungulates in areas of North America outside Yellowstone (White et al. 2009; Hardy 2001). These responses are species-specific, and comparison of Yellowstone's bison and elk to other ungulates, or to elk or bison in parks with more variable use or different levels of use is difficult For example, Yellowstone's elk exhibited an increase in the likelihood of a vigilance

response as cumulative OSV traffic increased over the course of a winter. In contrast, the likelihood of a vigilance response by bison decreased in winters with high visitation. Movement responses by both bison and elk appeared unchanged at 8–9 percent of observed interactions (White et al. 2009).

A predictable daily pattern of OSV use, such as that which occurs with guided OSV use, would be more likely to decrease overall behavioral responses by bison and elk throughout the winter, because animals are more likely to become habituated to a disturbance if it is predictable in time and space, not directly harmful, and limited in duration (Thompson and Henderson 1998; White et al. 2009). Also, the frequency of exposure to OSV disturbance (which may increase with higher allowable use limits) is an important consideration when assessing the likelihood of habituation, because there appears to be a threshold of disturbance at which wildlife are no longer able to habituate (White and Thurow 1985; Steidl and Anthony 2000). This threshold is generally species-specific and may be reached more quickly if a disturbance is novel, represents a greater threat, or occurs during a time of additional stress, such as increased predation pressure, harsh winters, or low food availability.

An issue raised by commenters in past planning processes is that OSV numbers under the action alternatives would exceed those recommended by wildlife biologists. That is not the case. The current definitive report on this topic is the peer reviewed scientific article entitled "Behavioral Responses of Bison and Elk in Yellowstone to Snowmobiles and Snow Coaches" (Borkowski et al. 2006). Borkowski et al. (2006) make it clear that the cumulative monitoring period they are referring to is from 1999–2004 and included average daily OSV use up to 593 per day (2002), maximum daily numbers extended up to 1,874 OSVs (2001), and cumulative OSV entries for the winter season at the West Entrance alone up to 46,885 (2002). The results of this paper are considered in the following impact analysis.

Based on recent behavioral monitoring data and modeling, it appears that snowmobiles are more likely to elicit a visible behavioral response from bison or elk (vigilance or movement), but snowcoaches elicit stronger levels of behavioral responses, such as movement or flight.

Behavioral data indicate that a larger number of recreationists produces behavioral responses in a larger number of individual animals, a data-based assumption that is carried forward in the following analysis (White et al. 2009). Guiding requirements directly mitigate wildlife impacts by reducing the number of interactions that result in intense, energetically expensive responses by wildlife. Reducing these interactions also helps foster habituation; in which wildlife reduce their responses because they no longer perceive OSV traffic as a serious threat (NPS 2008a). Guides may be able to recognize and minimize those situations where two or more factors such as distance of the wildlife group to the road and interaction time, may increase wildlife stress and exacerbate behavioral responses. Under all action alternatives, 100 percent guiding would be required, with alternative 4 allowing for a small number of these guides to be non-commercial. Non-commercial guides would receive guide training. The training would address how to handle interactions with wildlife and the rules regarding wildlife in the park. Therefore, this analysis assumes that generally there would be no difference between the use of commercial and non-commercial guides except that non-commercial guides may have less reliable use patterns and less park guiding experience. In contrast, commercial guides would likely have the benefit of repeated experience in the park and more reliable use patterns. All guides would be monitored by park law enforcement, which would ensure they are complying with all regulations and requirements.

In regard to the impacts of snowmobiles versus snowcoaches, generally, snowmobiles and snowcoaches elicit slightly different intensities and amounts of responses from bison and elk. Based on recent behavioral monitoring data and modeling, it appears that snowmobiles are more likely to elicit a visible

behavioral response from bison or elk (vigilance or movement), but snowcoaches elicit stronger levels of behavioral responses, such as movement or flight (Borkowski et al. 2006; McClure et al. 2009; White et al. 2009). White et al. (2009; page 12) found that probabilities of movement were greater for animals exposed to snowcoaches than for those exposed to snowmobiles; "the odds of observing a movement response were 1.1 times greater for each additional snowmobile, 1.5 times greater for each additional coach."

Physiological Reponses of Bison and Elk

The majority of responses by wildlife documented in Yellowstone have been low-intensity vigilance (look and resume) or, more rarely, sustained movement (travel) (Borkowski et al. 2006; White et al. 2009). The fact that an animal exhibits no visible external responses does not mean physiological responses are absent. Apparent habituation, as demonstrated by behavioral studies on bison and elk, may be due to an array of other factors resulting in decreases in visible response. These other factors may adversely affect bison or elk heart rate, stress levels, habitat use, and foraging time. No comprehensive studies have analyzed the energetic effects of bison and elk behavioral responses to OSVs in Yellowstone, due in part to the difficulties associated with separating the energetic costs associated specifically with responses to OSVs from the total daily energy expenditure (Borkowski et al. 2006). Numerous assumptions are required when making energy analyses, and poorly defined parameter estimates can strongly affect research and outcomes. Despite apparent low-level behavioral responses, associated physiological responses by bison and elk could increase the potential impacts of winter stress on some animals and decrease winter survival and spring reproductive rates of animals thus affected (Gill, Norris, and Sutherland 2001). Given the difficulties with quantitatively analyzing physiological responses to recreationists by wildlife, analyses for this document were made on the qualitative but conservative assumptions that increasing levels of disturbance, including OSV traffic, would likely result in increased stress to wintering wildlife (Hardy 2001; Creel et al. 2002).

Population-level Impacts/Demographics

As discussed in chapter 3, researchers have not observed that OSV use and winter recreation in Yellowstone have affected bison and elk at the population level. An unknown number of individual bison and elk would incur adverse effects when exposed to OSV traffic, and winter recreation under the alternatives of this EIS. Behavioral monitoring (winter 1999 to winter 2009) found that 8–10 percent of bison and elk displayed active responses including travel, flight, alert-attention, and defense (White et al. 2009). Small numbers or groups of bison and elk may be displaced, demonstrate increased physiological and stress responses and/or demonstrate increased vigilance or active movement responses. Mitigation measures listed under each alternative strive to minimize the frequency and intensity of impacts on individual animals.

Overall, based on the available science and literature and the research summarized in chapter 3, it was assumed for the following analysis that those forms of winter recreation practiced in the park may have cumulative effects on individual animals, but that such impacts have not risen to the level at which they exceed minor adverse impacts on wildlife populations in the park.

Bison and Elk Responses to Non-motorized Users

Bison and elk may occasionally respond to skiers and snowshoers; however, the overall frequency of interactions and behavioral, physiological, and/or displacement effects on bison or elk is quite low. This is primarily because few people travel far from roads, established trails, or other areas of concentrated human activity (e.g., Geyser Basin trails, Old Faithful Visitor Education Center, warming huts). Ski and snowshoe trails in Yellowstone are managed as wilderness in some areas, with groomed tracks set on only a few snow roads. The difficulties associated with non-motorized winter

travel in the park (e.g., limited daylight, extreme cold and wind, poor visibility, drifted or deep snow, storms), restrict most of these users to within two miles of motorized-accessible travel corridors and restrict total daily movements of skiers or snowshoers, which further limits the potential for an encounter with bison or elk that are not also exposed to OSVs (NPS 2008a). During periods of extreme weather, areas of the park may be closed to backcountry use to protect wildlife (see chapter 2). Visitors are instructed to maintain a distance of at least 25 yards from bison and elk, and it is illegal to approach bison or elk in a way that precipitates any behavioral response (NPS 2010e). Cassirer, Freddy, and Ables (1992) studied bison and elk responses to non-motorized users in Yellowstone backcountry areas. Their study found that elk in Yellowstone demonstrated strong flight and physiological responses to skiers who were traveling in the backcountry. However, the vast majority of winter visitors to the park travel in the front country, and do not visit the backcountry areas where this study was conducted. Thus, non-motorized users in the front country associated with OSV roads generally encounter animals that are also exposed to OSVs and associated human presence.

Wildlife encounters with and responses to pedestrians (i.e., skiers and snowshoers) were noted during monitoring studies of motorized winter recreation at Yellowstone. The monitoring focused on the area within 500 meters of OSV roads. Interactions with skiers or snowshoers accounted for less than 1 percent of all observed wildlife-human interaction events observed during the course of three winter seasons 2006/2007 to 2008/2009 (Davis et al. 2007; McClure et al. 2008, 2009). In contrast to the high level responses by elk that Cassirer, Freddy, and Ables (1992) observed in the backcountry, observations in the front country, along groomed road corridors, found that bison and elk never showed a visible response to skiers or snowshoers. These studies indicate that there is a higher level of response by elk to pedestrians in the backcountry than in motorized use areas during the winters and in addition, interactions between OSVs and elk are low; however, the sample size was very low (e.g., six observations in 2008/2009).

Wildlife response monitoring data indicate that bison or elk encounters with skiers and snowshoers were relatively infrequent along OSV routes. Encounters between non-motorized users and wildlife that occur in other areas of the park, such as along groomed ski trails or in backcountry off the road, have not been monitored, but the number and location of these trails would not vary between alternatives, and such encounters with non-motorized users in the backcountry would continue under any alternative. Researchers working outside of Yellowstone observed that non-motorized users elicit similar behavioral responses in bison compared to behavioral responses elicited by OSV users, but this study was conducted in areas with lower visitor use levels and different use timing and intensity than that occurring at Yellowstone (Fortin and Andruskiw 2003).

Thus, although non-motorized recreationists allowed under any of the proposed alternatives may occasionally elicit movement or vigilance responses from bison and elk, and may cause associated physiological effects, the effects would be minor in the front country along OSV roads and would be infrequent in Yellowstone. Because the number of interactions between non-motorized users and wildlife along OSV roads were infrequent (less than 1 percent) compared to those between OSVs and wildlife non-motorized users are expected to have short-term negligible adverse impacts on bison and elk across all alternatives. The NPS notes that effects from non-motorized use in the backcountry could exceed negligible, but would not exceed minor. Therefore, this discussion is not included separately under each alternative.

Vehicle-caused Mortality

Bison and elk OSV collision mortality during both historical and current levels of OSV use in Yellowstone is rare. Most road kill mortalities result from collisions with wheeled vehicles, and occur year-round, not just during the winter months. Few OSV-caused mortalities occurred even when the level of use was higher than the current levels (up to a daily average of 950 snowmobiles) (White et al. 2009). During the winters from 1989 to 1998, when winter use was not managed, only 10 bison, 3 elk, 2 coyotes, 1 red fox, and 1 pine marten were reported killed by snowmobiles in Yellowstone. In contrast, 98 bison, 427 elk, 75 coyotes, 84 moose, and 406 other large mammals (e.g., bighorn sheep, deer, pronghorn, wolves) were killed by wheeled vehicles in Yellowstone during the winter and summer seasons from 1989 to 1998 (Gunther, Biel, and Robison 1998). In sum, of the total 1,080 animals killed by motorized vehicles between 1989 and 1998, only 17 animals were killed by OSVs during the winter season. No animals have ever been reported killed by snowcoaches and, since guiding requirements were established, no wildlife deaths have been reported due to collisions with OSVs. Under all action alternatives, the probability of OSVs colliding with bison or elk would be low. Therefore, the impacts on bison and elk from OSV-collision mortality would be negligible under all alternatives; however, in the unlikely event that a collision resulting in mortality occurred, the impact would rise to moderate adverse under all alternatives, including the no-action alternative, where only administrative use would occur. Given that the likelihood of vehicle collisions/mortality is low and impacts would be the same under all alternatives, these impacts are not discussed separately under each alternative.

IMPACTS ON BISON AND ELK BY ALTERNATIVE

Impacts of Alternative 1: No Action - No Snowmobile/Snowcoach Use

Displacement of Individual Animals

Under alternative 1, OSV traffic through bison and elk ranges would be greatly reduced to a nominal level. Thus, the potential for displacement of individual animals would be decreased to nearly zero compared to recent maximum allowable use (alternative 2). The impacts of displacement on individual animals under alternative 1 would be localized, short term, negligible, and adverse.

Behavioral and Physiological Responses

Under alternative 1, the potential for bison and elk to be adversely affected or to have physiological responses would be minimized compared to recent maximum allowable use (alternative 2). This alternative would reduce the potential for behavioral responses and would have localized short-term negligible adverse impacts.

Population-level Impacts

After the establishment of the park, bison and elk populations in Yellowstone were actively managed by the park, which attempted to keep their populations at a pre-determined level. At this time bison crossing park boundaries continue to be culled by the state of Montana and the NPS. Because there was never a time without either active management or OSV use, the overall bison and elk populations (as well as individual bison and elk) have been subject to various degrees of direct and indirect human influence since the founding of Yellowstone. Therefore, it is difficult to predict what effect, if any, the absence of groomed roads may have on bison movements. Studies show that elk do not use groomed road corridors for travel to the same extent as bison, and that elk home range and movement patterns have remained stable during the period in which winter recreation became prevalent in Yellowstone (White et al. 2009). Many of the road corridors are in locations that are natural migration paths for

bison, such as along riverbanks and in valleys between steep-sided canyons. Thus, road grooming in these areas may not affect bison migration and travel routes, because self-groomed bison trail corridors would likely occur in these areas even in the absence of park roads or road grooming.

There is a vast library of research and modeling on bison population growth and westward range expansion. Most researchers have concluded that bison population growth is based primarily on the active management and culling of the park's bison population, rather than any energetic savings and associated increased survival from travel on groomed OSV routes (Bjornlie and Garrott 2001; Gates et al. 2005; Bruggeman et al. 2009a; Plumb et al. 2009; White et al. 2009). No population-level impacts on bison or elk have been documented from OSV and/or other human-caused disturbance, or the presence of groomed roads. Coughenour (2005) proposed a possible minimal decrease in bison survival, due to increased energetic costs, from travel through deep snow in the absence of groomed roads. With very little OSV travel in the park, the energetic costs associated with movement through deep snow in the absence of groomed roads may be offset by the energy savings due to reduced alert time and flight responses by bison to OSVs. Under this alternative, OSV use in the park would be minimal; therefore, bison and elk would only rarely exhibit flight behavior due to OSVs. Additionally, bison are naturally adapted to travel in deep snow and form self-groomed trails (Gates et al. 2005). Even in the absence of road grooming, many of these trails would likely overlap park roads, because park roads are multi-season wildlife travel corridors. Although it is difficult to differentiate between the additional movement costs that may be associated with travel through deep snow, and the energy savings due to lack of active movement responses, it is likely that costs and benefits would more or less balance out for bison. Therefore, population-level impacts under alternative 1 are predicted to be long-term negligible, and adverse; any population changes due to the absence of groomed roads in the park, or to low OSV levels, would likely take place over the course of several decades. The contribution of OSV use to bison mortality is likely very low in the context of the impacts of severe winter weather, and bison control measures including culling, or predation pressure.

Cumulative Impacts

Past, current, and future planning efforts by the NPS have affected bison and elk populations in Yellowstone. Prior to 1969, populations were maintained at predetermined levels by park management. These levels were met through lethal control of the herds, resulting in major, short- and long-term impacts on bison and elk. After active population management ceased, bison and elk populations grew rapidly, with approximately 3,100 bison culled by park management or the state of Montana from 1984 to 2000. In 2000, an IBMP endorsed by the federal government and the state of Montana, established guidelines for managing the risk of brucellosis transmission from bison to cattle. In 2008, adaptive adjustments to the IBMP were set in place to provide for additional management activities as identified below.

Bison leaving Yellowstone are currently subject to management control at the park boundary, pursuant to the 2008 adaptive adjustments to the IBMP and the 2000 IBMP (NPS 2000e, 2008b). 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 the implementation of non-lethal measures and, if populations drop below 2,100 bison, agencies cease lethal management and hunting and shift to non-lethal management measures. The IBMP adaptive adjustments to the 2000 IBMP (NPS 2008b) also call for an increase in bison vaccinations via completion of the EIS processes for remote delivery vaccination of bison and to use the outcome of the EIS and NEPA process to determine active management practices. The most recent IBMP "Managing the Abundance of Bison in Yellowstone National Park, Winter 2010," calls for the reduction in the bison herd of

330 animals, with selective culling as one of the management measures (Geremia, White, and Wallen 2011). The goal of the proposed Brucellosis Remote Vaccination Program for Bison is to protect Yellowstone bison by reducing brucellosis infection and, ultimately, to further reduce the risk of transmission to cattle outside the park. If this program, and other measures implemented under the 2008 adaptive adjustments are successful, hazing and lethal control of Yellowstone bison that travel beyond the park's border may become unnecessary, or occur less frequently, and bison may continue the westward expansion of their range into Montana. This may have an overall positive impact on the bison population in the greater Yellowstone area and may result in increased range and forage availability, nutritional uptake, and total population growth of bison if they are allowed to access and remain in suitable habitat outside park boundaries. If bison expand their range, there may be decreased population density, and reduced mortality of new-born calves, which are currently subject to hazing (in the Horse Butte area). Decreased population density may result in better body condition and increased reproductive success of cows. However, current management practices limit any western range expansion of Yellowstone bison, which in turn limit natural density dependent dispersal of bison, and the control methods currently used have an overall long-term minor to major adverse impact on bison population and viability. Impacts from these actions would depend on the success of a long-term remote brucellosis vaccination program. Short-term impacts would be adverse, minor to major, (based on how many bison are culled each year, which is a direct result of the number of bison that leave the park, which in turn primarily depends on winter severity and the number of consecutive harsh winters). Long-term impacts may range from negligible to moderate adverse, because the implementation of the remote brucellosis vaccine program would likely have some success in reducing the number of infected bison and may in the future limit or eliminate the need for culling.

The Gallatin National Forest has consolidated the checkerboard of private and public holdings in recent years, accompanied by a consolidation of private holdings, including within the Big Sky Area. It is difficult to predict the net effect of these actions on bison and elk, because the consolidated U.S. Forest Service (USFS) lands are less likely to be developed, whereas the private lands are more likely to be developed. Current actions also include reclamation of McLaren Mine tailings (MTDEQ 2010b) and Gardiner Basin and Cutler Meadows restoration. These actions would have variable effects on bison and elk, sometimes stimulating the growth of their preferred forage and habitat and sometimes limiting it, due to providing or fragmenting habitat for these species.

Future highway-and vehicle-travel related plans include the Gallatin Travel Plan Revision, and the Beartooth District of Custer National Forest Travel Management Plan. Whereas plans in the national forest are designed to minimize adverse impacts on wildlife, regional plans designed to increase the ease of travel for vehicles may not prioritize wildlife. Any increases in traffic, road width, and the number of roads may have long-term adverse impacts on bison and elk in the greater Yellowstone area. Additional roads and vehicles may lead to increased mortality caused by vehicle collisions, limited dispersal and travel of bison or elk to new habitat or preferred habitat locations, and habitat fragmentation. Impacts due to highway plans and road development would be long-term, ranging from minor to moderate adverse.

The reintroduction of gray wolves has contributed to decreases in the elk population in the greater Yellowstone area from the mid 1990s to the present, because elk are the primary prey of wolves in the park (White and Garrott 2005; Christianson and Creel 2010). The driving force behind the elk population decline is unclear, and the decline has been attributed to one or more factors other than wolves, including changes in vegetation, hunting, drought, and other variations in the ecosystem, with grizzly bears, rather than wolves, observed to be the primary predator of elk calves (Creel and Christianson 2008; Barber, Mech, and White 2008). Regardless of whether they precipitated the elk population decline, the presence of wolves increases the predation pressure on elk. The presence of wolves possibly increases the behavioral and physiological responses of elk to anything perceived as a

predation threat, including OSVs, humans, and sound from OSVs (Creel and Christianson 2008). Increased elk responses to winter users may increase stress levels, energy expenditure, and displacement, and decrease energy intake, potentially resulting in poorer body condition, decreased reproductive rates, and an overall decrease in survival (White et al. 2009; Creel 2009; Christianson and Creel 2010). The same is true, but to a much lesser degree, for bison. Bison calves are subject to predation by wolves (Barber, Mech, and White 2005), but wolves generally avoid attacking a full-grown bison due to risk of injury and the difficulty in taking down a large adult animal. Therefore, although impacts by wolves on elk populations are unclear, the increase in perceived predation risk may increase the behavioral and physiological responses to winter users by elk and possibly bison.

Major cumulative impacts would occur due to bison management and control measures under the IBMP, which is unrelated to direct impacts of winter use in the park. The long-term negligible to major impacts of these past, present, and reasonably foreseeable future actions, combined with the long-term negligible adverse impacts of alternative 1, would result in long-term minor to major adverse cumulative impacts on bison and elk, of which impacts due to winter use activities would make up only a very small part.

Conclusion

Based on an analysis of the available data and literature regarding bison and elk in the greater Yellowstone area, the no-action alternative would result in short- and long-term negligible adverse impacts on bison and elk in the park, because OSV use would be limited to minimal administrative use and non-motorized use would be more limited, resulting in no observable impacts. Human activity during the winter months would be reduced. Cumulative impacts under alternative 1 would be long-term minor to major adverse. Alternative 1 would contribute minimally to cumulative impacts because there would be no visitor OSVs in the park.

Impacts of Alternative 2: Continue Snowmobile/Snowcoach Use at 2012/2013 Winter Season Interim Regulation Limits

Displacement of Individuals

The level of OSV use under alternative 2 (up to 318 snowmobiles and 78 snowcoaches or an average of 123 daily transportation events with a maximum of 237 daily transportation events) would be equal to that permitted under the 2009 to 2013 interim regulations. There has not been any observed long-term displacement of bison or elk from 1969 to the present, based on observations from winter seasons when similar numbers of OSVs entered the park (winter 2003 to winter 2006, when daily OSV entrance numbers were 250–300), or during winter seasons with higher levels of use prior to 2003 (average 950 OSVs per day) (White et al. 2009; McClure et al. 2009). Bison and elk have continued to use the same core winter ranges during the past three and a half decades, even when OSV use fluctuated dramatically from winter to winter (Craighead et al. 1973; Aune 1981; Hardy 2001). Thus, range-wide displacement of individual bison or elk would be unlikely under alternative 2, because conditions similar to those permitted under the 2009 to 2013 interim regulations and those currently occurring, as well as past conditions would continue (where long-term displacement of individuals has not been observed). Although bison and elk may temporarily avoid areas of OSV use, resulting in short-term displacement, these short-term responses have not caused shifts in core winter habitat use.

No large scale shifts in habitat use have been attributed to OSVs in the park. Studies looking at small-scale shifts show that both bison and elk have demonstrated flight from OSVs or avoidance of OSV use areas, resulting in temporary shifts in habitat use by bison or elk (White et al. 2009). Although these displacement events are brief and temporary, if they occur frequently over the course of a winter

they may decrease the amount of time elk (and to a lesser extent bison), have to feed and may also increase energy demands due to movement. Because elk and bison generally suffer a decline in body condition associated with increased energy demands and poorer forage quality over the course of a winter, these factors may contribute to this energy imbalance. As a result, individual bison and elk that frequently avoid preferred forage areas due to OSV use may demonstrate poorer body condition. However, despite short-term responses to OSVs, overall habitat use by bison and elk does not appear to be affected (Hardy 2001; White et al. 2009). Researchers attribute changes in the distribution of elk during the winter primarily to snow mass and the snow depth, snow type, and melting characteristics that are influenced by Yellowstone's many geothermal features and vary in both timing and location during Yellowstone's severe winters (Messer 2003). Researchers attribute changes in bison distribution primarily to population density, snow characteristics, drought, and other factors affecting resource availability (Bruggeman et al. 2006).

Impacts on individual bison and elk related to displacement under alternative 2 would be localized, short-term moderate adverse because temporary displacement may increase energy demands and avoidance of preferred forage areas. Displacement events may be brief and temporary, and over the course of a winter such events may increase energy consumption by elk, and to a lesser extent, bison, potentially resulting in poorer body condition.

Behavioral and Physiological Responses

Under all action alternatives, guides would maintain buffer zones and instruct visitors to behave in a manner that minimizes the likelihood of a strong, energetically costly behavioral response by bison or elk. Based on the current managed use, guiding would also result in predictable defined morning and evening peaks in OSV traffic, which may result in initial increased behavioral responses by ungulates during that time due to more concentrated OSV use. A predictable daily pattern of OSV use would be more likely to decrease overall behavioral responses by bison and elk throughout the winter. This is because animals are more likely to become habituated to a disturbance if it is predictable in time and space, not directly harmful, and limited in duration (Thompson and Henderson 1998; White et al. 2009). Depending on the frequency of OSV encounters, active responses by bison and elk (which based on studies would occur during 8–9 percent of encounters (Borkowski et al. 2006; White et al. 2009) may result in relatively small energy costs to individuals. However, no adverse population-level effects would be expected, because there have been no observed impacts on population growth or demographics correlating to increased or decreased OSV use in the park over the last 38 years, including the winters from 2004 to 2012 when daily entrance numbers for OSVs (258 snowmobile and 30 snowcoaches daily, on average) were similar to those proposed under alternative 2. Peak OSV use levels during the winters from 2004 to 2012 were 488 snowmobiles and 55 snowcoaches, which is well above the daily limits proposed under alternative 2. Daily limits of up to 318 snowmobiles and 78 snowcoaches were not met in winter 2011/2012 after the implementation of the 2009 to 2013 interim regulations, with actual averages of only 191 snowmobiles and 36 snowcoaches per day. Based on behavioral observation from winters that had similar levels of use to those proposed under alternative 2 (winters 2006 to 2009), impacts on bison and elk resulting from continued OSV use levels are predicted to be localized, short-term minor adverse under alternative 2.

Population-level Impacts

Historically, researchers have not observed population-level effects for bison and elk during periods of non-guided travel and higher daily numbers of OSVs in the park. During recent wildlife behavioral monitoring, no short-term population-level effects from OSV use were observed for bison and elk, including when an average of 795 snowmobiles and 15 snowcoaches entered the park daily (Fuller

2006; White et al. 2009). Population level impacts have not been observed under historical or recent levels of use; therefore impacts are predicted to be negligible adverse under alternative 2.

Cumulative Impacts

Impacts on bison and elk from other past, present, and reasonably foreseeable future projects would be the same as described for alternative 1. These impacts are a result of the variety of land and wildlife management activities occurring on lands near or adjacent to the park including Northern Rockies Lynx Management, the Gallatin National Forest, and the Beartooth District of Custer National Forest travel management plans, timber harvests on adjoining lands, and the reintroduction of gray wolves to the greater Yellowstone area. Within the park, these impacts are a result of active management of the park's elk and bison populations, as well as other wildlife management programs such as the plan/SEIS for the remote vaccine delivery to bison. The major impacts stated are a result of bison control measures and management under the IBMP, which is unrelated to winter use in the park. The long-term negligible to major adverse impacts of these cumulative actions, when combined with the long-term minor to moderate adverse impacts of alternative 2, would result in long-term minor to major adverse cumulative impacts on these species. The implementation of alternative 2 would contribute only a small amount to the overall adverse cumulative impacts.

Conclusion

Alternative 2 would allow for use levels similar to the 2009 to 2013 interim regulations, with BAT requirements, guiding regulations, speed limits, and restrictions on OSV access to park roads only. Continued monitoring and assessment would allow for additional restrictions to be established if impacts greater than those predicted in this plan/SEIS be observed. Thus, overall impacts on bison and elk under alternative 2 would be short- and long-term minor to moderate adverse. Cumulative impacts would be long-term minor to major adverse, to which alternative 2 would contribute minimally.

Impacts of Alternative 3: Transition to Snowcoaches Meeting BAT Requirements Only

Displacement of Individuals

Generally, snowmobiles and snowcoaches elicit slightly different intensities and amounts of responses from bison and elk as discussed above. Under alternative 3, individual bison and elk may still be locally displaced when snowmobiles are phased out and access is limited to snowcoaches only, but impacts would likely be small and localized under either scenario. Alternative 3, when initially implemented, would have OSV use levels (up to 318 snowmobiles and 78 snowcoaches or an average of 123 daily transportation events with a maximum of 237 transportation events) similar to those permitted under the 2009 to 2013 interim regulations and impacts during this time would be the same as those under alternative 2.

Snowmobiles and snowcoaches differ in size of vehicle and group size. They therefore elicit different intensities and amounts of responses from bison and elk. Based on recent behavioral monitoring data and modeling, it appears that snowmobiles are more likely to elicit a visible behavioral response from bison or elk (vigilance or movement), but that snowcoaches elicit stronger levels of behavioral responses, such as movement or flight. The use of snowcoaches can reduce the total number of OSVs in the park on a daily basis, but has a higher likelihood of initiating a movement response by bison and elk.

Once all snowcoaches meet BAT requirements (by the winter season of 2017/2018), a three-year phaseout would begin resulting in use levels of 120 snowcoaches (or 120 transportation events) and no

snowmobiles, which would represent a reduction in the total number of OSVs in the park, and a reduction in transportation events, on a daily basis compared to recent maximum allowable use (alternative 2). With the implementation of BAT requirements the total time the animals are exposed to OSV related sounds would likely be reduced slightly. Although snowcoaches have a higher likelihood of initiating a movement response by bison and elk, the total number of OSV groups would be similar to, and even slightly below, that permitted under the 2009 to 2013 interim regulations. Therefore, impacts under alternative 3 are predicted to be localized, short-term minor to moderate adverse. These impacts would be similar to, but slightly less, than those occurring under alternative 2 because the overall number of transportation events would be reduced and Sylvan Pass would be closed. When the transition to snowcoaches occurs, both the number of OSVs and transportation events in the park would be less than those permitted under the 2009 to 2013 interim regulations (alternative 2), likely resulting in similar or reduced movement and associated displacement effects.

Behavioral and Physiological Responses

Behavioral and physiological responses by individual bison and elk would still occur under alternative 3, but such effects are predicted to be long-term minor adverse. This is because until the phaseout occurs, the frequency of encounters between OSVs and animals would be the same as under alternative 2. Based on recent behavioral monitoring data and modeling, it appears that snowmobiles are more likely to elicit a visible behavioral response from bison or elk but snowcoaches elicit stronger levels of behavioral responses, such as movement or flight (Borkowski et al. 2006; McClure et al. 2009; White et al. 2009). Recent behavioral observations found that bison and elk demonstrate a movement response during 8–9 percent of encounters with snowcoaches (Borkowski et al. 2006; White et al. 2009), which may result in minor to moderate energy costs to individuals. However, no adverse population-level effects would be expected because there have been no observed impacts on population growth or demographics correlating to increased or decreased OSV use in the park over the last 38 years. Behavioral responses and associated physiological effects resulting from exposure to human disturbance would result in localized, short-term minor adverse impacts.

Population-level Impacts

No population-level effects from OSV use have been observed for bison and elk historically, including when an average of 795 snowmobiles and 15 snowcoaches entered the park daily (greater than the level proposed under alternative 3) (Fuller 2006; White et al. 2009). Simulation indicates that long-term population-level impacts could occur due to the presence of groomed roads (Coughenour 2005). However, most researchers have concluded that bison population growth is based primarily on active management and culling of the park's bison population, rather than any energetic savings and associated increased survival from travel on groomed OSV routes (Bjornlie and Garrott 2001; Gates et al. 2005; Bruggeman et al. 2009a; Plumb et al. 2009; White et al. 2009). Behavioral response monitoring indicates movement responses in 8–9 percent of bison and elk observed, and these active travel and flight behaviors may result in small-scale displacement and increased energy expenditure. There have been no data indicating that these responses have resulted in observable impacts on population, but impacts on individuals that eventually lead to population-level impacts may occur over time, or with especially severe winters. Population-level impacts are predicted to be long-term minor adverse under alternative 3, because of the long-term impacts that could occur due to behavioral responses, potentially resulting in small-scale displacement that may lead to observable impacts on the population.

Cumulative Impacts

Impacts on bison and elk from other past, present, and reasonably foreseeable future actions would be the same as described for alternative 1. These impacts are a result of the variety of land and wildlife management activities occurring on lands near or adjacent to the park including Northern Rockies Lynx Management, the Gallatin National Forest and the Beartooth District of Custer National Forest travel management plans, timber harvests on adjoining lands, and the reintroduction of gray wolves to the greater Yellowstone area. Within the park, these impacts are a result of active management of the park's elk and bison populations, as well as other wildlife management programs such as the plan/SEIS for the remote vaccine delivery to bison. The major impacts stated are a result of bison control measures and management under the IBMP, which is unrelated to winter use in the park. These long-term negligible to major adverse impacts, when combined with the short- and long-term minor to moderate adverse impacts of alternative 3 would result in long-term minor to major adverse cumulative impacts. Alternative 3 would contribute little to the cumulative impacts on bison and elk due to low OSV numbers.

Conclusion

The existing data suggest that while the intensity and amount of impact on elk and bison from snowmobiles and snowcoaches differ, overall the impact of these OSVs on elk and bison is comparable. Thus, restricting OSVs to just snowcoaches would not eliminate adverse effects on wildlife. However, the available literature on bison and elk indicate that lower OSV events reduce wildlife displacement, behavior or physiology-related energy costs, and the potential for adverse demographic impacts, resulting in short- and long-term minor to moderate adverse impacts, and impacts under alternative 3 would be expected to be less than those under alternative 2. Cumulative impacts on bison and elk under alternative 3 would be long-term minor to major adverse, to which alternative 3 would contribute only a small amount.

Impacts of Alternative 4: Manage OSV Use by Transportation Events

Displacement of Individuals

Impacts related to displacement of individuals would generally be similar to those described for alternatives 2 and 3, but would be lower because the number of transportation events in the park on a daily basis would be reduced compared to recent maximum allowable use. Alternative 4 would manage OSV use in the park based on transportation events. One event would initially equal one group of snowmobiles (maximum of 10 per group, an average of 7 over the winter season) or one snowcoach. A maximum of 110 transportation events would be allowed each day; however, no more than 50 events could be snowmobile groups. Forty-six of the snowmobile events would be guided groups with a seasonal average size of 7 and a maximum of 10 snowmobiles. The remaining 4 snowmobile events would be non-commercially guided groups with a limit of 5 snowmobiles per group. Operators would decide whether to "spend" their daily allotments of transportation events on snowmobile groups or snowcoaches. As a result, the daily makeup and number of OSVs in the park could range from 0 to 480 snowmobiles and from 60 to 106 snowcoaches. At maximum daily snowmobile use, OSVs could increase to a maximum of 540 OSVs (480 snowmobiles and 60 snowcoaches), an increase over the most recent interim rule (alternative 2), which allowed for 396 OSVs (318 snowmobiles and 78 snowcoaches); however, this level of OSV use is within the range experienced at the park during historical (pre-2004) and recent (2004–2009) use periods and would reduce overall impacts because traffic would be packaged into transportation events and New BAT standards would be implemented. Although overall numbers of OSVs would rise, the number of transportation events would be reduced compared to recent maximum allowable use (alternative 2)

and would therefore reduce the number of times individual animals experience disturbance from OSVs.

If snowcoaches were maximized on a given day, their numbers would increase over those allowed in alternative 2; but total OSVs for that day (106 snowcoaches, 0 commercially guided snowmobiles, 20 non-commercially guided snowmobiles) would be less than one-third of the number of vehicles allowed under the most recent interim rule (alternative 2). Regardless of the daily makeup of OSVs, the maximum number of daily transportation events would be less under alternative 4 (110 events) compared to the maximum number allowed under the 2009 to 2013 interim regulations (potential for 123 transportation events assuming an average snowmobile group size of 7 and a potential for a maximum of 237 transportation events). If OSVs meet voluntary E-BAT standards (which would reduce the sound emissions from OSVs) the total number of snowmobiles would stay the same, with the potential to increase the number of snowcoaches from 106 to 212. If the snowcoach group size were to increase from 1 to 2 coaches, the 2 coaches would travel as close together as possible allowing for safety and would be considered 1 transportation event for purposes of managing OSV use. Additional impacts are not expected under this scenario, because the number of transportation events would remain the same as allowed under non-E-BAT standards.

There has not been any observed long-term displacement of bison or elk from 1969 to the present. Bison and elk have continued to use the same core winter ranges during the past three and a half decades, even when OSV use fluctuated dramatically from winter to winter (Craighead et al. 1973; Aune 1981; Hardy 2001). Thus, range-wide displacement of individual bison or elk would be unlikely under alternative 4 because conditions similar to recent maximum allowable use would continue (where long-term displacement of individuals has not been observed). Although bison and elk may temporarily avoid areas of OSV use, resulting in short-term displacement, these short-term responses have not caused shifts in core winter habitat use.

Alternative 4 would require 100 percent guided use, with up to four non-commercially guided snowmobile groups daily. As previously stated, non-commercial guides would receive guide training and the number of non-commercially guided groups would be small (maximum of four daily); therefore, it is assumed that there would be no difference in impacts between commercial and non-commercial guides. Between 1999 and 2003 there were no implemented guiding requirements and average daily entrance numbers were 795 snowmobiles and 15 snowcoaches. Non-commercially guided users are likely to travel in a less predictable fashion throughout the day, without the morning/evening peaks observed for guided users. This may limit the potential for wildlife habituation to OSVs. However, non-commercially guided snowmobile groups would make up less than 4 percent of total daily transportation events. Non-commercial guides would be clearly marked and would be required to comply with all park requirements and regulations. Compliance with park regulations would be monitored by park law enforcement. Should impacts on the resource increase or infractions occur under the non-commercially guided program, this program would be altered or discontinued.

Thus, displacement impacts on individual bison and elk under alternative 4 would be localized, short-term minor to moderate adverse. Displacement events may be brief and temporary, and over the course of a winter such events may increase energy consumption by elk, and to a lesser extent, bison, potentially resulting in poorer body condition.

Behavioral and Physiological Responses

There would be behavioral and physiological responses by individual bison and elk under alternative 4 but such effects are predicted to be long-term minor adverse. This is because daily OSV use would remain within the range that has been experienced over historical and recent periods, with the number

of transportation events being reduced by approximately 10 percent from recent maximum allowable use levels (maximum of 110 under alternative 4 compared to a maximum daily average of 123 under alternative 2). There could be an increased number of snowcoaches under alternative 4 compared to recent maximum allowable use if operators choose to use their daily allotments for snowcoaches rather than snowmobiles. Based on recent behavioral monitoring data and modeling, it appears that snowmobiles are more likely to elicit a visible behavioral response from bison or elk but snowcoaches elicit stronger levels of behavioral responses, such as movement or flight (Borkowski et al. 2006; McClure et al. 2009; White et al. 2009). Recent behavioral observations found that bison and elk demonstrate a movement response during 8–9 percent of encounters with snowcoaches (Borkowski et al. 2006; White et al. 2009), which may result in minor to moderate energy costs. However, an increase in snowcoach allotment would result in a corresponding decrease in snowmobile groups, resulting in no change to the overall number of transportation events and no increase in the level of impact to bison and elk, with the number of transportation events under alternative 4 being lower than that permitted under the 2009 to 2013 interim regulations (alternative 2). No adverse population-level effects would be expected because there have been no observed impacts on population growth or demographics correlating to increased or decreased OSV use in the park over the last 38 years. Behavioral responses and associated physiological effects resulting from exposure to human disturbance would result in localized, short-term minor adverse impacts. As discussed above, should all OSVs meet voluntary E–BAT standards, the increase in OSV use would not increase the overall number of transportation events and would not be expected to increase impact levels beyond a minimal level.

Population-level Impacts

No short-term population-level effects from OSV use have been observed for bison and elk historically, including when an average of 795 snowmobiles and 15 snowcoaches entered the park daily, which is greater than the level proposed under alternative 4 (Fuller 2006; White et al. 2009). Simulation indicates that long-term population-level impacts could occur due to the presence of groomed roads (Coughenour 2005). But most researchers have concluded that bison population growth is based primarily on the active management and culling of the park's bison population, rather than any energetic savings and associated increased survival from travel on groomed OSV routes (Bjornlie and Garrott 2001; Gates et al. 2005; Bruggeman et al. 2009a; Plumb et al. 2009; White et al. 2009). Behavioral response monitoring indicates movement responses in 8–9 percent of bison and elk observed, and these active travel and flight behaviors may result in small-scale displacement and increased energy expenditure. There have been no data indicating that these responses have resulted in observable impacts on the population, but impacts on individuals that eventually lead to population-level impacts may occur over time, or with especially harsh winters. Population-level impacts are predicted to be long-term minor adverse under alternative 4 because of the long-term impacts that could occur due to behavioral responses, potentially resulting in small-scale displacement that may lead to observable impacts on the population. As discussed above, should all OSVs meet voluntary E-BAT standards, the increase in OSV use would not increase the overall number of transportation events and would not be expected to increase impact levels beyond a minimal level.

Cumulative Effects

Impacts on bison and elk from other past, present, and reasonably foreseeable future actions would be the same as described for alternative 1. These impacts are a result of the variety of land and wildlife management activities occurring on lands near or adjacent to the park including Northern Rockies Lynx Management, the Gallatin National Forest and the Beartooth District of Custer National Forest travel management plans, timber harvests on adjoining lands, and the reintroduction of gray wolves to the greater Yellowstone area. Within the park, these impacts are a result of active management of the

park's elk and bison populations, as well as other wildlife management programs such as the plan/SEIS for the remote vaccine delivery to bison. The major impacts stated are a result of bison control measures and management under the IBMP, which is unrelated to winter use in the park. These long-term negligible to major adverse impacts, when combined with the short- and long-term minor to moderate adverse impacts of alternative 4 would result in long-term minor to major adverse cumulative impacts. Alternative 4 would contribute minimally to the cumulative impacts on bison and elk.

Conclusion

Alternative 4 would allow for use levels similar to those permitted under the 2009 to 2013 interim regulations, with an approximately 10 percent reduction in the number of transportation events. Should all OSVs meet voluntary E-BAT standards, group sizes would increase, but the number of transportation events would stay the same. The allowance for up to four non-commercially guided snowmobile groups per day is not expected to increase behavioral, physiological, or displacement responses by bison and elk. Continued monitoring and assessment would allow for additional restrictions to be established should impacts greater than those predicted in this plan/SEIS be observed. Thus, overall impacts under alternative 4 would be short- and long-term minor to moderate adverse. These impacts are expected to be less than those under alternatives 2 and 3 because the transportation events would be packaged and would result in fewer events than other action alternatives. Cumulative impacts would be long-term minor to major adverse, to which alternative 4 would contribute minimally.

LYNX AND WOLVERINES

Lynx and wolverines use similar habitat in Yellowstone and are primarily found in the eastern sector of the park, crossed by the East Entrance Road, and containing Sylvan Pass. Both species are highly mobile, with large home ranges and the ability to travel great distances in a day. Lynx and wolverines are rare in the greater Yellowstone area and their populations are limited to sparsely distributed mountainous or wooded habitat, so that the persistence of the species in an area may be dependent on genetic dispersal. Both species generally avoid areas of heavy human use, and are rarely observed by park researchers or visitors. Canada lynx in the lower 48 states were listed as threatened under the ESA in March 2000 (USFWS 2000). Also, in December 2010, the USFWS ruled that the wolverines in the contiguous United States were a distinct population segment that warranted being added to the Lists of Endangered and Threatened Wildlife and Plants (USFWS 2010e). However, at that time this listing was precluded by higher priority actions and, instead, the contiguous U.S. distinct population segment of the wolverine was added to the candidate species list, or is currently proposed for listing. As of February 4, 2013, the USFWS published a rule to list the distinct population segment of the North American wolverine occurring in the contiguous United States, as a threatened species under the ESA. At the time this plan/EIS was published, this rule was under public review (78 FR 7863).

Impacts of Alternative 1: No Action - No Snowmobile/Snowcoach Use

Displacement, Behavioral, and Physiological Effects

Although a few visitors may travel into the park by non-motorized means during the winter, it is unlikely that a large number of visitors would penetrate the backcountry and mountainous areas preferred by lynx and wolverines (due to the distance that would need to be covered by a skier or snowshoer in a harsh winter environment). Under alternative 1, non-motorized use at the East Entrance (Sylvan Pass), where lynx are known to occur, would not be expected because this area is an avalanche zone and with Sylvan Pass closed, avalanche mitigation activities would not occur. It is also

unlikely that visitors would encounter roaming lynx or wolverines anywhere else in the park due to the animals' scarcity, elusiveness, and propensity for night or dusk travel, when humans are generally not active in the park. Therefore, impacts from displacement would be localized, short-term negligible adverse, under alternative 1, whereas behavioral and physiological effects would be extremely rare and negligible with long-term beneficial impacts due to the elimination of human presence.

Population-level Effects

Under this alternative there would be no population-level effects compared to recent maximum allowable use (alternative 2), due to a nearly complete lack of interaction or encounters between winter users and lynx or wolverines, resulting in long-term negligible adverse impacts.

Cumulative Effects

Wolverines are still trapped in parts of the greater Yellowstone area, and such harvest may result in mortality of critical members of the population, limiting reproduction, genetic dispersal, and long-term viability of the species in the area. Although only a few individuals are trapped each year, the small population of wolverines may suffer long-term moderate adverse impacts from trapping activities (Squires et al. 2007).

Several of the forests in the region are revising their forest plans and/or travel plans, including the Gallatin National Forest Travel Plan revision, and the Beartooth Custer National Forest Travel Management Plan. Actions associated with these plans could affect lynx and wolverines. The federal and state wildlife management agencies are required to ensure the long-term viability of lynx (for the forests, pursuant to the Northern Rockies lynx amendment to all USFS forest plans). Impacts on lynx because of the implementation of the Northern Rockies lynx amendment to USFS plans would be long-term beneficial. Also, in December 2010, the USFWS ruled that the wolverines in the contiguous United States were a distinct population segment that warranted being added to the Lists of Endangered and Threatened Wildlife and Plants (USFWS 2010b). However, this listing was precluded by higher priority actions and, instead, the contiguous U.S. distinct population segment of the wolverine was added to the candidate species list.

The Gallatin National Forest has recently consolidated much of its checkerboard public and private land holdings, accompanied by the consolidation of private lands, particularly in the Big Sky area. This means there are larger tracts of public land that are less likely to be developed, but also large areas of private lands that are more likely to be developed. Many of the private lands are in relatively high altitude areas (in contrast to other areas of rapid subdivision and growth in greater Yellowstone area), and may once have been, or could be, important range for wolverines and lynx. Impacts from this consolidation would be long-term minor to moderate adverse, because development changes the landscape forever, eliminating habitat for existing lynx or wolverines using these areas and for any future lynx or wolverines dispersing into these areas.

Road construction is a recurring event in the park, including recent projects at the East Entrance and Madison to Norris road. Any activities in the park are undertaken in such a way as to minimize adverse effects on wildlife and wildlife habitat; this is also true for projects in the national forests, as required by the Northern Rockies lynx amendment to all USFS plans. For example, most facility construction projects in parks and forests take place at previously disturbed sites and replace existing structures, minimizing new effects on wildlife. The East Entrance project within the park involved only minimal realignment of existing roads. The Madison to Norris construction moved the road about half a mile from its original location, for a distance of about two miles, and restored two miles of road adjacent to the Gibbon River. Impacts on wolverines and lynx from road construction in the park

would be long-term negligible adverse, but would range from long-term minor to moderate adverse in the greater Yellowstone area. This is because lynx tend to limit their movements around roads and are prone to road kill mortality. Wolverines also avoid human activity, including roads, and may adjust their dispersal and movements where roads cross their territory (Banci 1994; Copeland 1996; Hornocker and Hash 1981). Additionally, road improvements in critical areas of wolverine or lynx habitat, such as mountain passes, could limit the animals' movements because roads in mountainous areas often occur in natural travel routes where the terrain is less demanding. Because so little is known about how wolverines travel across the landscape, it is difficult to determine the impacts of roads on this species.

The long-term moderate adverse impacts of these past, present, and reasonably foreseeable future actions, combined with the short- and long-term negligible adverse impacts of alternative 1, would result in long-term moderate adverse cumulative impacts on lynx and wolverines, mainly from trapping activities occurring outside the park. Alternative 1 would contribute minimally, if at all, to cumulative impacts because there would be no visitor OSVs in the park.

Conclusion

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 absence of human presence. Cumulative impacts of alternative 1 would be long-term minor to major adverse, to which alternative 1 would contribute minimally, if at all.

Impacts of Alternative 2: Continue Snowmobile/Snowcoach Use at 2012/2013 Winter Season Interim Regulation Limits

Displacement, Behavioral, and Physiological Effects

Alternative 2 would continue road grooming and avalanche management of Sylvan Pass, the closest OSV route to prime lynx and wolverine habitat in the eastern sector of the park. Wolverine females give birth to young in mid-February, during peak OSV season. Because denning females are likely sensitive to human disturbance (Myrberget 1968; Pulliainen 1968), OSV use and maintenance activities (particularly avalanche control methods) may cause wolverines using the area to leave, and/or cause females to abandon their dens for poorer den sites, increasing kit mortality and decreasing the reproductive success of wolverines. Also, groomed roads in other areas of the park may limit critical dispersal and movements of wolverines between the high-elevation alpine habitats that make up their range. Wolverines and lynx in Yellowstone are on the southern tip of their range in North America, and suitable habitat for both species in the greater Yellowstone area occurs in patches, separated by poor habitat (Brock et al. 2007). There have been documented movements of a dispersing, global positioning system (GPS) collared wolverine across the central range of Yellowstone, indicating that disturbance in any area of the park could impact dispersal and movements of wolverines and lynx if disturbances occur outside areas of ideal habitat for either species (Wildlife Conservation Society 2007).

Behavioral and physiological effects associated with encountering OSVs have never been specifically investigated for these species. However, observations of habitat use indicate that wolverines avoid areas of human activity, including snowmobile routes (Banci 1994; Heinemeyer, Aber, and Doak 2001). Studies conducted on the Rocky Mountain lynx populations have found that lynx may avoid crossing highways, avoid areas of human presence, and use roads as territory boundaries (Apps 1999). Lynx do not appear to avoid crossing logging roads or roads with lower levels of vehicle use (Koehler

and Brittel 1990; McKelvey et al. 1999). Mowat, Poole, and O'Donoghue (1999), who studied lynx in Canada where habitat is generally less fragmented than lynx habitat in the lower 48 states, observed that lynx appeared to tolerate moderate levels of snowmobile traffic, readily crossed highways, and established home ranges in proximity to roads. Under alternative 2, an average of 5 OSV groups would be expected to travel through Sylvan Pass daily (up to 22 OSVs per day). Avalanche control work has been ongoing in Sylvan Pass since 1973 and includes the use of explosives. Impacts on lynx and wolverines under this alternative are predicted to be localized, short-term moderate adverse because disturbance from OSVs on the Sylvan Pass road and avalanche control activities (blasting, use of administrative snowmobiles, human disturbance) could adversely impact reproductive success of denning wolverine females, or result in intermittent avoidance of the areas during active management for wolverine and lynx, that would not likely occur during natural avalanche events. It is highly unlikely that avalanche control activities would result in disturbances to lynx and wolverine prey species as these species (primary winter killed deer and elk) are not generally present in the Sylvan Pass area in winter. Depending on how far these species travel outside the eastern section of the park, where use would be more limited, impacts have the potential to be moderate adverse, because groomed OSV roads in other areas of the park could limit movements and dispersal of both species based on results from other areas as discussed previously. Specific behavioral and physiological effects are unknown, because habituation by lynx or wolverine to the levels of OSV use that would occur in Yellowstone under alternative 2 has never been observed because it is difficult to determine lynx or wolverine population numbers in Yellowstone, and lynx and wolverines are rarely observed by researchers. However, it is likely that increased human disturbance could possibly result in higher rates of flight or avoidance by wolverines and lynx. Additionally, associated physiological responses would also likely be increased in these species, with exposure to OSVs. Increased physiological responses generally result in increased energy expenditures and during severe winters could increase the risk to individuals.

Population-level Effects

The two recent sightings of lynx in the north-central section of the park, along the popular Norris Geyser Basin to Mammoth Hot Springs route, support the possibility that lynx may travel or may be found outside the park's east sector. Additionally, radio collar tracking indicates that wolverines may travel up to 50 miles in a 17-hour period, and travel through non-preferred habitat, including the central portion of Yellowstone (Inman et al. 2007a). These travels may result in fairly regular encounters between OSVs or groomed roads and these animals, even if lynx and wolverines are rarely seen by winter users due to their keen senses and general avoidance of human activity. Additionally, road density and associated human activity is proposed as one of the driving factors behind the extirpation of wolverines from formerly occupied wolverine habitat in California, Oregon, and Washington (Ruediger et al. 2000). Based on evidence that road density and human activity can disrupt movement, impacts on highly mobile lynx and wolverines due to groomed roads and human activity would be long-term, minor adverse, because groomed roads and OSV presence under alternative 2 have the potential to disrupt their winter movements.

Wolverines reproduce at slow rates, with females reaching reproductive maturity at about 3 years of age. Wolverines birth only one kit an average of every 2.3 years (Inman et al. 2007b) and female reproductive success is critical to ensuring the long-term viability of the species in the area. Under this alternative Sylvan Pass would remain open, and because wolverine females give birth in mid-February, there could be a potential for kit mortality and lower quality parental care by female wolverines, based on studies of wolverines in other areas (Pulliainen 1968), if they are denning in the area and are disturbed by OSVs and Sylvan Pass maintenance and avalanche control activities, such as use of the Howitzer. Impacts on wolverine reproductive success would be long-term, minor adverse

overall, but potentially moderate in areas immediately adjacent to areas of avalanche control activities during active control periods.

The East Entrance levels of 20 snowmobiles and 2 snowcoaches per day proposed under alternative 2 would keep snowmobile traffic in the area at low levels. Although lynx appear to be able to adapt to moderate levels of snowmobile use and human disturbance (Mowat, Poole, and O'Donoghue 1999), impacts on lynx may be long-term minor adverse because their mating season overlaps OSV use in the park by about two weeks, and roaming lynx may be limited in their movements by groomed OSV road use and disturbance (Copeland 1996; Mowat and Slough 1998).

Population-level impacts on lynx and wolverines under alternative 2 are predicted to be long-term minor adverse because lynx or wolverines may avoid areas of OSV use, or may limit their range and associated genetic dispersal due to the presence of groomed roads in the park, their large home range size, and the importance of travel between patchy habitat.

In the event that there is new documented presence of lynx and wolverine in the area, monitoring may be necessary. Opportunistic surveillance would also occur. If NPS monitoring indicates that human presence or activities are having impacts greater than those predicted in this plan/SEIS that cannot be otherwise mitigated, selected areas of the park (including sections of roads) may be closed to visitor use. However, it is difficult to determine lynx or wolverine population numbers in Yellowstone, and lynx and wolverines are rarely observed by researchers. The park has the authority to close areas of the park for wildlife protection; for example, to prevent disturbance of denning wolverines. If a wolverine or lynx den is found in an area of the park near human activity, where disturbance is likely, the superintendent could implement closures. Trail closures for park management purposes may result in a change in how OSV use is distributed increasing potential impacts in areas open to travel while reducing impacts in areas closed to travel.

Cumulative Effects

Impacts on lynx and wolverines from other past, present, and reasonably foreseeable future actions would be the same as described for alternative 1. These impacts are a result of the variety of land and wildlife management activities occurring on lands near or adjacent to the park including Northern Rockies Lynx Management (which makes up a large part of these impacts), the Gallatin National Forest and the Beartooth District of Custer National Forest travel management plans, timber harvests on adjoining lands, road construction, and trapping of wolverines. The short- and long-term minor to moderate adverse impacts of alternative 2 when combined with, the long-term moderate adverse effects of these other actions, would result in short- and long-term moderate adverse cumulative impacts on these species, mainly from trapping activities occurring outside the park. Alternative 2 would contribute a minimal amount to cumulative impacts, primarily due to continued OSV use in the park and at Sylvan Pass.

Conclusion

This alternative would maintain and allow OSV use at Sylvan Pass, the area of the park where human/wolverine interactions would be most likely to occur. However, daily entrance limits would restrict the East Entrance to just 20 snowmobiles and two snowcoaches per day, (approximately five transportation events), resulting in little use in this area, and minimal disturbance to wolverines. Restrictions on movements of lynx or wolverines during the winter months due to the presence and use of OSV routes in other areas of the park may limit reproductive success, dispersal, and overall genetic sustainability of the species, but such impacts are difficult to predict. Therefore, impacts predicted under this alternative would be short- and long-term minor adverse, with the potential for

moderate adverse impacts if lynx and wolverines travel to other areas of the park or are in areas of active avalanche control activities. Cumulative impacts on lynx and wolverines under alternative 2 would be short-and long-term moderate adverse, to which alternative 2 would contribute a minimal amount.

Impacts of Alternative 3: Transition to Snowcoaches Meeting BAT Requirements Only

Displacement, Behavioral, and Physiological Effects

Under this alternative road grooming and management of Sylvan Pass would not continue following the phaseout of snowmobiles, and daily use limits would be 120 snowcoaches, or 120 transportation events, per day once BAT requirements are met and the phaseout is complete. The closure of Sylvan Pass after the phaseout is complete under alternative 3 would virtually eliminate any OSV use in the eastern sector of the park, minimizing human travel through lynx and wolverine habitat compared to recent maximum allowable use (alternative 2). Therefore, if wolverine females denned in Sylvan Pass they would not be adversely affected by OSV use, and the long-term closure of the area would result in beneficial impacts from the absence of human presence. Until the phaseout occurs, impacts would be similar to those under alternative 2.

The continued presence of groomed roads in the park may limit critical dispersal and movements of wolverine between the high-elevation alpine habitats that make up their range. However, the lower OSV limits, and lower number of transportation events, proposed under alternative 3 compared to what was permitted under the 2009 to 2013 interim regulations (alternative 2) would decrease the amount of time that OSV sights and sounds are present in the park. Compared to alternative 4, the number of transportation events would be greater under alternative 3 (120 compared to 110). In addition, the reduced frequency at which OSVs traveling the roads may be encountered, compared to the use levels permitted under the 2009 to 2013 interim regulations, would minimize impacts on traveling lynx and wolverines in the central sector of the park. Behavioral and associated physiological effects on lynx and wolverines related to OSV use have never been comprehensively observed because it is difficult to determine lynx or wolverine population numbers in Yellowstone, and lynx and wolverines are rarely observed by researchers, but displacement and movements of wolverine and lynx in relation to habitat and human activity provide an estimate of effects.

Observations and GPS data on habitat use and movements indicate that wolverines avoid areas of human activity, including snowmobile routes (Banci 1994). Lynx appear to be able to adapt to moderate levels of human disturbance (Koehler and Brittel 1990; Mowat, Poole, and O'Donoghue 1999). Therefore, impacts to these two species under alternative 3 would be localized, short-term negligible to minor adverse because OSV use in the eastern sector of the park would be eliminated and use in other areas of the park would be similar in terms on the number of daily transportation events (120 under alternative 3 compared to an average of 123 under use levels permitted under the 2009 to 2013 interim regulations) there would still be potential for disruption of winter movements of lynx and wolverine in the central sector of the park. As previously noted, the closure of Sylvan Pass would result in beneficial impacts to lynx and wolverines. Specific behavioral and physiological effects of human disturbance are unknown. However, it is likely that with use levels (specifically number of transportation events) similar to those permitted under the 2009 to 2013 interim regulations, flight or avoidance responses by wolverines and lynx would be similar to those described for alternative 2.

Population-level Effects

Population-level impacts on lynx and wolverines under alternative 3 would be long-term negligible to minor adverse because the levels of OSV present (less than under recent maximum allowable use)

would likely result in less frequent and lower levels of behavioral responses and displacement effects on lynx and wolverines moving through the central sector of the park. Avoidance of OSV use areas in the central sector of the park may cause lynx or wolverine to limit their movements, decreasing genetic dispersal. The closure of Sylvan Pass would limit OSV impacts on any wolverine females and kits using the denning habitat in that area and on lynx using this area of prime subalpine habitat starting in mid-February resulting in beneficial impacts. The lower levels of motorized vehicle use in the rest of the park would limit direct impacts, in turn limiting population-level impacts.

Cumulative Effects

The impacts on lynx and wolverines from past, present, and foreseeable future actions under alternative 3 would be the same as those under alternative 1. These impacts are a result of the variety of land and wildlife management activities occurring on lands near or adjacent to the park including Northern Rockies Lynx Management (which makes up a large part of these impacts), the Gallatin National Forest and the Beartooth District of Custer National Forest travel management plans, timber harvests on adjoining lands, road construction, and trapping of wolverines. The short- and long-term negligible to minor adverse impacts of alternative 3, when combined with the long-term minor to major adverse impacts of other actions, would result in long-term moderate adverse cumulative impacts on wolverine and lynx populations in Yellowstone, mainly from trapping activities occurring outside the park. Alternative 3 would contribute a minimal amount to cumulative impacts due to the low levels of OSV use.

Conclusion

Under this alternative Sylvan Pass would be closed to OSV use and maintenance activities would cease in the area of the park where human/wolverine and lynx interactions are most likely to occur. With a similar number of transportation events to alternative 2 (120 daily transportation events under alternative 3 versus 123 average events under alternative 2), restrictions on movements of lynx or wolverines during the winter months due to the presence and use of OSV routes in other areas of the park may limit reproductive success, dispersal, and overall genetic sustainability of the species, but such impacts are difficult to predict. Therefore, impacts predicted under this alternative would be short- and long-term minor adverse, and long-term beneficial compared to recent allowable use, from the absence of human presence at Sylvan Pass. Cumulative impacts on lynx and wolverines under alternative 3 would be long-term moderate adverse, to which alternative 3 would contribute minimally.

Impacts of Alternative 4: Manage OSV Use by Transportation Events

Displacement, Behavioral, and Physiological Effects

Alternative 4 would manage OSV use in the park based on transportation events. One event would initially equal 1 group of snowmobiles (maximum of 10 per group, an average of 7 over the winter season) or 1 snowcoach. A maximum of 110 transportation events would be allowed each day; however, no more than 50 events could be snowmobile groups. Forty-six of the snowmobile events would be guided groups with a seasonal average size of 7 and a maximum of 10 snowmobiles. The remaining 4 snowmobile events would be non-commercially guided groups with a limit of 5 snowmobiles per group. Operators would decide whether to “spend” their daily allotments of transportation events on snowmobile groups or snowcoaches. As a result, the daily make-up and number of OSVs in the park could range from 0 to 480 snowmobiles and 60 to 106 snowcoaches. At maximum daily snowmobile use, OSVs could increase to a maximum of 540 OSVs (480 snowmobiles and 60 snowcoaches), an increase over the most recent interim rule (alternative 2) which allowed for 396 OSVs (318 snowmobiles and 78 snowcoaches);

however, this level of OSV use is within the range experienced at the park during historical (pre-2004) and recent (2004–2009) use periods. If snowcoaches were maximized on a given day, their numbers would increase over those allowed in alternative 2; but total OSVs for that day (106 snowcoaches, 0 commercially guided snowmobiles, and 20 non-commercially guided snowmobiles) would be less than one-third of the number of vehicles allowed under the most recent interim rule (alternative 2). Regardless of the daily makeup of OSVs, the maximum number of daily transportation events would be less under alternative 4 (110 events) compared to the maximum number allowed under the 2009 to 2013 interim regulations (potential for 123 transportation events assuming an average snowmobile group size of 7 and a potential for a maximum of 237 transportation events). If technologies were to improve and OSVs meet voluntary E-BAT standards (which would reduce the sound emissions from OSVs) the total number of snowmobiles would stay the same, with the potential to increase the number of snowcoaches from 106 to 212. If the snowcoach group size were to increase from 1 to 2 coaches, the 2 coaches would travel as close together as possible allowing for safety and would be considered 1 transportation event for purposes of managing OSV use. Additional impacts are not expected under this scenario, because the number of transportation events would remain the same as allowed under non-E-BAT standards.

Alternative 4 would continue road grooming and avalanche control management of Sylvan Pass, the closest OSV route to prime lynx and wolverine habitat in the eastern sector of the park. As a result, impacts on wolverines and lynx would be similar to the impacts described for alternative 2. The potential for the disturbance of wolverine denning habitat from OSV use and avalanche control maintenance activities in the eastern sector of the park would continue. Such disturbance may cause wolverines using the area to leave or cause females to abandon their dens for poorer den sites, and may increase kit mortality and decrease the reproductive success of wolverines, based on studies of wolverines in other areas (Pulliainen 1968). In addition, lynx may avoid the area during avalanche activities (blasting, use of administrative snowmobiles, human disturbance). Overall, the impacts from avalanche control would be the same as alternative 2. The continued presence of groomed roads in the park may limit critical dispersal and movements of wolverine between the high-elevation alpine habitats that make up their range. A decrease in the number of daily transportation events by approximately 10 percent (compared to recent maximum allowable use) would result in reduced frequency of encounters between OSVs and traveling lynx and wolverines in the central sector of the park and exposure to OSV sights and sounds. On average, daily OSV levels would be less than those permitted under the 2009 to 2013 interim regulations, reducing from an average of 123 events to 110 events, a reduction of approximately 10 percent. Alternative 4 would allow for up to four non-commercially guided snowmobile groups daily; however, only one would be allowed at each entrance resulting in only one non-commercially guided group potentially accessing the East Entrance and the area of prime lynx and wolverine habitat. As previously stated, non-commercial guides would receive guide training; therefore, it is assumed that there would be no difference in impacts between commercial and non-commercial guides. Non-commercial guides would be clearly marked and would be monitored to ensure that OSV use is consistent with park requirements and impacts are consistent with those expected for guided use.

Behavioral and associated physiological effects have never been comprehensively observed due to the low population numbers of the species in the park, but displacement and movements of wolverine and lynx in relation to habitat and human activity provide an estimate of effects. Observations and GPS data on habitat use and movements indicate that wolverines avoid areas of human activity, including snowmobile routes (Banci 1994). Lynx appear to be able to adapt to moderate levels of human disturbance (Koehler and Brittel 1990; Mowat, Poole, and O'Donoghue 1999). Impacts on lynx and wolverines under this alternative are predicted to be localized, short-term moderate adverse because disturbance from OSVs on the Sylvan Pass road and avalanche control maintenance activities could adversely impact the reproductive success of denning wolverine females. Depending on how far these species travel outside the eastern sector of the park, impacts have the potential to be moderate adverse

because groomed OSV roads in other areas of the park could limit movements and dispersal of both species, but impacts would be less than those under use levels permitted under the 2009 to 2013 interim regulations (alternative 2) because of the reduction in the number of transportation events. Specific behavioral and physiological effects of human disturbance are unknown.

Population-level Effects

Population-level impacts on lynx and wolverines under alternative 4 would be long-term minor adverse because the levels of OSV presence may result in behavioral responses and displacement effects on lynx and wolverines in the area. However, these impacts would be less than those for use levels permitted under the 2009 to 2013 interim regulations (alternative 2) because the number of transportation events would be reduced by approximately 10 percent. Avoidance of OSV use areas in the central sector of the park may disrupt lynx or wolverine winter movements, decreasing genetic dispersal. Under this alternative Sylvan Pass would remain open, and because wolverine females give birth in mid-February, there is a risk of increased kit mortality and lower quality parental care by female wolverines if they are denning in the area and are disturbed by OSVs and Sylvan Pass avalanche control maintenance activities (Pulliainen 1968). Though there may be short-term moderate adverse impacts associated with intermittent avalanche control operations, impacts on wolverine reproductive success would be long-term, minor adverse. As discussed above, should all OSVs meet voluntary E-BAT standards, the increase in OSV use would not increase the overall number of transportation events and would not be expected to increase impact levels beyond a minimal level.

Overall, these impacts would be mitigated under this alternative through monitoring and closures of areas if deemed necessary. Monitoring of human-wildlife interactions would continue under all alternatives. If NPS monitoring indicates that human presence or activities are having impacts greater than those predicted in this plan/SEIS that cannot be otherwise mitigated, selected areas of the park (including sections of roads) may be closed to visitor use. However, it is difficult to determine lynx or wolverine population numbers in Yellowstone, and lynx and wolverines are rarely observed by researchers. Therefore, NPS monitoring would require intensive surveys to determine any effects from OSVs on lynx or wolverines, due to the species' scarcity and their propensity to inhabit steep, mountainous areas of the park, limiting the effectiveness of this mitigation measure. The park has the authority to close areas of the park for wildlife protection; for example, to prevent disturbance of denning wolverines. If a wolverine or lynx den is found in an area of the park near human activity where disturbance is likely, the superintendent could implement closures. Trail closures for park management purposes may result in a change in how OSV use is distributed, increasing potential impacts in areas open to travel while reducing impacts in areas closed to travel.

Cumulative Effects

The impacts on lynx and wolverines from past, present, and foreseeable future actions under alternative 4 would be the same as those under alternative 1. These impacts are a result of the variety of land and wildlife management activities on lands near or adjacent to the park including Northern Rockies lynx management (which makes up a large part of these impacts), the Gallatin National Forest and the Beartooth District of Custer National Forest travel management plans, timber harvests on adjoining lands, road construction, and trapping of wolverines. The short- and long-term minor to moderate adverse impacts of alternative 4, when combined with the long-term minor to moderate adverse impacts of other actions, would result in long-term moderate adverse cumulative impacts on wolverine and lynx populations in Yellowstone, mainly from trapping activities occurring outside the park. Alternative 4 would contribute a minimal amount to cumulative impacts.

Conclusion

This alternative would allow OSV use at Sylvan Pass, the area of the park where human-wolverine interactions would be most likely. Furthermore, restrictions on movements of lynx or wolverines during the winter months due to the presence and use of OSV routes in other areas of the park may limit reproductive success, dispersal, and overall genetic sustainability of the species, but such impacts are difficult to predict. Therefore, impacts predicted under this alternative would be long-term minor adverse, with the potential for moderate adverse impacts if lynx and wolverines travel outside the eastern sector of the park or in the short term during avalanche control operations. Overall, impacts would be reduced from use levels permitted under the 2009 to 2013 interim regulations, because the number of daily transportation events would be reduced. Should all OSVs meet voluntary E-BAT standards, the overall number of transportation events would not increase and impacts would not be expected to increase. Cumulative impacts on lynx and wolverines under alternative 4 would be moderate adverse, of which alternative 4 would contribute a minimal amount.

TRUMPETER SWANS AND EAGLES

Both swans and eagles primarily use riparian or lakeside habitat in the park, and were regularly observed during NPS annual behavioral monitoring. Both are able to fly, limiting the barrier impacts of roads in or outside the park and limiting the ground disturbance to these species outside nesting, hunting, or feeding areas. These areas that are used by swans and eagles are along lakes or in riparian areas, which are also popular OSV corridors. Therefore impacts by OSVs on these species are similar, the species are combined for analysis.

Impacts of Alternative 1: No Action - No Snowmobile/Snowcoach Use

Displacement, Behavioral, and Physiological Effects

OSV use in the park would be minimal and limited to administrative use only. Displacement of bald eagles and swans is possible due to this occasional administrative use or to skiers or snowshoers in the park, but such displacement would be infrequent and short term, and a 400-meter no-stopping buffer around roosting or nesting eagles would remain in place for bald eagles in the park, which would reduce the risk of disturbance to eagles. The potential for other behavioral and physiological effects that could occur due to disturbance by foot traffic and low-level administrative traffic would be low, because this traffic would be so minimal under alternative 1 compared to recent maximum allowable use (alternative 2). For these reasons, impacts from alternative 1 would be localized, short-term negligible adverse. Long-term impacts would be beneficial because during the majority of the winter season human disturbance would be removed.

Population-level Effects

The vast majority of effects would result from a small number of skiers or snowshoers, who are only rarely expected to encounter trumpeter swans or eagles. Winter users would not be present during the active nesting season for trumpeter swans, and skiers or snowshoers rarely elicit any response from wildlife (McClure et al. 2009, 2008), resulting in no impacts to the critical reproductive periods, mortality, or nesting that could lead to population-level effects. The park would be managed as a backcountry area for skiers or snowshoers. A 400-meter no-stopping buffer would remain in place for bald eagles in the park, limiting the effects of skiers or snowshoers on eagles. Impacts from population-level effects on swans and eagles under alternative 1 would therefore be long-term negligible adverse.

Cumulative Effects

Other past, present, and foreseeable future actions in and around Yellowstone have the potential to impact swans and eagles, particularly because these species are highly mobile during the winter and year-round, and are able to fly outside Yellowstone. Any actions that reduce the ability of swans to produce viable offspring could further contribute to observed regional declines in the species population.

The Gallatin National Forest has consolidated much of its checkerboard holdings in recent years, which has been accompanied by consolidation of private lands, especially in the Big Sky area. The net effect of these consolidations on eagles and swans is difficult to predict, because consolidated USFS lands are less likely to be developed, whereas private lands are more likely to be developed.

Road construction projects in the park, such as the recent projects at the East Entrance and Madison to Norris road, have been or are being constructed in accordance with appropriate environmental reviews and mitigation measures so as to reduce impacts on wildlife in the region. Within the park, construction is also generally designed to minimize effects on wildlife. Overall, all construction projects in the region must minimize the effects of any projects on bald eagles. Swans are similarly protected under the Migratory Bird Treaty Act (MBTA). Additionally, swans and eagles are rarely killed on roads. Impacts due to road development and construction in the greater Yellowstone area would be localized, long-term negligible to moderate adverse.

The negligible to moderate impacts of these past, present, and reasonably foreseeable future actions, combined with the short- and long-term negligible adverse impacts of alternative 1, would result in long-term moderate adverse cumulative impacts on trumpeter swans and bald eagles. Alternative 1 would not include visitor OSV use in the park and would contribute only a small amount, if at all, to the overall cumulative impacts.

Conclusion

Alternative 1 would result in short- and long-term negligible adverse impacts on swans and eagles in the park because OSV use would be limited to minimal administrative use and there would be no observable impacts. Cumulative impacts would be long-term moderate adverse, and alternative 1 would contribute minimally to the overall cumulative impacts on eagles and swans.

Impacts of Alternative 2: Continue Snowmobile/Snowcoach Use at 2012/2013 Winter Season Interim Regulation Limits

Displacement, Behavioral, and Physiological Effects

Alternative 2 would allow for OSV use up to recently permitted use levels under the 2009 to 2013 interim regulations at 318 guided snowmobiles and 78 snowcoaches per day. For purposes of comparison to alternative 4 with 110 transportation events, this would result in an average of 123 daily transportation events, with a potential maximum of 237 transportation events. Recent observations of behavior demonstrate few active responses by eagles or swans when exposed to OSVs, with 80 percent of swans and 62 percent of eagles showing no reaction to OSVs, 8 percent of swans and 9 percent of eagles traveling away from OSVs, and no swans and 3 percent of eagles exhibiting a flight response (McClure et al. 2009). The likelihood of an active response by bald eagles and swans increase with decreased distance to the road, longer interaction time, direct approach or harassment by humans, approach by humans on foot, and, for eagles, burned forest habitat compared to open meadow (Grubb, Robinson, and Bowerman 2002; Gonzalez et al. 2006; Borkowski et al. 2006; White et al.

2006). Behavioral observations under use levels during the 2009 interim rule show limited displacement and few energetically costly behavioral responses, which would also likely limit physiological responses in swans and eagles. This indicates that a majority of both swans and eagles are expected to demonstrate limited responses to OSVs under the use limits proposed for alternative 2, which includes the same limits on OSVs as the 2009 to 2013 interim regulations. Also, swans demonstrate some level of habituation to OSV users (Hardy 2001; White et al. 2009), and guiding requirements in alternative 2 would limit actions by humans (e.g., interaction time) that precipitate stronger responses by swans and eagles. For these reasons, impacts on swans and eagles under alternative 2 would be localized, short-term negligible to minor adverse.

Population-level Effects

For bald eagles, increased behavioral responses to OSVs may result in reproductive failure or mortality if eagles avoid accessing prime foraging areas or are subject to such frequent flight responses that their eggs or young fail to survive. These responses may also require increased energy due to stress and increased activity (Stalmaster and Kaiser 1998; Steidl and Anthony 2000), because their critical breeding and nesting season overlaps with OSV use in the park. Swans nest outside the OSV winter use season, although breeding pairs of swans begin choosing territories as early as February. Increases in the frequency and duration of encounters between OSVs and swans or eagles and increases in duration of encounters could increase the potential for adverse impacts related to species displacement but would unlikely affect the species overall reproductive success. There are successful swan breeding territories near motorized routes in the greater Yellowstone area outside the park (McEneaney 2006), and OSVs have not been shown to be the primary factor in the decline of the resident swan population (Proffitt 2008). Eagle nests may fall within the 250 meter buffer distance specified for protection by the USFWS (USFWS 2008a). For example, foraging or roosting eagles near the Firehole and Madison drainages are often less than 250 meters from the road. Eagles exhibit increased behavioral response frequency and intensity with shorter distance to disturbance, number of vehicles per event, and interaction duration and rates (Gonzalez et al. 2006; White et al. 2009). However, management protocols would include a 400-meter no-stopping buffer, so OSV traffic would not be permitted to stop near any such nest when it is occupied. Thus, population-level impacts under alternative 2 to both swans and eagles would be localized, long-term negligible to minor adverse.

The impacts described above would be mitigated under this alternative in several ways. Monitoring of human-wildlife interactions would continue under all alternatives. If NPS monitoring indicates that human presence or activities have unacceptable effects on swans or eagles that cannot be otherwise mitigated, selected areas of the park (including sections of roads) may be closed to visitor use. Additionally, any area containing a nesting pair of swans would be closed by park management, and there is a mandatory no-stopping requirement in a 400-meter buffer zone from bald eagle nests. The park has the authority to close areas of the park for wildlife protection, such as to prevent disturbance of nesting eagles, or to enforce a buffer zone. Such closures would effectively limit adverse impacts of OSV use. Trail closures for park management purposes may result in a change in how OSV use is distributed increasing potential impacts in areas open to travel while reducing impacts in areas closed to travel.

Cumulative Effects

Impacts on trumpeter swans and bald eagles from other past, present, and reasonably foreseeable future actions would be the same as described for alternative 1. These impacts are a result of the variety of land and wildlife management activities occurring on lands near or adjacent to the park including the consolidation of checkerboard lands in the Gallatin National Forest, the Gallatin National Forest and the Beartooth District of Custer National Forest travel management plans, and timber harvests on adjoining lands. New construction in the park, such as that for roads and new visitor centers, also contributes to these impacts, but mitigation measures are in place to ensure that

these impacts are negligible to these populations. The negligible to moderate adverse effects of these actions, when combined with the short- to long-term negligible to minor adverse impacts of alternative 2, would result in short- and long-term moderate adverse cumulative impacts on these species. Alternative 2 would contribute a minimal amount to the overall adverse cumulative impacts.

Conclusion

Alternative 2 would limit impacts on swans and eagles through use-limits, guiding requirements, and little overlap of OSV use with the active swan nesting season. Given these conditions and the mitigation measures discussed above, impacts on eagles and swans under alternative 2 would be localized short- to long-term negligible to minor adverse. Cumulative impacts would be long-term moderate adverse, and alternative 2 would contribute a small amount to the overall adverse cumulative impacts.

Impacts of Alternative 3: Transition to Snowcoaches Meeting BAT Requirements Only

Displacement, Behavioral, and Physiological Effects

Initially, impacts under alternative 3 would be the same as under alternative 2. Alternative 3 would begin with the same use levels permitted under the 2009 to 2013 interim regulations (alternative 2) to 120 guided snowcoaches per day and zero snowmobiles once BAT requirements are met (by the winter season of 2017/2018), resulting in 120 transportation events. Recent wildlife behavioral observations found few active responses by eagles or swans when exposed to OSVs, as described in alternative 2. The slight decrease in transportation events under alternative 3 from use levels permitted under the 2009 to 2013 interim regulations (from an average of 123 under alternative 2 to 120 under alternative 3) would result in a slightly reduced frequency of interactions between OSVs and eagles or swans, overall decreasing interaction duration, and resulting in fewer adverse behavioral, physiological, and displacement effects. The potential for human behavior that precipitates more frequent and higher level responses, such as direct approach, stopping, or increased duration of interaction would also be reduced due to the slight reduction in the number of transportation events and guiding requirements. Although snowcoaches would continue to pass within 250 meters of nests due to road location, fewer overall OSVs would pass by on a daily basis than permitted under the 2009 to 2013 interim regulations. A majority of both swans and eagles would be exposed to fewer groups of OSVs per day, and guiding requirements would limit actions by humans (e.g., increased interaction time) that precipitate stronger responses by swans and eagles. Also, swans demonstrate some level of habituation to OSVs. Because the reduction from current permitted use levels would be slight (only 3 less transportation events), impacts on swans and eagles under alternative 3 would be similar to those under alternative 2 and would be localized short-term negligible to minor adverse.

Population-level Effects

For bald eagles and swans, increased behavioral responses to OSVs may result in reproductive failure, mortality, or nest abandonment, as described under alternative 2. The 400-meter no-stopping buffer near eagle nests and regulations on group size and low entrance limits would decrease the duration and frequency of encounters with OSVs. As discussed above under Displacement, Behavioral, and Physiological Effects, the number of transportation events under alternative 3 would be reduced slightly compared to the number permitted under the 2009 to 2013 interim regulations (alternative 2) with a reduction of 3 events. Also, guiding requirements would limit human activities that precipitate stronger responses by swans and eagles. Thus, population-level impacts under alternative 3 would be long-term negligible to minor adverse, with a slight reduction in impacts when compared to alternative 2.

Cumulative Effects

Impacts on trumpeter swans and bald eagles from other past, present, and reasonably foreseeable future actions would be the same as described for alternative 1. These impacts are a result of the variety of land and wildlife management activities occurring on lands near or adjacent to the park including the consolidation of checkerboard lands in the Gallatin National Forest, the Gallatin National Forest and the Beartooth District of Custer National Forest travel management plans, and timber harvests on adjoining lands. New construction in the park, such as that for roads and new visitor centers, also contributes to these impacts, but mitigation measures are in place to ensure that these impacts are negligible to these populations. The negligible to moderate adverse effects of these actions, when combined with the short- to long-term negligible to minor adverse impacts of alternative 3, would result in short- and long-term moderate adverse cumulative impacts on these species. Alternative 3 would contribute a small amount to the overall adverse cumulative impacts.

Conclusion

Alternative 3 would limit the impacts on swans and eagles through use limits, guiding requirements, and little overlap between OSV use and the active swan nesting season. Guiding requirements and the slight reduction in the number of transportation events when compared to recent maximum allowable use (alternative 2) would limit impacts on eagles and swans under alternative 3 and result in localized short- and long-term, negligible to minor, adverse impacts, with impacts slightly less than alternative 2. Cumulative impacts would be long-term moderate adverse, and alternative 3 would contribute a small amount to the overall adverse cumulative impacts.

Impacts of Alternative 4: Manage OSV Use by Transportation Events

Displacement, Behavioral, and Physiological Effects

Alternative 4 would manage OSV use in the park based on transportation events. One event would initially equal 1 group of snowmobiles (maximum of 10 per group, an average of 7 over the winter season) or 1 snowcoach. A maximum of 110 transportation events would be allowed each day; however, no more than 50 events could be snowmobile groups. Forty-six of the snowmobile events would be guided groups with a seasonal average size of 7 and a maximum of 10 snowmobiles. The remaining 4 snowmobile events would be non-commercially guided groups with a limit of 5 snowmobiles per group. Operators would decide whether to “spend” their daily allotments of transportation events on snowmobile groups or snowcoaches. As a result, the daily makeup and number of OSVs in the park could range from 0 to 480 snowmobiles and 60 to 106 snowcoaches. At maximum daily snowmobile use, OSVs could increase to a maximum of 540 OSVs (480 snowmobiles and 60 snowcoaches), an increase over the most recent interim rule (alternative 2), which allowed for 396 OSVs (318 snowmobiles and 78 snowcoaches); however, this level of OSV use is within the range experienced at the park during historical (pre-2004) and recent (2004–2009) use periods. If snowcoaches were maximized on a given day, their numbers would increase over those allowed in alternative 2; but total OSVs for that day (106 snowcoaches, 0 commercially guided snowmobiles, and 20 non-commercially guided snowmobiles) would be less than one-third of the number of vehicles allowed under the most recent interim rule (alternative 2). Regardless of the daily make-up of OSVs, the maximum number of daily transportation events would be less under alternative 4 (110 events) compared to the maximum number allowed under the 2009 to 2013 interim regulations (potential for 123 transportation events assuming an average snowmobile group size of 7 and a potential for a maximum of 237 transportation events). If technologies were to improve and OSVs meet voluntary E-BAT standards (which would reduce the sound emissions from OSVs) the total number of snowmobiles would stay the same, with the potential to increase the number of snowcoaches from 106 to 212. If the snowcoach group size were to increase from 1 to 2 coaches, the 2 coaches would travel as

close together as possible allowing for safety and would be considered 1 transportation event for purposes of managing OSV use. Additional impacts are not expected under this scenario, because the number of transportation events would remain the same as allowed under non-E-BAT standards.

Recent wildlife behavioral observations found few active responses by eagles or swans when exposed to groups of OSVs, as described in alternative 2. A decrease in the number of transportation events under alternative 4 compared to use levels under the 2009 to 2013 interim regulations (alternative 2) would result in reduced frequency of interactions between OSVs and eagles or swans, overall decreasing interaction duration, and resulting in fewer adverse behavioral, physiological, and displacement effects. The daily ratio of OSVs (snowmobile groups to snowcoaches) would depend on the operators and cannot be predicted at this time; however, there would be a decrease in daily transportation events under alternative 4 (110 events) compared to those permitted under the 2009 to 2013 interim regulations (daily average of 123 with a potential maximum of 237). On average, the daily number of transportation events would be lower than those permitted under the 2009 to 2013 interim regulations. Behavioral observations under use levels during the 2009 to 2013 interim regulations show limited displacement and few energetically costly behavioral responses, which would also likely limit physiological responses in swans and eagles. This indicates that a majority of both swans and eagles are expected to demonstrate limited responses to the number of transportation events proposed for alternative 4. Also, swans demonstrate some level of habituation to OSVs. Alternative 4 would allow for up to 4 non-commercially guided snowmobile groups daily. As previously stated, non-commercial guides would receive guide training; therefore, it is assumed that there would be no difference in impacts between commercial and non-commercial guides. However, non-commercial guides would be clearly marked and ORV use would be monitored to ensure that the use is consistent with park requirements and impacts are within those expected for guided use. Non-commercially guided users are likely to travel in a more random fashion throughout the day, without the morning/evening peaks observed for guided users. This may limit the potential for wildlife habituation to OSVs. However, since non-commercially guided snowmobile groups would make up less than 4 percent of total daily transportation events it is not expected that non-commercially guided use would have different impacts from commercially guided use. For these reasons, impacts on swans and eagles under alternative 4 would be localized, short-term negligible to minor adverse, and would be less under alternative 2 or 3 due to the reduced number of transportation events.

Population-level Effects

For bald eagles and swans, increased behavioral responses to OSVs may result in reproductive failure, mortality, or nest abandonment, as described under alternative 2. The 400-meter no-stopping buffer near eagle nests that would be observed by all guided groups and regulations on group size would decrease the duration and frequency of encounters with OSVs. Daily OSV numbers could be variable but the number of transportation events would be no greater than 110. Daily transportation events would decrease over those permitted under the 2009 to 2013 interim regulations (alternative 2). The OSV use season overlaps with the season for the establishment of nesting territory by breeding pairs of swans. Increased behavioral responses by swans to OSV use under alternative 4 may result in minor to moderate impacts. There is little overlap of OSV use with the active swan nesting season, which would limit impacts on that species. Population-level impacts under alternative 4 would be long-term negligible to minor adverse, and would be less than alternative 2 or 3 due to the reduced number of transportation events.

Cumulative Effects

Impacts on trumpeter swans and bald eagles from other past, present, and reasonably foreseeable future actions would be the same as described for alternative 1. These impacts are a result of the

variety of land and wildlife management activities on lands near or adjacent to the park including the consolidation of checkerboard lands in the Gallatin National Forest, the Gallatin National Forest and the Beartooth District of Custer National Forest travel management plans, and timber harvests on adjoining lands. New construction in the park, such as that for roads and new visitor centers, also contributes to these impacts, but mitigation measures are in place to ensure that these impacts are negligible to these populations. The negligible to moderate adverse effects of these actions, when combined with the short- to long-term negligible to minor adverse impacts of alternative 4, would result in short- and long-term moderate adverse cumulative impacts on these species. Alternative 4 would contribute a small amount to the overall adverse cumulative impacts.

Conclusion

Alternative 4 would limit impacts on swans and eagles through use-limits, providing training for and limiting non-commercially guided snowmobile groups, and little overlap of OSV use with the active swan nesting season. Given these conditions and the mitigation measures that would be implemented, impacts on eagles and swans under alternative 4 would be localized short- to long-term negligible to minor adverse, and would be less than under alternative 2 or 3 due to the reduced number of transportation events. Cumulative impacts would be long-term moderate adverse, and alternative 4 would contribute a small amount to the overall adverse cumulative impacts.

GRAY WOLVES

Since their reintroduction from 1995 to 1997, wolf numbers increased until 2003, when density-dependent factors unrelated to OSV use (including disease) caused declines. Wolves in Wyoming are classified as a non-essential, experimental population by the USFWS, and per the ESA (10(j)), are managed within Yellowstone as a threatened population. Gray wolves rarely encounter OSV users in the park, and it would appear that wolves avoid areas of frequent OSV use (McClure et al. 2009). During winter foraging travels, gray wolves frequent ungulate winter ranges including the Yellowstone northern range and areas of geothermic influence in the park (Green, Mattson, and Peek 1997); there are fewer wolves in the interior of the park than on the northern range because there are fewer elk in the interior (Smith et al. 2010; Sacklin pers. comm. 2010). Elk make up 83 percent of the wolves' diet, and other ungulates compose most of the remainder. Ungulate carcasses from winter-kill are also consumed during the spring denning season (Creel et al. 2007). During winter, wolves appear to travel primarily at night when in developed areas, with several nocturnal kills documented in these areas. Wolves den in April, after the winter use season has ended (Smith et al. 2010).

Disturbance to wolves from OSV use has been occasionally observed during wildlife monitoring surveys, and the majority of wolf responses to OSV use consisted of "look-resume" or no visible response (McClure et al. 2009). Although higher glucocorticoid levels have been documented in wolves at locations and times with increased snowmobile use, there is no evidence that this has caused population-level effects (Creel et al. 2002). Compacted OSV routes may provide low energy winter travel routes for wolves to access areas of ungulate use, or may direct the movements of wolves along roads, due to the ease of travel.

Wolves in and around Yellowstone rarely pose a threat to humans or demonstrate begging behaviors or approach humans, due to an abundance or native prey animals, general avoidance of humans, and in part due to hazing of any wolves frequenting areas of human use or development or observed approaching people. 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 and was not food conditioned, the amount of human use in the area frequented by the wolves was an issue. 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 frequently traveled on the Hayden Valley road. In summer 2009, following hazing, the Canyon wolves did not demonstrate these behaviors. The success of hazing with this pack and other wolf hazing in the park indicates that hazing is a successful strategy for habituated wolves, and effectively stops unwanted behaviors (Smith et al. 2010). Due to its level of habituation, hazing was not attempted on a yearling wolf from the Gibbons pack; this wolf was lethally removed on May 19, 2009 because of apparent food conditioning and habituation to humans demonstrated by the wolf approaching humans and chasing several park visitors. This wolf had likely been fed by people (Smith et al. 2010). Guiding requirements, education on proper storage of food and behavior around wildlife, and limits on the total number of visitors a day reduce the development of habituation in park wolves due to winter use. 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).

Impacts of Alternative 1: No Action - No Snowmobile/Snowcoach Use

Displacement, Behavioral, and Physiological Effects

Although a few visitors might travel into the park on foot (skiers and snowshoers), it is unlikely that they would venture far into the park or into the winter ranges of wolves or that visitors would encounter any roaming wolves anywhere else in the park due to the scarcity and elusiveness of wolves and their propensity for night or dusk travel, when humans are generally not active in the park (Smith et al. 2009). Because no OSV use would be permitted under this alternative, OSVs would not operate in the wolves' winter range. Encounters are possible, but wolves are likely to generally avoid interaction and effects would be short-term and rare. Therefore, minimal displacement is expected to occur under this alternative and behavioral and physiological effects would be extremely rare. Displacement, behavioral, and physiological impacts on wolves under alternative 1 would be localized, short-term negligible adverse.

Population-level Effects

Under this alternative there would be negligible population-level effects such as disturbance during denning season, or disruption of hunting success. This is because there would be a nearly complete lack of interaction or encounters between winter users and wolves. Impacts would be long-term negligible adverse.

Cumulative Effects

Wolves in Wyoming were proposed for delisting from the ESA by the USFWS on October 4, 2011. However, until a final rule is published in the *Federal Register*, wolves are still protected under the ESA in Wyoming. Once delisting is final, the State of Wyoming would have management responsibility for wolves outside the park and the Wind River Reservation, and a 5-year monitoring period would commence during which the state would submit annual reports to the USFWS. The Wyoming Gray Wolf Management Plan (Wyoming Game and Fish Commission 2011) calls for wolves to be managed as a "trophy game animal" within a Wolf Trophy Game Management Area. Outside the Wolf Trophy Game Management Area wolves would be classified as a "predatory animal." The management plan commits to maintaining at least 10 breeding pairs and at least 100 individuals within the area of the state under its management. It also would establish a wolf hunting season and hunting areas. Wolves have been delisted in Idaho and Montana and are currently managed by those states under their respective wolf management plans. Both states allow wolf hunting and trapping seasons depending on population size. During the 2011/2012 season in Idaho, 253 wolves were harvested by hunting and 123 by trapping (Idaho Department of Fish and Game

2012). In Montana, 166 wolves were harvested during the 2011 wolf hunt (Montana Fish Wildlife and Parks 2012). All three states are required to maintain the long-term viability of wolves. The reasonably foreseeable delisting of wolves in Wyoming and implementation of a hunting season in areas outside the park, along with active management in the states of Idaho and Montana that includes hunting and trapping of wolves, would result in both long- and short-term minor to moderate adverse impacts on wolf populations in the greater Yellowstone area.

The Gallatin National Forest Travel Plan Revision and the Beartooth Custer National Forest Travel Management Plan are now being implemented. Actions associated with these plans could affect wolves, but negative effects would be minimized because federal and state wildlife management agencies are required to ensure the long-term viability of wolves in their planning efforts and projects. Impacts would be long-term negligible to minor adverse.

The Gallatin National Forest has recently consolidated much of its checkerboard public and private land holdings, accompanied by the consolidation of private lands, particularly in the Big Sky area. This means there are larger tracts of public land that are less likely to be developed, but also large areas of private lands that are more likely to be developed. The net effects of these actions on wolves are difficult to predict.

The Gardiner Basin and Cutler Meadows restoration (currently in progress) would likely benefit wolf prey species, because the prey species preferred browse of native plants would be favored by these restorations, with overall long-term beneficial impacts on wolves.

The impacts of past, present, and foreseeable future actions would be long-term minor adverse. The impacts of these past, present, and reasonably foreseeable future actions, combined with the short- and long-term negligible adverse impacts of alternative 1, would result in long-term minor adverse cumulative impacts on wolves. Alternative 1 would contribute a small amount, if at all, to the overall cumulative impacts.

Conclusion

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.

Impacts of Alternative 2: Continue Snowmobile/Snowcoach Use at 2012/2013 Winter Season Interim Regulation Limits

Displacement, Behavioral, and Physiological Effects

Alternative 2 would continue use levels under the 2009 to 2013 interim regulations of up to 318 guided snowmobiles and 78 guided snowcoaches per day. For purposes of comparison to alternative 4 with 110 transportation events, this would result in an average of 123 daily transportation events, with a potential maximum of 237 transportation events. Winter road monitoring crews rarely observed behavioral responses by wolves to OSVs in Yellowstone, due to infrequent encounters, with a total of only 14 sightings of wolf-OSV interaction over the last seven winter monitoring seasons. Generally, responses by wolves are either look-resume or no visible response (McClure et al. 2009). Glucocorticoid measurements from wolves in Yellowstone and other areas where wolves are exposed to snowmobiles were correlated between and within years during periods of higher OSV activity (Creel et al. 2002).

Chronic elevated glucocorticoid levels may result in long-term adverse effects on immune function and body condition, decreasing survival and reproductive rates (Sapolsky 1992). No evidence exists for population-level effects (Creel et al. 2002). Also, frequent exposure to humans may result in habituation by wolves, resulting in possible lethal removal if wolves lose fear of humans and begin to engage in problematic behaviors such as approaching humans or chasing visitors (Smith et al. 2010).

Wolves appear to avoid interaction with OSV users, but there is no evidence from wolf territories in the park of large-scale displacement or habitat avoidance (Smith, Stahler, and Guemsey 2005). Observations of habitat use by radio-collared wolves indicate that wolves frequently travel in the Madison-Firehole-Gibson basin during Winter OSV use, but avoid areas of human activity during the day. Wolf tracks were frequently observed on roads at night, suggesting that wolves travel on roads at night to conserve energy but avoid OSV activity during the day (Smith, Stahler, and Guemsey 2005, 2006). It appears that wolves avoid encounters with OSVs and maintain normal travel activities in the park. Wolves may travel on roads to conserve energy, but they do not appear to follow roads for long distances, or to areas they would not frequent otherwise. Physiological responses would likely be increased with increased numbers of OSVs in the park (or with increased transportation events), but guiding requirements and use-limits under alternative 2 would limit these responses. Therefore, impacts under alternative 2 would be localized, short-term negligible to minor adverse.

Population-level Effects

Wolf populations in the park have grown during periods of much higher OSV use than those currently occurring (with daily averages of 795 snowmobiles/day), and data suggest that inter-species aggression and natural mortality causes including diseases influence park wolf populations more than disturbance from OSV use. However, in the first few years after wolves were reintroduced to the Lamar Valley in 1995 and 1996, there was little interspecies competition due to the low total number of wolves in the park and large unoccupied territories containing ample available prey species, so it is unknown how OSV use affected population growth. Additionally, wolf hunting success data suggest 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, in turn increasing energy expenditure and mortality and decreasing reproductive success. Also, the levels of use under alternative 2 could result in some increases in glucocorticoid levels, indicating increased stress, which could eventually affect the reproductive and survival rates of this species; however, chronic elevations that would result in decreased reproductive survival rates of this species are unlikely. Therefore, population-level impacts under alternative 2 are predicted to be long-term negligible to minor adverse.

The impacts described above would be mitigated under this alternative through several measures. If NPS monitoring indicates that human presence or activities are having unacceptable effects on wolves that cannot be otherwise mitigated, selected areas of the park (including sections of roads) may be closed to visitor use. Additionally, areas within a 1-mile radius of a wolf den are closed to public entry and many of the wolf dens are already within grizzly bear spring closure areas, which are protected from human disturbance.

Cumulative Effects

Impacts on wolves from other past, present, and reasonably foreseeable future actions would be the same as described for alternative 1. These impacts are a result of the variety of land and wildlife management activities occurring on lands near or adjacent to the park including the consolidation of checkerboard lands in the Gallatin National Forest, the Gallatin National Forest and the Beartooth District of Custer National Forest travel management plans, timber harvests on adjoining lands, and

the reintroduction of gray wolves to the greater Yellowstone area, one of the largest causes of these impacts. Within the park, these impacts are a result of active management of the park's elk and bison populations, as well as other wildlife management programs such as the planned remote vaccine delivery to bison, a minimal contributor to impacts on the gray wolf population. New construction in the park, such as that for roads and new visitor centers, also contributes to these impacts, but mitigation measures are in place to ensure that impacts are negligible to these populations. The minor adverse effects of these actions, when combined with the short- and long-term negligible to minor adverse impacts of alternative 2, would result in long-term minor adverse cumulative impacts on wolves. Alternative 2 would contribute a small amount to the overall adverse cumulative impacts.

Conclusion

Alternative 2 would result in short- and long-term negligible to minor adverse impacts on wolves in the park because OSV use levels and guiding requirements use would limit the duration of interaction and the approach distance of OSV users. Cumulative impacts would be long-term minor adverse, and alternative 2 would contribute a small amount to the overall adverse cumulative impacts.

Impacts of Alternative 3: Transition to Snowcoaches Meeting BAT Requirements Only

Displacement, Behavioral, and Physiological Effects

Alternative 3 would reduce OSV use levels and the overall number of transportation events (from an average of 123 and 237 maximum permitted under the 2009 to 2013 interim regulations to 120) once all snowcoaches meet BAT requirements (winter season 2015/2016) and the 3-year phaseout of snowmobiles is complete (winter season 2020/2021). Once this phaseout is complete OSV numbers would equal 120 guided snowcoaches per day and 0 snowmobiles or 120 transportation events. Prior to this phaseout, the impacts of alternative 3 would be the same as those of alternative 2. Once the 3-year phaseout is completed, the lower number of transportation events per day, compared to recent maximum allowable use, would limit the frequency and duration of OSV presence in the park, and would minimally elevate glucocorticoid levels in wolves, potentially resulting in fewer long-term adverse effects on immune function and body condition (Sapolsky 1992).

Wolves appear to avoid interaction with OSV users, but there is no evidence from wolf territories in the park of large-scale displacement or habitat avoidance (Smith, Stahler, and Guemsey 2005). Observations of habitat use by radio-collared wolves indicate that wolves frequently travel in the Madison-Firehole-Gibson basin during Winter OSV use, but avoid areas of human activity during the day. Wolf tracks were frequently observed on roads, suggesting that wolves travel on roads at night or when OSVs are not present to conserve energy, but avoid OSV activity during the day. This indicates that displacement is short term and directly results from OSV presence (Smith, Stahler, and Guemsey 2005, 2006). Frequent exposure to humans may result in habituation by wolves, resulting in possible lethal removal if wolves lose fear of humans and begin to engage in problematic behaviors such as approaching humans or chasing visitors (Smith et al. 2010). Such habituation behaviors by wolves have not been attributed to OSV visitors following the establishment of guiding requirements.

Under alternative 3 the frequency and duration of motorized vehicle presence in the park would decrease compared to recent maximum allowable use and wolves would need to spend less time avoiding encounters with OSVs, resulting in only small-scale, temporary displacement. Physiological responses would decrease with lower numbers of motorized users in the park. Therefore, impacts would be localized, short-term negligible to minor adverse.

Population-level Effects

Wolf populations in the park have grown during periods of much higher OSV use (daily averages of 795 snowmobiles per day) than that which would occur under alternative 3, and data suggest that inter-species aggression and natural causes influence park wolf populations more than OSV use, as described under alternative 2. Such data suggest that avoidance of such areas by wolves during the day due to OSV use may limit their hunting success, in turn increasing energy expenditure and mortality and reducing reproductive success. Also, it is likely that the levels of use under alternative 3 would result in some increases in glucocorticoid levels, indicating increased stress. However, chronic elevations that would result in decreased reproductive survival rates of this species are unlikely. Therefore, population-level impacts under alternative 3 are predicted to be long-term negligible adverse.

Cumulative Effects

Impacts on wolves from other past, present, and reasonably foreseeable future actions would be the same as described for alternative 1. These impacts are a result of the variety of land and wildlife management activities occurring on lands near or adjacent to the park including the consolidation of checkerboard lands in the Gallatin National Forest, the Gallatin National Forest and the Beartooth District of Custer National Forest travel management plans, timber harvests on adjoining lands, and reintroduction of gray wolves to the greater Yellowstone area, one of the largest causes of these impacts. Within the park, these impacts are a result of active management of the park's elk and bison populations, as well as other wildlife management programs such as the planned remote vaccine delivery to bison, a minimal contributor to impacts on the gray wolf population. New construction in the park, such as that for roads and new visitor centers, also contributes to these impacts, but mitigation measures are in place to ensure that these impacts are negligible to these populations. The minor adverse effects of these actions, when combined with the short- and long-term negligible to minor adverse impacts of alternative 3, would result in long-term minor adverse cumulative impacts on wolves. Alternative 3 would contribute a small amount to the overall adverse cumulative impacts.

Conclusion

Alternative 3 would result in short- and long-term negligible to minor adverse impacts on wolves in the park because OSV use, or total number of transportation events, would be slightly reduced from the levels permitted under the 2009 to 2013 interim regulations (alternative 2) and the duration of encounters and approach distance of OSV users when encountering wolves would be limited due to guiding requirements. Cumulative impacts would be long-term minor adverse, and alternative 3 would contribute a small amount to the overall adverse cumulative impacts.

Impacts of Alternative 4: Manage OSV Use by Transportation Events

Displacement, Behavioral, and Physiological Effects

Alternative 4 would manage OSV use in the park based on transportation events. One event would initially equal 1 group of snowmobiles (maximum of 10 per group, an average of 7 over the winter season) or 1 snowcoach. A maximum of 110 transportation events would be allowed each day; however, no more than 50 events could be snowmobile groups. Forty-six of the snowmobile events would be guided groups with a seasonal average size of 7 and a maximum of 10 snowmobiles. The remaining 4 snowmobile events would be non-commercially guided groups with a limit of 5 snowmobiles per group. Operators would decide whether to "spend" their daily allotments of transportation events on snowmobile groups or snowcoaches. As a result, the daily make-up and number of OSVs in the park could range from

0 to 480 snowmobiles and from 60 to 106 snowcoaches. At maximum daily snowmobile use, OSVs could increase to a maximum of 540 OSVs (480 snowmobiles and 60 snowcoaches), an increase over the most recent interim rule (alternative 2), which allowed for 396 OSVs (318 snowmobiles and 78 snowcoaches); however, this level of OSV use is within the range experienced at the park during historical (pre-2004) and recent (2004–2009) use periods. If snowcoaches were maximized on a given day, their numbers would increase over those allowed in alternative 2; but total OSVs for that day (106 snowcoaches, 0 commercially guided snowmobiles, and 20 non-commercially guided snowmobiles) would be less than one-third of the number of vehicles allowed under the most recent interim rule (alternative 2). Regardless of the daily makeup of OSVs, the maximum number of daily transportation events would be less under alternative 4 (110 events) compared to the maximum number allowed under the 2009 to 2013 interim regulations (potential for 123 transportation events assuming an average snowmobile group size of 7 and a potential for a maximum of 237 transportation events). If technologies were to improve and OSVs meet voluntary E-BAT standards (which would reduce the sound emissions from OSVs) the total number of snowmobiles would stay the same, with the potential to increase the number of snowcoaches from 106 to 212. If the snowcoach group size were to increase from 1 to 2 coaches, the 2 coaches would travel as close together as possible allowing for safety and would be considered 1 transportation event for the purposes of managing OSV use. Additional impacts are not expected under this scenario, because the number of transportation events would remain the same as allowed under non-E-BAT standards.

Winter road monitoring crews rarely observed behavioral responses by wolves to OSVs in Yellowstone, due to infrequent encounters, with a total of only 14 sightings of wolf-OSV interaction over the last seven winter monitoring seasons. Generally, responses by wolves are either look-resume or no visible response (McClure et al. 2009). Glucocorticoid measurements from wolves in Yellowstone and other areas where wolves are exposed to snowmobiles were correlated between and within years during periods of higher OSV activity (Creel et al. 2002). Chronic elevated glucocorticoid levels may result in long-term adverse effects on immune function and body condition, decreasing survival and reproductive rates (Sapolsky 1992). No evidence exists for population-level effects (Creel et al. 2002). Also, frequent exposure to humans may result in habituation by wolves, resulting in possible lethal removal if wolves lose fear of humans and begin to engage in problematic behaviors such as approaching humans or chasing visitors (Smith et al. 2010).

Wolves appear to avoid interaction with OSV users, but there is no evidence from wolf territories in the park of large-scale displacement or habitat avoidance (Smith, Stahler, and Guernsey 2005). Observations of habitat use by radio-collared wolves indicate that wolves frequently travel in the Madison-Firehole-Gibson basin during winter OSV use, but avoid areas of human activity during the day. Wolf tracks were frequently observed on roads, suggesting that wolves travel on roads at night or when OSVs are not present to conserve energy, but avoid OSV activity during the day, indicating that displacement is short term and directly results from OSV presence (Smith, Stahler, and Guernsey 2005, 2006). Frequent exposure to humans may result in habituation by wolves, resulting in possible lethal removal if wolves lose fear of humans and begin to engage in problematic behaviors such as approaching humans or chasing visitors (Smith et al. 2010). Such habituation behaviors by wolves have not been attributed to OSV visitors following the establishment of guiding requirements. A decrease in OSV, or in transportation events, would result in a reduced frequency of interactions between OSVs and wolves resulting in fewer adverse behavioral, physiological, and displacement effects. An increase in OSVs and transportation events would have the opposite effect. The daily makeup of OSVs would depend on the operators and cannot be predicted at this time; however, the number of transportation events would remain the same and there would be a slight decrease in the number of daily transportation events under alternative 4 compared to those permitted under the 2009 to 2013 interim regulations. On average, daily OSV levels would be reduced from 123 (as allowed under current management represented by alternative 2) to 110. Alternative 4 would allow for up to four non-commercially guided snowmobile groups daily. As previously stated, non-commercial guides

would receive guide training; therefore, it is assumed that there would be no difference in impacts between commercial and non-commercial guides. However, non-commercially guided use would be monitored to ensure ORV use is consistent with park requirements and impacts are consistent with those expected for guided use. Therefore, impacts under alternative 4 would be localized, short-term negligible to minor adverse, and would be reduced from those under alternatives 2 and 3. As discussed above, should all OSVs meet voluntary E-BAT standards, the increase in OSV use would not increase the overall number of transportation events and would not be expected to increase impact levels beyond a minimal level.

Population-level Effects

Wolf populations in the park have grown during periods of higher OSV use (daily averages of 795 snowmobiles/day) than those that would occur under alternative 4, and data suggest that interspecies aggression and natural causes influence park wolf populations more than OSV use, as described under alternative 2. Such data suggest that avoidance of such areas by wolves during the day, due to OSV use, may limit their hunting success, in turn increasing energy expenditure and mortality and reducing reproductive success. Chronic elevations that would result in decreased reproductive survival rates of this species are unlikely. Therefore, population-level impacts under alternative 4 are predicted to be long-term minor adverse. As discussed above, should all OSVs meet voluntary E-BAT standards the increase in OSV use would not increase the overall number of transportation events and would not be expected to increase impact levels beyond a minimal level.

Cumulative Effects

Impacts on wolves from other past, present, and reasonably foreseeable future actions would be the same as described for alternative 1. These impacts are a result of the variety of land and wildlife management activities occurring on lands near or adjacent to the park including the consolidation of checkerboard lands in the Gallatin National Forest, the Gallatin National Forest and the Beartooth District of Custer National Forest travel management plans, timber harvests on adjoining lands, and the reintroduction of gray wolves to the greater Yellowstone area, one of the largest causes of these impacts. Within the park, these impacts are a result of active management of the park's elk and bison populations, as well as other wildlife management programs such as the planned remote vaccine delivery to bison, a minimal contributor to impacts on the gray wolf population. New construction in the park, such as that for roads and new visitor centers, also contributes to these impacts, but mitigation measures are in place to ensure that these impacts are negligible to these populations. The minor adverse effects of these actions, when combined with the short- and long-term negligible to minor adverse impacts of alternative 4, would result in long-term minor adverse cumulative impacts on wolves. Alternative 4 would contribute a small amount to the overall adverse cumulative impacts.

Conclusion

Alternative 4 would result in short- and long-term negligible to minor adverse impacts on wolves in the park, less than those expected under alternatives 2 and 4. OSV use, specifically the number of transportation events, would be reduced from the levels permitted under the 2009 to 2013 interim regulations, which would reduce the frequency of OSV encounters with wolves. Should all OSVs meet voluntary E-BAT standards, it would not increase the overall number of transportation events and would not be expected to increase impact levels beyond a minimal level. Cumulative impacts would be long-term minor adverse, and alternative 4 would contribute a small amount to the overall adverse cumulative impacts.

AIR QUALITY

GUIDING REGULATIONS AND POLICIES

Air quality is addressed in NPS *Management Policies 2006*. The *NPS Management Policies 2006* state that NPS will "seek to perpetuate the best possible air quality in parks to (1) preserve natural resources and systems; (2) preserve cultural resources; and (3) sustain visitor enjoyment, human health, and scenic vistas" (NPS 2006a; Section 4.7.1). NPS *Management Policies 2006* further state that the NPS will assume an aggressive role in promoting and pursuing measures to protect air quality related values (AQRVs) from the adverse impacts of air pollution.

In addition, in compliance with the Clean Air Act (CAA), the U.S. Environmental Protection Agency (EPA) has promulgated National Ambient Air Quality Standards (NAAQS) and regulations. The standards were enacted for the protection of the public health and welfare, allowing for an adequate margin of safety. To date, the EPA has issued standards for the following criteria pollutants: carbon monoxide (CO), sulfur dioxide (SO_2), particles with a diameter less than or equal to a nominal 10 micrometers (PM_{10}), particles with a diameter less than or equal to a nominal 2.5 micrometers ($PM_{2.5}$), ozone (O_3), nitrogen dioxide (NO_2), and lead (Pb). Each state and locality has the primary responsibility for air pollution prevention and control. Refer to "Chapter 3: Affected Environment" for more information on each of the criteria pollutants and associated NAAQS, the Prevention of Significant Deterioration (PSD) program and state-level air quality standards.

METHODOLOGY

This section provides an overview of the major components of the air quality analysis methodology. For detailed technical information on the development of emissions factors, background concentrations and other modeling assumptions, refer to the air emissions modeling report available online at http://www.nps.gov/yell/parkmgmt/winterusetechnicaldocuments.htm.

Criteria Pollutant Concentrations

The park, in consultation with the NPS Air Resources Division (ARD), selected four locations for air quality modeling based on OSV traffic levels. To help compare and contrast different levels of OSV use, the sites were selected to include those areas where the highest pollutant concentrations would be expected and to represent a range of OSV activity levels. The four locations selected for modeling are the West Entrance, the West Entrance to Madison Junction Road, the Old Faithful staging area, and the Canyon to Fishing Bridge road.

Maximum predicted ambient concentrations of CO, NO_2 and PM_{10} and $PM_{2.5}$ were calculated for each location using EPA-approved air quality models (CAL3QHCR and AERMOD). Impacts for each alternative were assessed with respect to the NAAQS and the 1-hour CO state standard in Montana, which is 23 parts per million (ppm) (compared to the 1-hour CO NAAQS of 35 ppm). The estimates of maximum CO, NO_2, PM_{10} and $PM_{2.5}$ concentrations generated by OSVs take into account emissions data, meteorological phenomena, vehicle traffic/travel conditions, and the physical configurations of roads and staging areas.

The air quality modeling procedures and assumptions were generally similar to those used for the 2011 Winter Use Plan/EIS. However, for CO, updated emissions data and other changes resulted in increases in CO concentrations for this plan/SEIS relative to the 2011 Winter Use Plan/EIS analysis, particularly at the West Entrance. All snowmobile and snowcoach emissions factors were based on an updated emission test study conducted in March, 2012 (Ray et al. 2013). As a result of using the latest

test data, the snowmobile CO emission factors used to represent "BAT snowmobiles" for this plan/SEIS are higher than the 2011 Winter Use Plan/EIS factors. The 2012 emissions testing study tested newer snowmobile models, but used the same methodology as the 2006 study. The exact cause of the increase in snowmobile CO emissions relative to 2006 (particularly idle emissions for the 2011 Arctic Cat TZ1) is not known, and the manufacturer of this particular vehicle was unable to verify if the measured emission levels were inconsistent with what they expected emission levels to be based on dynamometer testing.

In addition, the plan/SEIS assumes a more realistic 80/20 gasoline/diesel snowcoach ratio for the current fleet and a 70/30 gasoline/diesel snowcoach ratio for future BAT snowcoaches, compared to the 50/50 ratio assumed for most alternatives in the 2011 Winter Use Plan/EIS. This also increased plan/SEIS CO emission factors (and modeling results) over the 2011 Winter Use Plan/EIS values, because gas snowcoaches have higher CO emissions than diesel snowcoaches. Refer to the air emissions report (available online at http://www.nps.gov/yell/parkmgmt/winterusetechnicaldocuments.htm) for further detailed information regarding the modeling methodology and assumptions.

Additional changes to modeling were made between the draft plan/SEIS and this final plan/SEIS to address questions raised during the public comment period. These changes are detailed in table 43.

TABLE 43: ADDITIONAL AIR QUALITY MODELING CHANGES

	Draft plan/SEIS Air Quality Models (Ray 2012a, Version 4.1)	Final plan/SEIS Air Quality Models (Ray 2012a, Version 6.5)	Rationale for Change
Snowmobiles			
Number of Emission Factors	One emission factor: • Based on weighted composite of Arctic Cat (%) and Ski Doo (%). Used for all alternatives (scenarios).	Three emission factors: • Current conditions: based on weighted composite of Arctic Cat (63.3%) and Ski Doo (36.7%) • New BAT: based on 100% Ski Doo Ace 600 • E-BAT: based on 33% reduction from 100% Ski Doo Ace 600 (Ray 2012a v 6.5, Table 11).	Higher degree of specificity for emission factors. Captured NPS desire to use the 'cleanest' and 'quietest' BAT snowmobiles currently available in the marketplace.
Queuing	Old Faithful: 5 minutes.	Old Faithful: 3 minutes.	More representative of observed conditions at site.
2011 Arctic Cat TZ1 and 2011 Ski Doo Ace 600			Minor changes to PEM measured emission values at recommendation of Frey (2012).

	Draft plan/SEIS Air Quality Models (Ray 2012a, Version 4.1)	Final plan/SEIS Air Quality Models (Ray 2012a, Version 6.5)	Rationale for Change
Snowcoaches			
Number of Emission Factors	One emission factor: based on weighted composite of 5 vehicles tested in March 2012.	Ten emission factors: based on future fleet combinations of BAT snowcoaches for different plan/SEIS alternatives (Ray 2012a, Table 16). Number of vehicles in each category is listed along with the total number of vehicles in Table 16 of Ray 2012a. Actual emission factors can be found in Table 17 of Ray 2012a.	Higher degree of specificity for emission factors. (Ray 2012a, Version 6.5, Table 17).
Disregarded BAT 1	See Ray 2012a, Version 4.1, page 12.		BAT 1 was based on the assumption that carbureted bombardiers would be phased out without replacement. NPS believes these vehicles will be retrofitted with modern EFI gasoline engines that meet the snowcoach BAT (Tier 2) standards.
Definition of Snowcoach BAT	See Ray 2012a, Version 4.1, page 12.	See Ray 2012a (just below Table 14).	Operational definition was incorrect in version 4.1.
Emission Factors Associated Snowcoaches Used for Modeling			Minor changes to PEM measured emission values at the recommendation of Frey (2012) after additional calculations.

Emissions Inventory

In addition to the modeling analysis for determining potential short-term CO, NO_2, and particulate concentrations, an emissions inventory for criteria pollutants (CO, particulate matter (PM), and NO_x) and hydrocarbons in tons per winter season was completed for each alternative. An emissions inventory of hazardous air pollutants (HAPs) (benzene, 1-3 butadiene, formaldehyde, and acetaldehyde) was also completed. Emissions were calculated using travel estimates of OSVs used on Yellowstone roads, the road lengths, and the modes of operation of the vehicles. Emission factors were combined with daily vehicle traffic levels for each road segment for each alternative to determine total parkwide emissions for each pollutant. The winter season was defined as a 90-day period running from mid-December to mid-March.

Because Yellowstone is classified as a federal Class I area, PM_{10} increment comparisons under PSD increments were assessed. PSD increments are the maximum permitted increases in pollutant concentrations over baseline levels for PM_{10}. For Class I areas, the PM_{10} PSD increments are 4 and 8 micrograms per cubic meter ($\mu g/m^3$) for the annual and 24-hour averaging periods, respectively. Winter OSV emissions were considered increment consuming or contributing sources for this analysis. The analysis assessed PSD increments for the 24-hour averaging period only, since the sources of concern are only present during the winter season and an annual average would not be applicable. This assessment is a screening level approach and may indicate that a detailed analysis is required if

concentrations are near the PM_{10} PSD increments. Furthermore, because the methodology employed in this analysis is a screening-level analysis, it is not intended for regulatory purposes and does not constitute a regulatory PSD increment consumption analysis.

Visibility Impacts

As required by the visibility protection provision of the CAA, additional requirements apply when a proposed source has the potential to impair visibility in a Class I area (40 CFR 52.27 (d)), such as Yellowstone. Potential visibility impacts for each alternative were assessed using the EPA recommended screening model VISCREEN assuming worst-case meteorological conditions.

Analysis Scenarios

Under alternative 1, OSV use by visitors would not be allowed. Administrative OSV use would continue under alternative 1, but at a reduced level compared to other alternatives because there would be minimal operations within the park.

Alternatives 2 and 3 were modeled based on the maximum allowed level of OSV use each day of the winter season as described in chapter 2. Alternative 4 was modeled based on the maximum allowable daily use (10 snowmobiles per transportation event), as described in chapter 2, for comparison to NAAQS standards. When addressing tons per year, average seasonal use was used.

Two fleet scenarios were modeled for alternative 2: current fleet (prior to the full implementation of BAT for snowcoaches by 2017/2018) and the New BAT snowcoach fleet.

For alternative 3, the condition modeled assumed the complete transition to all BAT snowcoaches and no snowmobiles. The earlier years of alternative 3, prior to the transition to all snowcoaches, was assumed to be the same as alternative 2 (current fleet / current BAT).

Four modeling scenarios were used to represent the range of possible conditions under alternative 4:

- Alternative 4a assumes that the maximum allowable number of transportation events for snowmobiles would be used (50 events). This means 480 snowmobiles and 60 snowcoaches would be allowed to enter the park. Alternative 4a assumes a fleet of all BAT snowcoaches and New BAT snowmobiles with a 90 g per kw/hr CO emissions limit.
- Alternative 4b assumes that the maximum number of transportation events for snowcoaches would be used, which results in 0 commercially guided snowmobiles, 20 non-commercially guided snowmobiles, and 106 snowcoaches entering the park. Alternative 4b assumes a fleet of all BAT snowcoaches and New BAT snowmobiles with a 90 g per kw/hr CO emissions limit.
- Alternative 4c assumes the maximum number of transportation events for snowmobiles are used (50 events) and all 480 snowmobiles would meet voluntary E-BAT standards. All snowcoaches were assumed to meet the voluntary E-BAT standards and therefore allowed to double from 60 to 120.
- Alternative 4d assumes the maximum number of transportation events for snowcoaches (106) are used and the number of snowcoaches is allowed to double from 106 to 212. The 20 snowmobiles allowed in the park all meet voluntary E-BAT standards.

- Overall, the modeling results presented below are similar to what would be expected based on existing monitoring data. Modeling estimates for CO and PM overestimate emissions compared to existing monitoring data, while the results for NO_2 slightly underestimate emissions. For all pollutants analyzed (both those overestimated and underestimated) modeling results were reasonable compared to monitoring and allow for an accurate comparison of alternatives.

Air Quality Modeling Considerations

Air quality modeling is used to estimate ambient air pollution concentrations from the various management alternatives with their associated differing emissions. Models allow for an estimate of ambient air concentrations to be made under a variety of potential conditions and at multiple locations However, estimates of traffic patterns, emissions of the various pollutants, and vehicle composition are all critical inputs to the modeling. Meteorological data considered representative of the area is another critical input. The physical characteristics of the emission source(s), such as traffic along a roadway or a staging or parking area, dictate the choice of model.

To gauge whether model estimates are reasonable, modeling results of current emissions under the current management paradigm (318 snowmobiles and 78 snowcoaches) can be compared with ambient air quality monitoring data collected in the park. Two park locations have monitoring that can be compared to modeled results: the West Entrance and Old Faithful. The modeling done for the West Entrance used a roadway intersection model that simulates traffic queuing and flow, while the modeling for the Old Faithful area used a model appropriate for a staging area (ARS 2012). One to one comparisons of model estimates to monitored values can only reasonably be done if all model inputs are precisely known. In these modeling analyses, representative inputs are used, so a comparison of recent, high measured values, associated with OSV use, to the maximum values from the modeling can be used to gauge the reasonableness of the estimates.

The maximum values of the roadway CO modeling at the West Entrance, for current conditions, fall within the range of the measured high values from the past three years, for both average and high OSV use. The exception was the high OSV use, highest 1-hour estimate which is higher than measured. Similarly, the highest estimate of NO_2 for both the average and high use OSV modeling falls within the range of the highest recent measurements that were indicative of OSV use. Particulate matter (PM) is underestimated by the model at the West Entrance. Possible explanations for the underestimate, given the general agreement for CO and NO_2, are either that OSV PM emission estimates are low, or that there is another source of PM not considered in the modeling such as chimney smoke from the town of West Yellowstone. Other factors that could cause modeled results to deviate somewhat from monitored values could include locations of receptors (for modeling) compared to air quality monitoring stations, sensitivity of shorter-duration standards (such as 1-hour CO standards) to outliers or peaks, changing emission profiles of vehicles (relative emission rates of OSVs appear highly sensitive to operating conditions such as snowfall, etc.) among other factors. However, even if the maximum measured concentration of PM at the West Entrance is due to OSV use, a doubling of that concentration due to a doubling of PM emissions would still be a minor impact (see “Intensity Definitions” below).

The staging area modeling at Old Faithful systematically underestimates the high measured concentrations for CO and PM (no NO_2 measurements were made at Old Faithful). The reason for this is unknown but may be due to some of the reasons outlined above. However, the maximum measured concentrations of CO and PM at Old Faithful are relatively low and if they were even doubled under one of the alternatives the impacts would still be minor.

Based on the available information, the roadway modeling for CO and NO_2 provides a reasonable estimate of likely ambient pollution concentrations along roadways. PM estimates are somewhat low, but measured concentrations are also low, such that projections made from the PM modeling are not going to lead to erroneous conclusions. Similarly, the staging area modeling at Old Faithful underestimates concentrations, but projections will not lead to erroneous conclusions.

Intensity Definitions

Concentrations at or above the NAAQS are not the expected natural condition for a park and could result in a non-attainment designation for a park unit, reflecting unacceptable and polluted air. However, pollutant concentrations below the NAAQS can also have substantial effects on park resources and human health. The EPA has developed an AQI that correlates criteria pollutant concentrations to associated health concern categories. The NPS used the AQI in combination with the PRB concentration for each pollutant to develop the air quality intensity definitions shown in table 44 (NPS 2011a). The PRB concentration represents the natural background plus human pollution from transport outside North America. The air quality intensity definitions reflect the importance of maintaining excellent air quality in parks, not merely complying with the NAAQS. Even concentrations at 80 percent of the NAAQS are considered a major impact.

TABLE 44: AIR QUALITY INTENSITY DEFINITIONS

Impact level	1-hr Carbon Monoxide (ppm)	8-hr Carbon Monoxide (ppm)	24-hr PM_{10} ($\mu g/m^3$)	24-hr $PM_{2.5}$ ($\mu g/m^3$)	1-hr Nitrogen Dioxide (ppb)
Negligible	0–0.2	0–0.2	0–11	0–5	0–1
Minor	0.3–17.5	0.3–4.4	12–77	6–20	2–49
Moderate	17.6–27.9	4.5–7.1	78–119	21–28	50–79
Major	28.0–35.0	7.2–9.0	120–150	29–35	79–100

Source: Technical Guidance on Assessing Impacts to Air Quality in NEPA and Planning Documents (NPS 2011a).

A negligible impact is defined as the range of concentrations for each pollutant that is the highest estimated PRB concentration, as determined by the EPA in its criteria pollutant documents and pollutant assessments. Concentrations in this range are indistinguishable from variations in the background concentrations that are of natural and long-range transport origin. The minor impact level follows the AQI scale and corresponds to concentrations from the PRB up to an additional 50 percent of the difference between the PRB and the NAAQS. The moderate impact level is from 51 to 79 percent of the NAAQS. The major impact level in table 44 corresponds to 80 to 100 percent of the NAAQS for each pollutant. The EPA often uses 80 percent as a threshold warning for approaching the NAAQS.

Qualitative visibility impact thresholds are defined separately from the air quality definitions (table 45).

TABLE 45: VISIBILITY INTENSITY DEFINITIONS

Impact Level	Description
Negligible	No perceptible visibility impacts are likely (no visible smoke, plume, or haze).
Minor	Perceptible visibility impacts occur, but are only visible from a small area of the park, are of short duration (less than one day per year) and are visible to only a few park visitors on the days that they occur.
Moderate	Perceptible visibility impacts occur and are visible from several areas of the park, occur between one and several days per year, and many park visitors may observe them on the days that they occur.
Major	Perceptible visibility impacts occur and are visible from many areas of the park, occur many days over the course of a year, or are visible to a majority of park visitors on the days that they occur.

Source: Technical Guidance on Assessing Impacts to Air Quality in NEPA and Planning Documents (NPS 2011a).

Study Area

The study area for the assessment of the various alternatives is the park. The study area for the cumulative impacts analysis is the park plus the lands adjacent to the park boundaries.

Criteria Pollutant Concentrations

Tables 46 and 47 show the maximum predicted 1- and 8-hour average CO concentrations for each of the action alternatives. The modeling results indicate that winter use vehicle emissions would not result in any exceedance of the CO NAAQS, or Montana's stricter 1-hr CO standard of 23 ppm, under any of the alternatives. The maximum predicted 1-hour CO concentrations are above background levels, but less than 50 percent of the difference between background levels and the NAAQS, resulting in minor impacts under any of the alternatives. The maximum predicted 8-hour CO concentrations are in the minor range for all alternatives, except for alternatives 1 and 4b, which result in negligible impacts.

TABLE 46: MAXIMUM PREDICTED 1-HOUR CARBON MONOXIDE (CO) CONCENTRATIONS (IN PPM)

Alternative	Fleet Assumption	Site 1: West Entrance	Site 2: West Entrance to Madison	Site 3: Canyon to Fishing Bridge	Site 4: Old Faithful Staging Area	Maximum Impact
Alternative 1: No Action - No Snowmobile/Snowcoach Use	Administrative Use, Current Fleet	0.5	0.5	0.2	0.2	Minor
Alternative 2: Continue Snowmobile/Snowcoach Use at 2012/2013 Winter Season Interim Regulation Limits	**2a** - Current Fleet, 318 snowmobiles and 78 snowcoaches	11.2	1.0	0.3	0.3	Minor
	2b - 318 snowmobiles and 78 BAT Snowcoaches	10.3	0.8	0.3	0.3	Minor
Alternative 3: Transition to Snowcoaches Meeting BAT Requirements Only	120 BAT Snowcoaches, No Snowmobiles (modeling scenario 3b)	0.7	0.9	0.3	0.2	Minor
Alternative 4: Manage OSV Use by Transportation Events (110 Events)	**4a** - 480 New BAT Snowmobiles, 60 BAT Snowcoaches	9.2	0.5	0.2	0.3	Minor
	4b - 20 New BAT Snowmobiles, 106 BAT Snowcoaches	0.6	0.9	0.3	0.2	Minor
	4c - 480 E-BAT Snowmobiles and 120 BAT Snowcoaches	6.3	0.9	0.3	0.2	Minor
	4d - 20 New BAT Snowmobiles, 212 BAT Snowcoaches	0.7	1.6	0.3	0.2	Minor

Note: The 1-hour NAAQS for CO is 35 ppm and the stricter Montana state standard is 23 ppm.

TABLE 47: MAXIMUM PREDICTED 8-HOUR CARBON MONOXIDE (CO) CONCENTRATIONS (IN PPM)

Alternative	Fleet Assumption	Site 1: West Entrance	Site 2: West Entrance to Madison	Site 3: Canyon to Fishing Bridge	Site 4: Old Faithful Staging Area	Maximum Impact
Alternative 1: No Action - No Snowmobile/Snowcoach Use	Administrative Use, Current Fleet	0.2	0.2	0.2	0.2	Negligible
Alternative 2: Continue Snowmobile/Snowcoach Use at 2012/2013 Winter Season Interim Regulation Limits	**2a** - Current Fleet, 318 snowmobiles and 78 snowcoaches	1.6	0.3	0.2	0.2	Minor
	2b - 318 snowmobiles and 78 BAT Snowcoaches	1.5	0.2	0.2	0.2	Minor
Alternative 3: Transition to Snowcoaches Meeting BAT Snowcoaches Requirements Only	120 BAT Snowcoaches, No Snowmobiles (modeling scenario 3b)	0.2	0.3	0.2	0.2	Minor
Alternative 4: Manage OSV Use by Transportation Events (110 Events)	**4a** - 480 New BAT Snowmobiles, 60 BAT Snowcoaches	1.4	0.2	0.2	0.2	Minor
	4b - 20 New BAT Snowmobiles, 106 BAT Snowcoaches	0.2	0.2	0.2	0.2	Negligible
	4c - 480 E-BAT Snowmobiles and 120 BAT Snowcoaches	1.1	0.3	0.2	0.2	Minor
	4d - 20 New BAT Snowmobiles, 212 BAT Snowcoaches	0.2	0.4	0.2	0.2	Minor

Note: The 8-hour NAAQS for CO is 9 ppm.

Table 48 shows the maximum predicted 1-hour NO_2 concentrations for each of the alternatives. For all alternatives, the modeling results indicate that the maximum 1-hour NO_2 concentrations would be well below the NAAQS, except for 4a and 4c, as discussed below. For alternatives 1, 2a, 2b, 3, 4b, and 4d the predicted maximum NO_2 concentrations would fall in the category of a minor impact (above background levels, but less than 50 percent of the difference between background levels and the NAAQS). There would be moderate impacts under alternatives 4a and 4c.

Table 49 shows the maximum predicted 24-hour $PM_{2.5}$ concentrations for each of the alternatives. The modeling results indicate that no winter use vehicle emissions from any of the alternatives would result in exceedances of the 24-hour $PM_{2.5}$ NAAQS. Under all alternatives, 24-hour $PM_{2.5}$ concentrations would be in the range of background concentrations (negligible impacts).

TABLE 48: MAXIMUM PREDICTED 1-HOUR NITROGEN DIOXIDE (NO_2) CONCENTRATIONS (IN PPB)

Alternative	Fleet Assumption	Site 1: West Entrance	Site 2: West Entrance to Madison	Site 3: Canyon to Fishing Bridge	Site 4: Old Faithful Staging Area	Maximum Impact
Alternative 1: No Action - No Snowmobile/Snowcoach Use	Administrative Use, Current Fleet	9	11	4	0.4	Minor
Alternative 2: Continue Snowmobile/Snowcoach Use at 2012/2013 Winter Season Interim Regulation Limits	2a - Current Fleet, 318 snowmobiles and 78 snowcoaches	31.7	49.2	14.1	0.6	Minor
	2b - 318 snowmobiles and 78 BAT Snowcoaches	24.5	44.5	13.1	0.5	Minor
Alternative 3: Transition to Snowcoaches Meeting BAT Requirements Only	120 BAT Snowcoaches, No Snowmobiles (modeling scenario 3b)	19.3	16.9	6.0	0.5	Minor
Alternative 4: Manage OSV Use by Transportation Events (110 Events)	4a - 480 New BAT Snowmobiles, 60 BAT Snowcoaches	34.5	69.7	20.7	0.5	Moderate
	4b - 20 New BAT Snowmobiles, 106 BAT Snowcoaches	11.7	21.7	7.0	0.4	Minor
	4c - 480 E-BAT Snowmobiles and 120 BAT Snowcoaches	34.0	50.7	15.0	0.5	Moderate
	4d - 20 New BAT Snowmobiles, 212 BAT Snowcoaches	21.7	29.8	7.0	0.5	Minor

Note: The NAAQS for NO_2 is 100 ppb, for the 1-hour averaging period.

TABLE 49: MAXIMUM PREDICTED 24-HOUR $PM_{2.5}$ CONCENTRATIONS (IN $\mu G/M^3$)

Alternative	Fleet Assumption	Site 1: West Entrance	Site 2: West Entrance to Madison	Site 3: Canyon to Fishing Bridge	Site 4: Old Faithful Staging Area	Maximum Impact
Alternative 1: No Action - No Snowmobile/Snowcoach Use	Administrative Use, Current Fleet	1.4	1.4	1.4	1.4	Negligible
Alternative 2: Continue Snowmobile/Snowcoach Use at 2012/2013 Winter Season Interim Regulation Limits	**2a** - Current Fleet, 318 snowmobiles and 78 snowcoaches	2.0	1.4	1.4	1.4	Negligible
	2b - 318 snowmobiles and 78 BAT Snowcoaches	1.7	1.4	1.4	1.4	Negligible
Alternative 3: Transition to Snowcoaches Meeting BAT Requirements Only	120 BAT Snowcoaches, No Snowmobiles (modeling scenario 3b)	1.4	1.4	1.4	1.4	Negligible
Alternative 4: Manage OSV Use by Transportation Events (110 Events)	**4a** - 480 New BAT Snowmobiles, 60 BAT Snowcoaches	2.6	1.5	1.4	1.5	Negligible
	4b - 20 New BAT Snowmobiles, 106 BAT Snowcoaches	1.5	1.4	1.4	1.4	Negligible
	4c - 480 E-BAT Snowmobiles and 120 BAT Snowcoaches	2.8	1.5	1.4	1.5	Negligible
	4d - 20 New BAT Snowmobiles, 212 BAT Snowcoaches	1.5	1.4	1.4	1.4	Negligible

Note: The NAAQS for $PM_{2.5}$ is 35 micrograms per cubic meter ($\mu g/m^3$), for the 24-hour averaging period.

Prevention of Significant Deterioration Increment Analysis

Since Yellowstone is a Class I area, PM_{10} PSD increment consumption was assessed. For Class I areas, the PM_{10} PSD increment is 8 micrograms per cubic meter for the 24-hour averaging period, which the EPA has determined to be the largest "allowable" incremental increase for PM_{10} in these areas. This increment is evaluated in reference to the previously established baseline date of 1979 for Yellowstone (NPS 2000c), which was used to determine baseline concentrations. For this study, a screening level approach was employed in comparing predicted PM_{10} increments (no background contribution) with estimated 1979 baseline concentrations to determine the increment for the alternatives.

Snowmobile traffic in the park increased from 1979 until the early 2000s and then decreased to levels less than those from the late 1970s, whereas snowcoach travel has seen a steady increase, almost doubling in 10 years. It is expected that the BAT snowmobiles required by the proposed alternatives would generally result in a net decrease in 24-hour PM_{10} levels compared to the established baseline data. The 1979 baseline levels were estimated as part of the final 2007 Yellowstone Winter Use Plan EIS. The methodology used to develop the 1979 baseline levels involved adjusting 1999 Historical Conditions Scenario modeled PM_{10} levels based on the maximum daily snowmobile levels (from Yellowstone entry records) for 1979 and 1999. Because the methodology employed in this study is a

screening-level analysis, it is not intended for regulatory purposes and does not constitute a regulatory PSD increment consumption analysis. Typically, detailed analysis would be required if concentrations are near or "consume" the allowable Class I PM_{10} PSD increment.

The predicted 24-hour PM_{10} PSD increment consumption values are shown in table 50 for each of the alternatives. The PSD increment is below the applicable PSD increment threshold of 8 micrograms per cubic meter for all alternatives and analysis sites. Therefore, further detailed analysis of PM_{10} increment consumption is not required.

TABLE 50: 24-HOUR PM_{10} PSD INCREMENT CONSUMPTION IN MICROGRAMS PER CUBIC METER ($\mu G/M^3$)

Alternative	Fleet Assumption	Site 1: West Entrance	Site 2: West Entrance to Madison	Site 3: Canyon to Fishing Bridge	Site 4: Old Faithful Staging Area
Alternative 1: No Action - No Snowmobile/Snowcoach Use	Administrative Use, Current Fleet	0.01	0.01	0.00	0.01
Alternative 2: Continue Snowmobile/Snowcoach Use at 2012/2013 Winter Season Interim Regulation Limits	**2a** - Current Fleet, 318 snowmobiles and 78 snowcoaches	0.60	0.04	0.02	0.04
	2b - 318 snowmobiles and 78 BAT Snowcoaches	0.32	0.04	0.02	0.04
Alternative 3: Transition to Snowcoaches Meeting BAT Requirements Only	120 BAT Snowcoaches, No Snowmobiles (modeling scenario 3b)	0.04	0.00	0.00	0.01
Alternative 4: Manage OSV Use by Transportation Events (110 Events)	**4a** - 480 New BAT Snowmobiles, 60 BAT Snowcoaches	1.20	0.05	0.03	0.05
	4b - 20 New BAT Snowmobiles, 106 BAT Snowcoaches	0.05	0.00	0.00	0.01
	4c - 480 E-BAT Snowmobiles and 120 BAT Snowcoaches	1.35	0.05	0.03	0.05
	4d - 20 New BAT Snowmobiles, 212 BAT Snowcoaches	0.08	0.00	0.00	0.01
1999 Historical Unregulated Scenario	N/A	191.47	40.18	5.85	3.76
PSD Baseline Year: 1979 Historical Condition	N/A	42.46	8.91	1.13	0.72

Note: Baseline year concentrations are based on the ratio of 1979 to 1999 snowmobile levels at the modeling locations. Class I PSD Increment for 24-hour average PM_{10} is 8 $\mu g/m^3$.

Emissions Inventory

The total maximum potential winter season emissions in the park in tons per winter season are shown for each action alternative in table 51.

TABLE 51: PARKWIDE TOTAL WINTER SEASON MOBILE SOURCE EMISSIONS

Alternative	Fleet Assumption	Carbon Monoxide (CO)		Hydrocarbon		Nitrogen Oxides (NO_x)		Particulate Matter (PM)	
		lb/day	tpy	lb/day	tpy	lb/day	tpy	lb/day	tpy
Alternative 1: No Action - No Snowmobile/Snowcoach Use	Administrative Use, Current Fleet	502	23	20	1	108	5	0.3	0.02
Alternative 2: Continue Snowmobile/Snowcoach Use at 2012/2013 Winter Season Interim Regulation Limits	**2a** - Current Fleet, 318 snowmobiles and 78 snowcoaches	3,299	148	150	7	873	39	3	0.11
	2b - 318 snowmobiles and 78 BAT Snowcoaches	2,827	127	90	4	805	36	2	0.11
Alternative 3: Transition to Snowcoaches Meeting BAT Requirements Only	120 BAT Snowcoaches, No Snowmobiles (modeling scenario 3b)	2,852	128	28	1	272	12	1	0.03
Alternative 4: Manage OSV Use by Transportation Events (110 Events)	**4a** – 480 New BAT Snowmobiles, 60 BAT Snowcoaches	1,311	59	20	1	1,227	55	3	0.15
	4b - 20 New BAT Snowmobiles, 106 BAT Snowcoaches	2,247	101	13	1	326	15	1	0.03
	4c - 480 E-BAT Snowmobiles and 120 BAT Snowcoaches	2,861	129	20	1	891	40	3	0.15
	4d - 20 New BAT Snowmobiles, 212 BAT Snowcoaches	5,233	235	18	1	413	19	1	0.03

All of the action alternatives would result in substantially greater emissions than the no-action alternative. Of the action alternatives, alternative 4a generally has the lowest CO emissions, while alternative 4d has the highest CO emissions. Alternative 2 would have substantially higher hydrocarbon emissions relative to the other action alternatives because it does not include New BAT or E-BAT standards for snowmobiles. NOx and PM emissions would be highest under analysis condition 4a, and lowest under alternative 3. The PM emissions of alternatives 4b and 4d would be similar to alternative 3.

Hazardous Air Pollutant Emissions

Total winter season mobile source emissions of HAPs for the action alternatives are summarized in table 52. HAP emissions, such as benzene, would be highest under alternative 2 and lowest under alternative 4. There is very little variation in HAP emissions between the different distributions of transportation events under alternative 4.

TABLE 52: PARKWIDE TOTAL WINTER SEASON MOBILE SOURCES HAPS EMISSIONS

Alternative	Fleet Assumption	Benzene (tpy)	1-3 Butadiene (tpy)	Formaldehyde (tpy)	Acetaldehyde (tpy)
Alternative 1: No Action - No Snowmobile/Snowcoach Use	Administrative Use, Current Fleet	0.03	0.00	0.02	0.01
Alternative 2: Continue Snowmobile/Snowcoach Use at 2012/2013 Winter Season Interim Regulation Limits	**2a** - Current Fleet, 318 snowmobiles and 78 snowcoaches	0.21	0.02	0.15	0.06
	2b - 318 snowmobiles and 78 BAT Snowcoaches	0.11	0.00	0.11	0.04
Alternative 3: Transition to Snowcoaches Meeting BAT Requirements Only	120 BAT Snowcoaches, No Snowmobiles (modeling scenario 3b)	0.04	0.00	0.03	0.01
Alternative 4: Manage OSV Use by Transportation Events (110 Events)	**4a** - 480 New BAT Snowmobiles, 60 BAT Snowcoaches	0.03	0.00	0.02	0.01
	4b - 20 New BAT Snowmobiles, 106 BAT Snowcoaches	0.02	0.00	0.01	0.00
	4c - 480 E-BAT Snowmobiles and 120 BAT Snowcoaches	0.03	0.00	0.02	0.01
	4d - 20 New BAT Snowmobiles, 212 BAT Snowcoaches	0.03	0.00	0.02	0.01

Note: Four-stroke snowmobile HAPs estimated as a fraction of measured hydrocarbon emissions based on data reported in SwRI's Laboratory Testing of Snowmobile Emissions, Lela and White, July 2002.

Snowcoach HAPs were estimated as a fraction of hydrocarbon emissions based on MOBILE6.2 modeling of hydrocarbon and air toxics emission factors for light- and heavy-duty vehicles.

Visibility

As described above under Visibility Impacts, potential visibility impacts for each alternative were assessed using the EPA recommended screening model VISCREEN assuming worst-case meteorological conditions. The results of the VISCREEN modeling showed no potential for perceptible visibility impacts under any of the action alternatives. Therefore, further detailed analysis of visibility impacts was not warranted.

SUMMARY OF IMPACTS

This section summarizes the impact analysis results for each alternative and provides conclusions regarding the effects of each alternative on air quality and visibility. The air quality impacts for each alternative are representative of the maximum level of impact that could result from emissions of CO, NO_2 and $PM_{2.5}$. This section is followed by the detailed impact analysis of each alternative.

- Limited administrative OSV use under alternative 1 would have long-term minor adverse impacts. There would be no exceedances of the NAAQS. No perceptible visibility impacts would be likely, resulting in long-term negligible adverse impacts.
- Alternative 2 would result in long-term minor adverse impacts on air quality and there would be no exceedances of the NAAQS before, during and after the transition to the requirement for BAT snowcoaches. No perceptible visibility impacts would be likely, resulting in long-term negligible adverse impacts. Overall, alternative 2 would have greater adverse impacts to air quality than alternative 1, due to the fact that OSV would be authorized for visitors.
- Alternative 3 would result in long-term minor adverse impacts on air quality before, during, and after the transition to BAT snowcoaches only. There would be no exceedances of the NAAQS. No perceptible visibility impacts would be likely, resulting in long-term negligible adverse impacts under all modeling scenarios. Overall, alternative 3 would have greater adverse impacts to air quality than alternative 1, due to the fact that OSV use would be allowed for park visitors, but would have less of an impact to air quality than alternative 2 because it would allow a lower number of transportation events and the eventual transition to snowcoaches only would result in a reduction of all criteria pollutants.
- The impact of alternative 4 would vary between negligible adverse and minor adverse for 1-hour CO, 8-hour CO, and 24-hour $PM_{2.5}$ depending on the allocation of transportation events. There would be no exceedances of the NAAQS. Alternative 4 would have long-term moderate adverse impacts on air quality as a result of the predicted maximum 1-hour NO_2 concentrations under conditions 4a and 4c (the analysis scenarios where transportation event allocations are used to maximize the number of snowmobile entries) at the West Entrance only. No perceptible visibility impacts would be likely, resulting in long-term negligible adverse impacts under all alternatives. Overall, alternative 4 would have greater adverse impacts to air quality than alternative 1, due to the fact that OSV use would be allowed for park visitors, but would have less of an impact to air quality than alternative 2 because it would allow a lower number of transportation events, and the BAT requirements along with voluntary E-BAT standards would result in a criteria pollutants similar to or less than alternative 2.

DETAILED IMPACT ANALYSIS

Impacts of Alternative 1: No Action - No Snowmobile/Snowcoach Use

Limited administrative OSV use under alternative 1 would have long-term minor adverse impacts on air quality as a result of the predicted maximum 1-hour CO, 8-hour CO and 1-hour NO_2 concentrations of 3.4 ppm, 1.0 ppm and 7.3 ppb, respectively. No exceedances of the NAAQS would occur. No perceptible visibility impacts would be likely, resulting in long-term negligible adverse impacts.

Cumulative Impacts

Past, present, and reasonably foreseeable future actions that have the potential to impact air quality are summarized below. Substantial impacts on air quality and visibility in the park are not expected due to the protections granted under the CAA as a Class I area. The impacts of past, present, and reasonably foreseeable future actions, combined with the long-term negligible impacts of alternative 1, would result in long-term minor adverse impacts on air quality. Under alternative 1, the past, present, and reasonably foreseeable future actions would be the primary contributors to the cumulative impacts. The contribution of the low levels of administrative OSV use under this alternative to overall cumulative impacts would be minimal.

Wheeled-vehicle and OSV use outside the boundaries of the park has the potential to impact regional winter season air quality, including the background pollutant levels in the park. Unlike in Yellowstone, the use of BAT snowmobiles (which result in lower CO and hydrocarbon emissions) is not required on adjacent federal lands. Future trends in the emissions from wheeled vehicles and OSVs operating outside the park will be influenced by the travel management plans of the adjacent national forests. The potential implications of two such travel plans are summarized below—the Gallatin National Forest Travel Plan Revision and the Beartooth District of Custer National Forest Travel Management Plan.

Gallatin National Forest is adjacent to Yellowstone's northern border and part of its western border. The 2006 Record of Decision (ROD) for the Gallatin National Forest Travel Plan Revision decreased the area of the Gallatin National Forest open to snowmobile use (outside of wilderness areas) from 84 percent to about 55 percent (USFWS 2006). Snowmobile routes would be concentrated in the areas surrounding West Yellowstone and Cooke City. The final EIS for the Gallatin National Forest Travel Plan Revision concluded that air quality was not a significant issue for the evaluation of the travel plan alternatives and that no violations of the Montana ambient air quality standards or NAAQS would occur (USFS 2006). Therefore, it can be concluded that the impacts of the Gallatin Travel Plan on air quality in Yellowstone would be long-term negligible adverse because it would be less than the effect within Gallatin National Forest itself.

The Beartooth District of Custer National Forest is adjacent to the northeast corner of Yellowstone. A (ROD) for the Beartooth District Travel Management Plan was issued in 2008 (USFWS 2008b). The travel management plan addressed motorized vehicle routes, but OSV regulations were explicitly excluded from the scope of the plan. As a result, OSV use in the Beartooth District remains regulated by a 1986 Forest Plan. OSV use in the small portion of the Beartooth District around Cooke City is administered by the Gallatin National Forest Travel Plan Revision described previously. The 2008 final EIS for the travel management plan concluded that air quality in the Beartooth District would continue to be well under the NAAQS for the following reasons: "(1) good dispersion characteristics across the District, (2) low inversion potential across the District, (3) low emissions from vehicles relative to other potential sources, and 4) reduced or equivalent route miles open to motorized vehicles under all alternatives compared to the existing condition" (USFS 2008b). In addition, the park is generally upwind from the Beartooth District. Therefore, it can be concluded that the impact of the Beartooth District Travel Management Plan on air quality in the park would be long-term negligible adverse because it would be less than the effect within the Beartooth District itself.

Parts of Wyoming and Montana are experiencing record amounts of oil and gas leasing. The pollutant emissions generated by oil and gas drilling include NO_x and SO_2. The emissions from oil and gas drilling can contribute to ozone formation and visibility impacts. Long-term minor adverse impacts on air quality and visibility from oil and gas development in the region can reasonably be expected. Oil and gas development is considered the largest "threat" to air quality in the greater Yellowstone area by

the Greater Yellowstone Clean Air Partnership (GYC 2005). Specific areas where oil and gas development is concentrated include the Pinedale Anticline and Jonah II natural gas fields near Pinedale, Wyoming (GYC 2005).

The most recent environmental analysis conducted by the Bureau of Land Management for oil and gas development in the Pinedale Anticline is provided in the 2008 Pinedale Anticline Project Area Supplemental Environmental Impact Statement (BLM 2008a). The Bureau of Land Management approved up to 600 additional well pads and 4,399 wells in the Pinedale Anticline (BLM 2008b). The air quality analyses conducted for the Pinedale Anticline SEIS concluded that there would be no exceedances of the NAAQS or the applicable PSD increments in the analyzed Class I areas, including Yellowstone. This conclusion remained true even in modeling of a cumulative impacts scenario that included other major industrial sources in the region (BLM 2008c).

In terms of visibility impacts, the Pinedale Anticline SEIS analysis predicted a maximum of three days per year where visibility in Yellowstone would change by 0.5 deciview (approximately a 5 percent change in light extinction) or more taking into account the cumulative emissions of the Pinedale Anticline development, other emissions sources and IMPROVE network background levels. Based on the direct impacts of the Pinedale Anticline development alone, no exceedances of 0.5 deciview were predicted. The analysis is based on 98th percentile values in accordance with Federal Land Managers' Air Quality Related Values Work Group (FLAG) guidance. The Bureau of Land Management analysis results show that the Pinedale Anticline development would not result in adverse visibility impacts in Yellowstone based on the FLAG thresholds for Class I areas (0.5 deciview change for direct impacts and 1.0 deciview change for cumulative impacts).

Another trend with the potential to result in more development is the consolidation of lands in 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 to occur there, with consequent effects on traffic and air quality (NPS 2007c). Population and employment growth in the Yellowstone region affects winter season air quality through emissions from woodstoves, furnaces, industrial point sources (including power plants and oil refineries), on-road vehicles, and off-road recreational vehicles. The major emissions from woodstoves include PM, CO, VOC, and NO_x (USEPA 1995). These same pollutants are also emitted by on-road vehicles and off-road recreational vehicles in the winter. Daily vehicle miles traveled on state highways in Park County and Teton County, Wyoming for 2008 were estimated at 587,627 and 622,770, respectively (WDOT 2008). There is insufficient information available to develop a cumulative emissions scenario taking into account all future emissions from population and employment growth in the region. However, given the existing air quality in the area and increasing emissions standards for both mobile and point sources that will lower pollutant emissions, the impacts of these actions on air quality in the park are considered to be long-term minor adverse.

Conclusion

The effects of alternative 1 on air quality and visibility would be long-term minor adverse. Cumulative impacts would result in long-term minor adverse impacts on air quality.

Impacts of Alternative 2: Continue Snowmobile/Snowcoach Use at 2012/2013 Winter Season Interim Regulation Limits

Alternative 2 would allow for a mix of snowmobiles and snowcoaches at use levels allowed between 2009 and 2013, but would require snowcoaches to become BAT. Before, during, and after the transition to BAT snowcoaches, alternative 2 would result in long-term minor adverse impacts on air quality. Before the transition to BAT snowcoaches (alternative 2a), the predicted maximum 1-hour CO, 8-hour CO, and 1-hour NO_2 concentrations would be 11.2 ppm, 1.6 ppm, and 49.2 ppb, respectively. After the transition to BAT snowcoaches (alternative 2b), the predicted maximum 1-hour CO, 8-hour CO, and 1-hour NO_2 concentrations would be 10.3 ppm, 1.5 ppm, and 44.5 ppb, respectively. No exceedances of the NAAQS would occur before, during, or after the transition to BAT snowcoaches. No perceptible visibility impacts would be likely, resulting in long-term negligible adverse impacts before, during, and after the transition to BAT snowcoaches.

Cumulative Impacts

Impacts on air quality from other past, present, and reasonably foreseeable future actions would be the same as described for alternative 1. These impacts are a result of generators outside the park's boundaries, such as wheeled vehicle and OSV use outside the park, activities from oil and gas leasing, and the consolidation of lands in the Gallatin National Forest. The implementation of other management plans that address motorized uses such as the Gallatin National Forest Travel Management Plan and the Beartooth District of Custer National Forest Travel Management Plan also would impact air quality in the region. The effects of these actions, when combined with the long-term minor adverse impacts of alternative 2, would result in long-term minor adverse cumulative impacts on air quality.

Conclusion

Alternative 2 would have long-term minor adverse impacts on air quality before and after the transition to BAT snowcoaches. Alternative 2 would have long-term negligible adverse effects on visibility, before, during, and after the transition to BAT snowcoaches. There would be long-term minor adverse cumulative impacts on air quality and visibility.

Impacts of Alternative 3: Transition to Snowcoaches Meeting BAT Requirements Only

Before, during, and after the transition to BAT snowcoaches only, alternative 3 would result in long-term minor adverse impacts on air quality. Before the start of the transition, criteria pollutants would be the same as described above for modeling scenario 2a. After the transition to BAT snowcoaches only, the predicted maximum 1-hour CO, 8-hour CO, and 1-hour NO_2 concentrations would be 0.9 ppm, 0.3 ppm, and 19.3 ppb, respectively. There would be no exceedances of the NAAQS. No perceptible visibility impacts would be likely, resulting in long-term negligible adverse impacts before, during, and after the transition to BAT snowcoaches.

Cumulative Impacts

Impacts on air quality from other past, present, and reasonably foreseeable future actions would be the same as described for alternative 1. These impacts are a result of generators outside the park's boundaries, such as wheeled vehicle and OSV use outside the park, activities from oil and gas leasing, and the consolidation of lands in the Gallatin National Forest. The implementation of other management plans that address motorized uses such as the Gallatin National Forest Travel Management Plan and the Beartooth District of Custer National Forest Travel Management Plan also

would impact air quality in the region. The effects of these actions, when combined with the long-term minor adverse impacts of alternative 3, would result in long-term minor adverse cumulative impacts on air quality.

Conclusion

The effects of alternative 3 on air quality would be long-term minor adverse. The effect of alternative 3 on visibility would be long-term negligible adverse. Cumulative impacts on air quality and visibility would be long-term minor adverse.

Impacts of Alternative 4: Manage OSV Use by Transportation Events

The impact of alternative 4 would vary between negligible adverse and minor adverse for 1-hour CO, 8-hour CO, and 24-hour $PM_{2.5}$ depending on the allocation of transportation events. There would be no exceedances of the NAAQS. Alternative 4 would have long-term moderate adverse impacts on air quality as a result of the predicted maximum 1-hour NO_2 concentrations under conditions 4a and 4c (the analysis scenarios where transportation event allocations would be used to maximize the number of snowmobile entries). This would be the condition at the West Entrance to Madison only. If snowcoach entries were maximized (conditions 4b and 4d), there would be long-term minor adverse impacts on air quality. The greatest air quality impact would occur under alternative 4a where the predicted maximum 1-hour CO, 8-hour CO, and 1-hour NO_2 concentrations would be 9.2 ppm, 1.4 ppm, and 69.7 ppb, respectively. The smallest air quality impact would occur under alternative 4b where the predicted maximum 1-hour CO, 8-hour CO, and 1-hour NO_2 concentrations would be 0.9 ppm, 0.2 ppm, and 21.7 ppb, respectively. The impact of alternative 4 could vary between minor adverse and moderate adverse season to season depending on the allocation of transportation events. No perceptible visibility impacts would be likely, resulting in long-term negligible adverse impacts under all analysis conditions.

Cumulative Impacts

Impacts on air quality from other past, present, and reasonably foreseeable future actions would be the same as described for alternative 1. These impacts are a result of generators outside the park's boundaries, such as wheeled-vehicle and OSV use outside the park, activities from oil and gas leasing, and the consolidation of lands in the Gallatin National Forest. Implementation of other management plans that address motorized uses such as the Gallatin National Forest Travel Management Plan and the Beartooth District of Custer National Forest Travel Management Plan also would impact air quality in the region. The effects of these actions, when combined with the long-term minor to moderate adverse impacts of alternative 4, would result in long-term minor to moderate adverse cumulative impacts on air quality.

Conclusion

The effects of alternative 4 on air quality would be long-term minor except for predicted maximum 1-hour NO_2 concentrations under conditions 4a and 4c (the analysis scenarios where transportation event allocations would be used to maximize the number of snowmobile entries) at one site that would result in long-term moderate adverse impacts. All other sites would have minor long-term adverse impacts. The effect of alternative 4 on visibility would be long-term negligible adverse. Cumulative impacts on air quality and visibility would be long-term minor to moderate adverse.

SOUNDSCAPES AND THE ACOUSTIC ENVIRONMENT

GUIDING REGULATIONS AND POLICIES

The acoustical environment is part of the physical resource that the NPS must conserve as a park "resource and value" under *NPS Management Policies 2006*, Section 1.4.6. Park resources and values include, "the park's scenery, natural and historic objects, and wildlife, and the processes and conditions that sustain them, including, to the extent present in the park: the ecological, biological, and physical processes that created the park and continue to act upon it; scenic features; natural visibility, both in daytime and at night; natural landscapes; natural soundscapes and smells; water and air resources; soils; geological resources; paleontological resources; archeological resources; cultural landscapes; ethnographic resources; historic and prehistoric sites, structures, and objects; museum collections; and native plants and animals." An intact natural soundscape enhances visitor experience and allows for natural functioning of wildlife communication.

Regarding general park soundscape management, NPS *Management Policies 2006*, Section 4.9 "Soundscape Management," requires that the NPS "preserve, to the greatest extent possible, the natural soundscapes of parks." Additionally, the NPS "will restore to the natural condition wherever possible those park soundscapes that have become degraded by the unnatural sounds (noise), and will protect natural soundscapes from unacceptable impacts" (NPS 2006a, Section 4.9). Director's Order 47: Soundscape Preservation and Management, was developed to emphasize NPS policies "that will require, to the fullest extent practicable, the protection, maintenance, or restoration of the natural soundscape resource in a condition unimpaired by inappropriate or excessive noise sources." This director's order also directs park managers to measure acoustic conditions, differentiate existing or proposed human-made sounds that are consistent with park purposes, set acoustic goals based on the sounds deemed consistent with the park purpose, and determine which noise sources are impacting the parks (NPS 2000d).

SOUNDSCAPES TERMINOLOGY

Refer to "Chapter 3: Affected Environment" or appendix F for background information on the units used to measure sounds (A-weighted decibels (dBA)) and metrics such as percent time audible and L_{eq} (the constant sound level that conveys the same energy as the variable sound levels during the analysis period). Several examples of sound pressure levels in the dBA scale are listed in table 26 in chapter 3, including typical sounds found in Yellowstone.

METHODOLOGY

The NPS Natural Sounds and Night Skies Division conducted acoustic modeling to evaluate the potential impacts of the alternatives on natural soundscapes. A brief overview of the modeling methodology and assumptions is provided below. For additional detailed technical information, refer to the soundscapes modeling report available online at: http://www.nps.gov/yell/parkmgmt/winterusetechnicaldocuments.htm.

The acoustical modeling conducted by the Volpe National Transportation Systems Center for the final 2007 Winter Use Plan EIS used an adapted version of the Federal Aviation Administration's Integrated Noise Model. For the 2011 Winter Use Plan/EIS and this plan/SEIS the NPS adapted the Noise Model Simulation (NMSim) model for analysis of OSVs. NMSim computes the time history of noise as a mobile noise source passes by a receptor location.

Several basic model inputs developed for the final 2007 Yellowstone Winter Use Plan EIS were used for the NMSim analysis, including temperature, relative humidity, snow cover, and natural ambient sound levels. The modeling accounts for the acoustic effects of topography, OSV speeds, and OSV group size. The alternatives were modeled assuming the appropriate snowcoach and snowmobile BAT sound level limits. The maximum numbers of snowmobiles and snowcoaches allowed under each alternative were allocated to specific link segments throughout the day. The modeling includes the noise generated by administrative vehicles. The modeling framework excludes certain factors such as the effects of vegetation and inversions.

The NMSim outputs were processed with statistical software to generate maps and summary data for the approximately 40,000 locations that were modeled to evaluate the spatial spread of noise throughout the park. The analysis focused on four key indicators of OSV noise effects:

Percent Time Audible—Percent time audible is a measure of the length of time during a 8-hour day (8:00 a.m. to 4:00 p.m.) that OSV vehicles would be audible to humans with normal hearing at the specified location (regardless of the sound level). As discussed in "Chapter 3: Affected Environment," percent time audible constantly varies throughout the day. However, the percent time audible over a 8-hour day provides a useful metric for comparing the alternatives.

Audible Equivalent Sound Level (L_{eq})—Audible L_{eq} measures sound levels experienced at a location during the time that OSVs are audible. L_{eq} is the constant sound level that conveys the same energy as the variable sound levels during the analysis period. Audible L_{eq} differs from the typical calculation of L_{eq} in that it excludes time during which OSVs are not audible.

Peak 4—Peak 4 is the mean of the four loudest sustained sound levels experienced at a location. Peak 4 replaces the maximum sound level (L_{max}) indicator used in previous studies. The modeling interval was 5 seconds, so four values collectively compose at least 15 seconds of exposure. Peak 4 provides a robust indicator of the loudest events, while avoiding modeling anomalies.

Eight-hour Equivalent Sound Level (L_{eq})—The 8-hour L_{eq} accounts for the magnitude and duration of OSV sound over the 8:00 a.m. to 4:00 p.m. analysis period (including times when no OSV sounds are audible).

Minor modifications were made to the sound models between the draft plan/SEIS and this final plan/SEIS to address questions raised during public comment. These differences are detailed in table 53.

Study Area

The study area for assessment of the various alternatives is the park. The study area for the cumulative impacts analysis is the park plus the lands adjacent to the park boundaries.

Analysis Scenarios

Alternative 1 was modeled based on administrative OSV use only (no visitor OSV use). Administrative OSV use would continue under alternative 1, but at a reduced level compared to other alternatives because there would be minimal operations within the park. Administrative use was modeled at current levels. Since administrative use would likely decrease from current levels under alternative 1, the modeling results represent an upper bound of potential impacts.

Alternatives 2, 3, and 4 were modeled based on the maximum allowed level of OSV use each day of the winter season as described in chapter 2. Two fleet scenarios were modeled for alternative 2: 2a is the current fleet (prior to the full implementation of BAT for snowcoaches by 2017/2018) and 2b is the future BAT snowcoach fleet.

For alternative 3, the condition modeled assumed the complete transition to all BAT snowcoaches and no snowmobiles, known as modeling scenario 3b. Modeling scenario 3a would be identical to scenario 2a. The earlier years of alternative 3, prior to the transition to all snowcoaches, were assumed to be the same as alternative 2 (current fleet).

TABLE 53: ADDITIONAL CHANGES TO SOUNDSCAPE MODELING

	Draft SEIS Sound Models	Final SEIS Sound Models	Rationale for Change
Snowmobiles			
BAT input model	BAT effects modeled by adjusting standard snowmobile numbers (e.g., reducing snowmobile numbers by a factor of 10 to represent a 10 decibel (dB) reduction)	New BAT and E-BAT model input sources created by adjusting the standard snowmobile by the appropriate level	Using a dedicated source for BAT provides more accurate results, and greater flexibility in fleet mixture modeling
East Entrance Closure	East Entrance to Fishing Bridge was closed for administrative traffic	East Entrance to Fishing Bridge was closed for administrative traffic only for alternative 3A	Represents conditions more likely to exist under proposed alternatives
Modeling Software		Adjustments in the way audibility was calculated when audibility approached 0%	Raw model inputs use single vehicle metrics; more accurate low level inputs yield more accurate results for distant points
Snowcoaches			
Fleet Mixture		Changes in fleet mixture	More accurate mixture of snowcoach types
East Entrance Closure	East Entrance to Fishing Bridge was closed for administrative traffic	East Entrance to Fishing Bridge was closed for administrative traffic only for Alt 3A	Represents conditions more likely to exist under proposed alternatives
Modeling Software		Adjustments in the way audibility was calculated when audibility approached 0%	Raw model inputs use single vehicle metrics; more accurate low level inputs yield more accurate results for distant points

Four different modeling scenarios were used to represent the range of conditions that could occur under alternative 4:

- Alternative 4a assumes the maximum allowable number of transportation events for snowmobiles would be used (50 events). This means 480 snowmobiles and 60 snowcoaches would enter the park. Alternative 4a was analyzed for the future fleet mix of all BAT snowcoaches (75 dBA sound level limit) and new-BAT snowmobiles (67 dBA sound level limit).
- Alternative 4b assumes the maximum number of transportation events for snowcoaches would be used, which results in 0 commercially guided snowmobiles, 20 new-BAT non-commercially

guided snowmobiles, and 106 snowcoaches entering the park. Alternative 4b was modeled for the future fleet mix of all BAT snowcoaches.

- Alternative 4c is similar to alternative 4a, except the number of snowcoaches would be allowed to double from 60 to 120 assuming that voluntary E-BAT standards were met (e.g., 71 dBA sound level limit). The maximum number of snowmobiles would remain at 480. Alternative 4c was analyzed assuming a BAT fleet of snowcoaches and an E-BAT snowmobile fleet voluntarily quieter than required (e.g., 65 dBA sound level limit instead of 67 dBA). Alternative 4 provides an incentive to snowmobiles to meet the E-BAT requirement by allowing an increase in average group size.[3]
- Alternative 4d is similar to alternative 4b, except the number of snowcoaches would be allowed to double from 106 to 212 assuming that voluntary E-BAT was met (e.g., 71 dBA sound level limit). The number of commercially guided snowmobiles would remain 0 with 20 non-commercially guided snowmobiles. Alternative 4d was analyzed assuming a BAT fleet of snowcoaches and an E-BAT snowmobile fleet voluntarily quieter than required (e.g., 65 dBA sound level limit instead of 67 dBA).

INTENSITY DEFINITIONS

Separate intensity definitions based on the 8-hour L_{eq} metric were established for travel corridors and backcountry areas (table 54). Although natural quiet is important in both settings, the backcountry intensity definitions are more protective than the intensity definitions for the travel corridor. The intensity definitions are based on accepted noise standards and dose-response studies measuring visitor annoyance with vehicle noise in park settings. For a detailed discussion of the rationale for the soundscapes intensity definitions, refer to the soundscapes modeling report available online at: http://www.nps.gov/yell/parkmgmt/winterusetechnicaldocuments.htm.

TABLE 54: INTENSITY DEFINITIONS FOR SOUNDSCAPES

Impact Level	Travel Corridors	Backcountry
Negligible	8-hour L_{eq} < 15 dBA	8-hour L_{eq} < 5 dBA
Minor	8-hour L_{eq} ≥15 dBA and < 25 dBA	8-hour L_{eq} ≥5 dBA and < 15 dBA
Moderate	8-hour L_{eq} ≥ 25 dBA and 8-hour L_{eq} < 35 dBA	8-hour L_{eq} ≥ 15 dBA and 8-hour L_{eq} < 25 dBA
Major	8-hour L_{eq} ≥ 35 dBA	8-hour L_{eq} ≥ 25 dBA

In accordance with recommendations in the NPS VERP Handbook (NPS 1997) and other management guidance, the overall impact determinations for the park incorporate provisions for exceptions. An exception was incorporated into the intensity definitions. If less than 10 percent of the travel corridor or backcountry was within a given category, the overall conclusion for the alternative would drop to the next lower category. For example, if 5 percent of the travel corridor was in the major impact category and 6 percent was in the moderate impact category, the overall conclusion would be moderate impacts in the travel corridor.

[3] Note that because the soundscapes modeling is based on the highest possible daily OSV use levels (10 snowmobiles per group), the effect of changes in average group size over an entire winter season under alternative 4 is not accounted for, which would be 7 snowmobiles per group.

SUMMARY OF MODELING RESULTS

This section provides an overview of the soundscapes analysis results, including summary comparison tables for the action alternatives. Alternative-specific impact descriptions are provided in subsequent sections and include discussion of cumulative effects and the conclusions for each alternative.

Percent Time Audible

Percent time audible is a measure of the length of time during an eight-hour day (8:00 a.m. to 5:00 p.m.) that OSV would be audible to humans with normal hearing (regardless of the sound level). For example, 50 percent time audible means OSV sounds could potentially be heard in specified areas for 50 percent of the day, or four hours during an eight-hour day – not necessarily consecutive hours, but spaced throughout the day. Tables 55 and 56 summarize the percent time audible results for the travel corridor and backcountry areas, respectively.

TABLE 55: TRAVEL CORRIDOR PERCENT TIME AUDIBLE MODELING RESULTS

Alternative	Fleet Assumption	Percent of Travel Corridor by Percent Time Audible Categories				
		0% Time Audible	1 to 20% Time Audible	21 to 50% Time Audible	51 to 80% Time Audible	Over 80% Time Audible
Alternative 1: No Action - No Snowmobile/Snowcoach Use	Administrative Use, Current Fleet	32.1	52.8	14.3	0.8	0
Alternative 2: Continue Snowmobile/Snowcoach Use at 2012/2013 Winter Season Interim Regulation Limits	**2a** - Current Fleet, 318 snowmobiles and 78 snowcoaches	12.7	38.0	26.8	16.9	5.6
	2b - 318 snowmobiles and 78 BAT Snowcoaches	13.3	41.6	26.3	14.8	4
Alternative 3: Transition to Snowcoaches Meeting BAT Requirements Only	BAT Snowcoaches, No Snowmobiles (modeling scenario 3b)	27.7	32.6	20.9	13.6	5.2
Alternative 4a: Manage OSV Use by Transportation Events (480 snowmobiles/60 snowcoaches)	New BAT Snowmobiles, BAT Snowcoaches	15.7	42.6	25.7	13.3	2.7
Alternative 4b: Manage OSV Use by Transportation Events (20 snowmobiles/106 snowcoaches)	New BAT Snowmobiles, BAT Snowcoaches	17.1	41.0	24.9	13.7	3.3
Alternative 4c: Manage OSV Use by Transportation Events (480 snowmobiles, 120 snowcoaches)	E-BAT Snowmobiles and BAT Snowcoaches	15.1	46.8	24.6	11.5	2
Alternative 4d: Manage OSV Use by Transportation Events (20 snowmobiles/212 snowcoaches)	New BAT Snowmobiles, BAT Snowcoaches	14.9	45.7	24.5	12.2	2.7

TABLE 56: BACKCOUNTRY PERCENT TIME AUDIBLE MODELING RESULTS

Alternative	Fleet Assumption	Percent of Backcountry Area by Percent Time Audible Categories				
		0% Time Audible	1 to 20% Time Audible	21 to 50% Time Audible	51 to 80% Time Audible	Over 80% Time Audible
Alternative 1: No Action - No Snowmobile/Snowcoach Use	Administrative Use, Current Fleet	97.2	2.7	0.1	0	0
Alternative 2: Continue Snowmobile/Snowcoach Use at 2012/2013 Winter Season Interim Regulation Limits	**2a** - Current Fleet, 318 snowmobiles and 78 snowcoaches	92.6	5.9	1.1	0.4	0
	2b - 318 snowmobiles and 78 BAT Snowcoaches	92.9	6.1	0.7	0.3	0
Alternative 3: Transition to Snowcoaches Meeting BAT Requirements Only	BAT Snowcoaches, No Snowmobiles (modeling scenario 3b)	95.5	3.6	0.7	0.2	0
Alternative 4a: Manage OSV Use by Transportation Events (480 snowmobiles/60 snowcoaches)	New BAT Snowmobiles, BAT Snowcoaches	94.5	4.8	0.5	0.2	0
Alternative 4b: Manage OSV Use by Transportation Events (20 snowmobiles/106 snowcoaches)	New BAT Snowmobiles, BAT Snowcoaches	95.0	4.3	0.5	0.2	0
Alternative 4c: Manage OSV Use by Transportation Events (480 snowmobiles, 120 snowcoaches)	E-BAT Snowmobiles and BAT Snowcoaches	94.0	5.6	0.3	0.1	0
Alternative 4d: Manage OSV Use by Transportation Events (20 snowmobiles/212 snowcoaches)	New BAT Snowmobiles, BAT Snowcoaches	93.9	5.8	0.3	0	0

Note: Percent time audible calculated for the 8-hour period from 8:00 a.m. to 5:00 p.m.

Under alternative 1, OSV sounds would audible to a human with normal hearing between 51 and 80 percent of the time in 0.8 percent of the travel corridor area (table 55). The areas with the longest percent time audible are on and adjacent to roadways. Under alternative 1, none of the travel in the travel corridor would have OSVs audible more than 80 percent of the time.

The maximum OSV use levels modeled under all the action alternatives would increase the area of the travel corridor where OSV sounds are audible more than 80 percent of the time, relative to alternative 1. The largest increases in OSV time audible would be under alternative 2a (up to 5.6 percent of the travel corridor with OSVs audible more than 80 percent of the time). The remainder of the action alternatives would result in OSVs being audible more than 80 percent of the time in between 5.2 and 1.8 percent of the travel corridor area.

As shown in table 56, OSVs are not audible in 93 percent or more of the backcountry area under any of the alternatives. None of the alternatives would result OSV time audible more than 80 percent of the time in any areas of the backcountry. As would be expected, the primary influence of the alternatives on OSV audibility is within the travel corridors. However, some changes occur in the area

of the backcountry, resulting in OSVs being audible between 51 and 80 percent of the time. For example, the area of the backcountry with OSVs audible between 51 and 80 percent of the time would increase from 0 percent under alternative 1 to 0.4 percent under alternative 2a. Alternative 3b would increase the area of the backcountry in the 51 to 80 percent time audible category to 0.2 percent. The maximum area of backcountry with OSV time audible over 50 percent under alternative 4 would be 0.2 percent. The areas of the backcountry where the audibility of OSVs would increase are generally adjacent to the boundary between the travel corridor and backcountry management zones. The percent time audible results for alternative 4c shows the beneficial effect of voluntary E-BAT for snowmobiles, despite higher numbers of OSVs than other analysis conditions. This condition allows for a reduction in percent time audible while allowing more visitors.

Audible L_{eq}

Whereas percent time audible describes whether or not OSVs are audible, audible L_{eq} describes how high the sound levels are during those times that OSVs are audible. Audible L_{eq} is expressed as an equivalent sound level—the constant sound level conveying the same energy as all the varying sound levels over the 8:00 a.m. to 5:00 p.m. analysis period (excluding those times when OSVs are not audible). Tables 57 and 58 summarize the audible L_{eq} results for the travel corridor and backcountry areas, respectively.

TABLE 57: TRAVEL CORRIDOR AUDIBLE L_{EQ} MODELING RESULTS

Alternative	Fleet Assumption	Percent of Travel Corridor Area by Audible Leq Categories				
		0 dBA or Less	1 to 20 dBA	21 to 35 dBA	36 to 60 dBA	Over 60 dBA
Alternative 1: No Action - No Snowmobile/Snowcoach Use	Administrative Use, Current Fleet	31.1	39.4	24.6	4.8	0.1
Alternative 2: Continue Snowmobile/Snowcoach Use at 2012/2013 Winter Season Interim Regulation Limits	**2a** - Current Fleet, 318 snowmobiles and 78 snowcoaches	12.6	45.2	35.2	6.8	0.2
	2b - 318 snowmobiles and 78 BAT Snowcoaches	13.1	44.7	35.4	6.6	0.2
Alternative 3: Transition to Snowcoaches Meeting BAT Requirements Only	BAT Snowcoaches, No Snowmobiles (modeling scenario 3b)	27.7	34.2	32.2	5.7	0.2
Alternative 4a: Manage OSV Use by Transportation Events (480 snowmobiles/60 snowcoaches)	New BAT Snowmobiles, BAT Snowcoaches	16.5	45.5	32.4	5.5	0.1
Alternative 4b: Manage OSV Use by Transportation Events (20 snowmobiles/106 snowcoaches)	New BAT Snowmobiles, BAT Snowcoaches	16.8	40.6	36.4	6.0	0.2
Alternative 4c: Manage OSV Use by Transportation Events (480 snowmobiles, 120 snowcoaches)	E-BAT Snowmobiles and BAT Snowcoaches	13.7	54.7	26.6	4.9	0.1
Alternative 4d: Manage OSV Use by Transportation Events (20 snowmobiles/212 snowcoaches)	New BAT Snowmobiles, BAT Snowcoaches	13.7	51.7	29.2	5.2	0.2

TABLE 58: BACKCOUNTRY AUDIBLE L_{EQ} MODELING RESULTS

Alternative	Fleet Assumption	Percent of Backcountry Area by Audible Leq Categories			
		0 dBA or Less	1 to 10 dBA	11 to 20 dBA	Over 20 dBA
Alternative 1: No Action - No Snowmobile/Snowcoach Use	Administrative Use, Current Fleet	97.1	1.2	1.7	0
Alternative 2: Continue Snowmobile/Snowcoach Use at 2012/2013 Winter Season Interim Regulation Limits	**2a** - Current Fleet, 318 snowmobiles and 78 snowcoaches	92.5	5.1	2.4	0.0
	2b - 318 snowmobiles and 78 BAT Snowcoaches	92.9	4.5	2.6	0.0
Alternative 3: Transition to Snowcoaches Meeting BAT Requirements Only	BAT Snowcoaches, No Snowmobiles (modeling scenario 3b)	95.5	1.1	3.4	0.0
Alternative 4a: Manage OSV Use by Transportation Events (480 snowmobiles/60 snowcoaches)	New BAT Snowmobiles, BAT Snowcoaches	94.7	2.8	2.5	0.0
Alternative 4b: Manage OSV Use by Transportation Events (20 snowmobiles/106 snowcoaches)	New BAT Snowmobiles, BAT Snowcoaches	94.9	1.4	3.7	0.0
Alternative 4c: Manage OSV Use by Transportation Events (480 snowmobiles, 120 snowcoaches)	E-BAT Snowmobiles and BAT Snowcoaches	93.2	4.9	1.9	0
Alternative 4d: Manage OSV Use by Transportation Events (20 snowmobiles/212 snowcoaches)	New BAT Snowmobiles, BAT Snowcoaches	93.2	4.1	2.7	0

Under alternative 1, audible L_{eq} is between 1 and 35 dBA in approximately 95 percent of the travel corridor. The American National Standards Institute (ANSI) standard 2.12 specifies 35 dBA as the desired background condition for many indoor spaces where quiet and outstanding listening conditions are important (bedrooms, auditoriums, theaters, conference rooms). Only 4.8 percent of the travel corridor area has an audible L_{eq} between 36 and 60 dBA, and 0.1 percent exceeds 60 dBA. Background sound levels of 50 to 60 dBA begin to interfere with conversation, causing the speakers to raise their voices. The OSV use levels modeled under the action alternatives would increase the percentage of the travel corridor with an audible L_{eq} over 35 dBA compared to the no-action alternative. The largest increases would occur under alternative 2a (current fleet, 7 percent of travel corridor over 35 dBA audible L_{eq}). The audible Leq results for alternative 4c show the beneficial effect of E-BAT for snowmobiles, despite higher numbers of OSVs than other analysis conditions.

Table 58 shows that OSV audible L_{eq} sound levels in over 90 percent of the backcountry area are very low under the no-action alternative, and any of the action alternatives. Small differences in backcountry audible L_{eq} are shown in the range of 11 to 20 dBA. Under any of the alternatives, backcountry audible L_{eq} would not exceed 20 dBA.

Peak 4

Percent time audible and audible L_{eq} do not provide information on short-duration peaks in OSV sound levels that can be important to understanding impacts on natural soundscapes. Peak 4 is the

mean of the four loudest sustained sound levels (at least 15 seconds in duration) during the 8:00 a.m. to 5:00 p.m. analysis period. The peak 4 results are determined by the loudest vehicle in use, regardless of how often it is used. Tables 59 and 60 summarize the peak 4 results for the travel corridor and backcountry areas, respectively. Mapping of the peak 4 results for each alternative is provided in appendix E. Appendix F shows the soundscapes methodology.

Under alternative 1, 71.8 percent of the travel corridor area would experience peak 4 levels of 35 dBA or less (table 59). In 26.2 percent of the travel corridor, peak 4 sound levels would be between 36 and 60 dBA and in 1.4 percent of the travel corridor peak 4 sound levels would be between 61 and 80 dBA. The travel corridor would not experience peak 4 sound levels over 80 dBA under alternative 1. A background sound level of 80 dBA requires people to shout to be understood, even when the listener is nearby (see table 26 in chapter 3). All of the action alternatives (except for alternative 3) would increase the area of the travel corridor with peak 4 sound levels over 80 dBA to 0.1 percent. Up to 2.2 percent of the travel corridor would have peak 4 levels between 60 and 80 dBA under alternative 2, compared to 1.1 percent under alternative 3 and 1.8 percent under alternative 4.

Table 60 shows that even peak sound levels in the backcountry are relatively quiet. Peak 4 sound levels in the backcountry do not exceed 35 dBA under the no-action alternative, or any of the action alternatives. The action alternatives peak 4 levels do not exceed 30 dBA in the backcountry.

TABLE 59: TRAVEL CORRIDOR PEAK 4 MODELING RESULTS

Alternative	Fleet Assumption	Percent of Travel Corridor Area by Peak 4 Categories					
		0 dBA or Less	1 to 20 dBA	21 to 35 dBA	36 to 60 dBA	61 to 80 dBA	Over 80 dBA
Alternative 1: No-Action - No Snowmobile/Snowcoach Use	Administrative Use, Current Fleet	17.8	22.3	31.7	26.2	2	0
Alternative 2: Continue Snowmobile/Snowcoach Use at 2012/2013 Winter Season Interim Regulation Limits	**2a** - Current Fleet, 318 snowmobiles and 78 snowcoaches	7.8	23.3	37.3	29.3	2.2	0.1
	2b - 318 snowmobiles and 78 BAT Snowcoaches	8.2	24.5	37.0	28.1	2.1	0.1
Alternative 3: Transition to Snowcoaches Meeting BAT Requirements Only	BAT Snowcoaches, No Snowmobiles (modeling scenario 3b)	21.0	28.6	35.0	14.3	1.1	0
Alternative 4a: Manage OSV Use by Transportation Events (480 snowmobiles/60 snowcoaches)	New BAT Snowmobiles, BAT Snowcoaches	9.7	28.1	38.1	22.5	1.5	0.1
Alternative 4b: Manage OSV Use by Transportation Events (20 snowmobiles/106 snowcoaches)	New BAT Snowmobiles, BAT Snowcoaches	10.2	30.4	39.8	18.2	1.3	0.1
Alternative 4c: Manage OSV Use by Transportation Events (480 snowmobiles, 120 snowcoaches)	E-BAT Snowmobiles and BAT Snowcoaches	8.3	25.5	39.8	24.5	1.8	0.1
Alternative 4d: Manage OSV Use by Transportation Events (20 snowmobiles/212 snowcoaches)	New BAT Snowmobiles, BAT Snowcoaches	8.3	25.5	39.9	24.4	1.8	0.1

TABLE 60: BACKCOUNTRY PEAK 4 MODELING RESULTS

Alternative	Fleet Assumption	Percent of Backcountry Area by Peak 4 Categories					
		0 dBA or Less	1 to 10 dBA	11 to 20 dBA	21 to 30 dBA	31 to 35 dBA	Over 35 dBA
Alternative 1: No Action - No Snowmobile/Snowcoach Use	Administrative Use, Current Fleet	88.1	6.4	4.1	1.3	0.1	0
Alternative 2: Continue Snowmobile/Snowcoach Use at 2012/2013 Winter Season Interim Regulation Limits	**2a** - Current Fleet, 318 snowmobiles and 78 snowcoaches	87.3	7.0	4.4	1.3	0	0
	2b - 318 snowmobiles and 78 BAT Snowcoaches	87.9	6.7	4.2	1.2	0	0
Alternative 3: Transition to Snowcoaches Meeting BAT Requirements Only	BAT Snowcoaches, No Snowmobiles (modeling scenario 3b)	91.5	5.4	2.7	0.4	0	0
Alternative 4a: Manage OSV Use by Transportation Events (480 snowmobiles/60 snowcoaches)	New BAT Snowmobiles, BAT Snowcoaches	89.7	6.2	3.5	0.6	0	0
Alternative 4b: Manage OSV Use by Transportation Events (20 snowmobiles/106 snowcoaches)	New BAT Snowmobiles, BAT Snowcoaches	90.5	6.0	3.1	0.4	0	0
Alternative 4c: Manage OSV Use by Transportation Events (480 snowmobiles, 120 snowcoaches)	E-BAT Snowmobiles and BAT Snowcoaches	88.1	6.9	4	1	0	0
Alternative 4d: Manage OSV Use by Transportation Events (20 snowmobiles/212 snowcoaches)	New BAT Snowmobiles, BAT Snowcoaches	88.1	6.9	4	1	0	0

8-Hour L_{eq}

The 8-hour L_{eq} analysis results for the travel corridor and backcountry areas are provided in tables 61 and 62, respectively. The 8-hour L_{eq} results are presented graphically in appendix E.

Within the travel corridors, the highest 8-hour L_{eq} levels (≥ 35 dBA) occur on and adjacent to roads. Under alternative 1, approximately 2.2 percent of the travel corridor area experiences 8-hour L_{eq} sound levels greater than or equal to 35 dBA (table 61). All the action alternatives increase the area of travel corridor with 8-hour L_{eq} sound levels greater than or equal to 35 dBA compared to the no-action alternative. The largest impact in terms of 8-hour Leq would occur under alternative 2a (4.5 percent ≥ 35 dBA) and the smallest with E-BAT snowmobiles under alternative 4c (approximately 3 percent ≥ 35 dBA).

Under alternative 1, all of the backcountry area would have 8-hour L_{eq} sound levels less than 15 dBA. Alternatives 2, 3b, and 4b would result in 0.1 percent of the area of backcountry in the 15 to 25 dBA range. The 8-hour L_{eq} sound level in the backcountry would not exceed 25 dBA. Under all alternatives, approximately 99 percent of the backcountry area would have an 8-hour L_{eq} of less than 5 dBA, representing exceptional natural quiet conditions.

TABLE 61: TRAVEL CORRIDOR 8-HOUR L_{EQ} MODELING RESULTS

Alternative	Fleet Assumption	Percent of Travel Corridor Area by 8-hour Leq Categories			
		< 15 dBA (Negligible)	≥ 15 and < 25 dBA (Minor)	≥ 25 and < 35 dBA (Moderate)	≥ 35 dBA (Major)*
Alternative 1: No Action - No Snowmobile/Snowcoach Use	Administrative Use, Current Fleet	79.6	14	4.2	2.2
Alternative 2: Continue Snowmobile/Snowcoach Use at 2012/2013 Winter Season Interim Regulation Limits	**2a** - Current Fleet, 318 snowmobiles and 78 snowcoaches	58.9	23.9	12.7	4.5
	2b - 318 snowmobiles and 78 BAT Snowcoaches	60.2	23.4	12.1	4.3
Alternative 3: Transition to Snowcoaches Meeting BAT Requirements Only	BAT Snowcoaches, No Snowmobiles (modeling scenario 3b)	64.3	20.5	11	4.1
Alternative 4a: Manage OSV Use by Transportation Events (480 snowmobiles/60 snowcoaches)	New BAT Snowmobiles, BAT Snowcoaches	64.7	21.9	9.8	3.6
Alternative 4b: Manage OSV Use by Transportation Events (20 snowmobiles/106 snowcoaches)	New BAT Snowmobiles, BAT Snowcoaches	61.1	23.5	11.3	4
Alternative 4c: Manage OSV Use by Transportation Events (480 snowmobiles, 120 snowcoaches)	E-BAT Snowmobiles and BAT Snowcoaches	71.2	18.8	7	3
Alternative 4d: Manage OSV Use by Transportation Events (20 snowmobiles/212 snowcoaches)	New BAT Snowmobiles, BAT Snowcoaches	67.6	20.6	8.2	3.5

TABLE 62: BACKCOUNTRY 8-HOUR L_{EQ} MODELING RESULTS

Alternative	Fleet Assumption	Percent of Backcountry Area by 8-hour Leq Categories			
		< 5 dBA (Negligible)	≥ 5 and < 15 dBA (Minor)	≥ 15 and < 25 dBA (Moderate)	≥ 25 dBA (Major)*
Alternative 1: No Action - No Snowmobile/Snowcoach Use	Administrative Use, Current Fleet	99.8	0.2	0	0
Alternative 2: Continue Snowmobile/Snowcoach Use at 2012/2013 Winter Season Interim Regulation Limits	**2a** - Current Fleet, 318 snowmobiles and 78 snowcoaches	98.8	1.1	0.1	0
	2b - 318 snowmobiles and 78 BAT Snowcoaches	99	0.9	0.1	0
Alternative 3: Transition to Snowcoaches Meeting BAT Requirements Only	BAT Snowcoaches, No Snowmobiles (modeling scenario 3b)	99	0.9	0.1	0
Alternative 4a: Manage OSV Use by Transportation Events (480 snowmobiles/60 snowcoaches)	New BAT Snowmobiles, BAT Snowcoaches	99.3	0.7	0	0
Alternative 4b: Manage OSV Use by Transportation Events (20 snowmobiles/106 snowcoaches)	New BAT Snowmobiles, BAT Snowcoaches	99	0.9	0.1	0
Alternative 4c: Manage OSV Use by Transportation Events (480 snowmobiles, 120 snowcoaches)	E-BAT Snowmobiles and BAT Snowcoaches	99.6	0.4	0	0
Alternative 4d: Manage OSV Use by Transportation Events (20 snowmobiles/212 snowcoaches)	New BAT Snowmobiles, BAT Snowcoaches	99.5	0.5	0	0

SUMMARY OF IMPACTS

This section summarizes the soundscapes impact analysis conclusions. A detailed discussion of each alternative follows, including a discussion of cumulative impacts.

- Alternative 1 would have long-term minor adverse impacts on soundscapes in travel corridors and long-term negligible adverse impacts in backcountry areas.
- Alternative 2 would have long-term moderate adverse impacts on soundscapes in travel corridors and long-term negligible adverse impacts in backcountry areas. Overall, alternative 2 would have greater adverse impacts to soundscapes than alternative 1, due to the fact that OSV use would be authorized for visitors.
- Alternative 3 would have long-term moderate adverse impacts on soundscapes in travel corridors and long-term negligible adverse impacts in backcountry areas. Overall alternative 3 would have greater adverse impacts to soundscapes than alternative 1, due to the fact that OSV use would be authorized for visitors, but would have less of an impact to soundscapes than alternative 2 because it would allow for a lower number of transportation events, and a reduction of 8-hour L_{eq} along the travel corridor and in the backcountry.

- Impacts could vary from season to season under alternative 4 depending on the distribution of transportation events and whether operators choose to use quieter vehicles to take advantage of an increase in the allowable average group size. Regardless of these factors, alternative 4 would have long-term moderate adverse impacts on soundscapes in travel corridors. In the backcountry areas, alternative 4 would have long-term negligible adverse impacts. Overall alternative 4 would have greater adverse impacts to soundscapes than alternative 1, due to the fact that OSV use would be authorized for visitors, but would have less of an impact to soundscapes than alternative 2 and alternative 3 because it would allow for a lower number of transportation events, and a reduction of 8-hour L_{eq} along the travel corridor and in the backcountry.

All of the action alternatives are within a very narrow range of OSV noise exposure. The small differences among alternatives are, in many cases, on the order of known uncertainties in sound level measurement and probable uncertainties in the noise modeling accuracy.

Under alternative 4 the proposed improvements in vehicle noise output (BAT and E-BAT) outweighs the proposed increases in vehicle numbers, yielding lower aggregate noise exposures for the proposed alternatives relative to current conditions.

Managing groups and group sizes has no effect on the metric used for the intensity definitions (8-hour L_{eq}), but offers significant benefits in terms of the duration of noise audibility (and noise-free intervals).

DETAILED IMPACT ANALYSIS

Impacts of Alternative 1: No Action - No Snowmobile/Snowcoach Use

Under alternative 1, within the travel corridors 2.2 percent of the area would have an 8-hour L_{eq} greater than or equal to 35 dBA (compared to 4.5 percent under recent maximum allowable use – alternative 2). In the backcountry, 0.2 percent of the area would have an 8-hour L_{eq} between 5 and 15 dBA (compared to 1.1 percent under recent maximum allowable use). Administrative OSVs would be audible over 50 percent of the time in approximately 0.8 percent of the travel corridor area. Alternative 1 would have long-term minor adverse impacts on soundscapes in travel corridors and long-term negligible adverse impacts in backcountry areas.

Cumulative Impacts

Past, present, and reasonably foreseeable future actions both outside and within the park have the potential to impact soundscapes in the park. Aircraft overflights (including commercial jets, research flights in low-flying propeller planes, corporate and general aviation aircraft, and medical rescue helicopters) cause motorized sounds that are audible at sound levels which range from very quiet to levels that mask other sounds. Relative to snowmobile- and snowcoach-related sounds, the duration of audible aircraft overflights is short. The 2005-2010 observational study found that in total, motorized sounds were audible 56 percent of the time. Aircraft accounted for 6.7 percent of the duration of motorized sounds (Burson 2010a). As shown in table 63, jets are responsible for the majority of the duration of audible aircraft sounds.

TABLE 63: AIRCRAFT TIME AUDIBLE, 2005-2010 OBSERVATIONAL STUDY

	Time Audible (Hours: Minutes: Seconds)	Percent out of the Total Duration of Motorized Sounds	Percent out of the Total Duration of the Observational Study
Jets	6:30:41	4.5%	2.5%
Propeller aircraft	2:39:10	1.8%	1.0%
Helicopters	0:32:43	0.4%	0.2%
Total	9:42:34	6.7%	3.8%

The observational study results reported above are based on monitoring in developed and travel corridor locations. Aircraft overflights are audible approximately 6 percent of the average day in backcountry areas such as Fern Lake (Burson 2007). Taking into account both natural and non-natural sounds, hourly L_{eq} sound levels were generally between 20 and 30 dBA at Fern Lake and maximum hourly sound levels were 60 dBA. No OSV sounds were audible at Fern Lake, which is 8 miles from the nearest OSV corridor (the road between Fishing Bridge and Canyon). In the winter, aircraft are about the only source of non-natural sounds in backcountry areas far from roads.

Despite recent slowing in the growth in air travel mirroring the recession-related slowdown in overall economic activity, long-term growth is still expected according to Federal Aviation Administration forecasts (FAA 2010). As a result, aircraft overflights are expected to continue to result in short- and long-term minor adverse impacts, particularly in backcountry areas and on days with low wind levels.

Due to the attenuation of sound with increasing distance from the source, OSV use outside the park boundaries is unlikely to affect substantial portions of the interior of the park. However, in some areas within a few miles of the park boundary, OSV use outside the park is a major source of non-natural sounds. For example, snowmobiles operating outside Yellowstone's western boundary in Gallatin National Forest and possibly in West Yellowstone, Montana, were commonly audible at the West Yellowstone 3.1 site (three miles from the park boundary) during 2004/2005 monitoring (Burson 2005). The distinctive sounds of two-stroke snowmobiles over three miles away were clearly distinguishable in recordings and while visiting the site. The percent time audible at West Yellowstone of OSVs traveling only on the groomed road between the West Entrance and Madison Junction was estimated to be 36 percent. However, OSV use outside the park raised the total percent time audible at West Yellowstone 3.1 to 66 percent (Burson 2005).

There is insufficient monitoring information available to quantify the audibility of OSVs outside the park in locations other than West Yellowstone 3.1. The audibility of OSVs outside the park has not been specifically noted at any monitoring site other than West Yellowstone 3.1 (Burson 2004-2009, 2010a). One trend with the potential to result in more OSV activity outside the park is the consolidation of lands in the Gallatin National Forest. In the last 10 years, the Gallatin National Forest has negotiated several land exchanges that have consolidated some previously checkerboarded holdings. Although this has generally positive effects for most wildlife (because consolidated lands are less subject to development), it has the negative side effect of private land consolidation (especially in the Big Sky area), which has allowed more land subdivision and rural growth to occur there, with consequent effects on traffic and natural soundscapes (NPS 2007c).

Future trends in the audibility of OSVs operating outside the park will be influenced by the travel management plans of the adjacent national forests. The potential implications of two such travel plans are summarized below—the Gallatin National Forest Travel Plan Revision and the Beartooth District of Custer National Forest Travel Management Plan.

Gallatin National Forest is adjacent to Yellowstone's northern border and part of its western border. The 2006 ROD for the Gallatin National Forest Travel Plan Revision decreased the area of the Gallatin National Forest open to snowmobile use (outside of wilderness areas) from 84 percent to about 55 percent (USFS 2006). The travel plan was designed to cluster motorized use areas to reduce the total area potentially affected by noise from snowmobiles. As a result, the USFS expected that noise levels would increase in those concentrated use zones and decrease elsewhere. The largest concentration of designated snowmobile trails in the Gallatin National Forest in the vicinity of the park is around West Yellowstone. There is a smaller number and length of snowmobile trails around Cooke City. Snowmobile use is prohibited in most of the remaining areas along the border between Gallatin National Forest and Yellowstone National Park (e.g., the Lee Metcalf Wilderness Area to the west and the Absaroka Beartooth Wilderness Area to the north). It can be reasonably expected that the audibility of OSVs in use outside the park will increase in the future within a few miles of the trails around West Yellowstone and Cooke City. Other areas of Yellowstone adjacent to wilderness areas would not be affected by OSV use.

The Beartooth District of Custer National Forest is adjacent to the northeast corner of Yellowstone. A ROD for the Beartooth District Travel Management Plan was issued in 2008 (USFS 2008b). The travel management plan addressed motorized vehicle routes, but OSV regulations were explicitly excluded from the scope of the plan. As a result, OSV use in the Beartooth District remains regulated by a 1986 Forest Plan. OSV use in the small portion of the Beartooth District around Cooke City is administered by the Gallatin National Forest Travel Plan Revision described previously. The motorized routes allowed by the 2008 Travel Management Plan are all at least 15 miles from the boundary of Yellowstone. As a result, it can be concluded that motorized vehicle routes in the Beartooth District would have no effect on natural soundscapes in Yellowstone. Motorized vehicle use (including OSVs) is prohibited in the Absaroka Beartooth Wilderness Area, which covers much of the Beartooth District where it is adjacent to the park.

The impacts of past, present, and reasonably foreseeable future actions, combined with the long-term negligible to minor impacts of alternative 1, would result in long-term minor adverse cumulative impacts on natural soundscapes. In backcountry areas, other past, present, and reasonably foreseeable future actions (e.g., airplanes, OSV use outside the park) would be the primary contributors to the cumulative impacts. Administrative OSV use would be the main contributor to the cumulative impacts within the travel corridors.

Conclusion

The effects of alternative 1 on soundscapes would be long-term, negligible to minor, and adverse due to administrative OSV use. Minor impacts would be limited to travel corridors. There would be long-term minor adverse cumulative impacts on soundscapes.

Impacts of Alternative 2: Continue Snowmobile/Snowcoach Use at 2012/2013 Winter Season Interim Regulation Limits

Under alternative 2, within the travel corridors 4.5 to 4.7 percent of the area would have an 8-hour L_{eq} greater than or equal to 35 dBA (compared to 2.2 percent under alternative 1). In the backcountry, 1.1 to 0.9 percent of the area would have an 8-hour L_{eq} between 5 and 15 dBA (compared to 0 percent under alternative 1). Assuming the maximum allowed use levels, OSVs would be audible over 50 percent of the time in approximately 5.6 percent of the travel corridor area with the current fleet and 4 percent of the corridor following the transition to the all-BAT snowcoach fleet, compared to 0 percent of the travel corridor area under alternative 1. Alternative 2 would have long-term moderate adverse impacts on soundscapes in the travel corridor and long-term negligible adverse impacts on

soundscapes backcountry areas before, during, and after the transition to all BAT snowcoaches. The all BAT snowcoach scenario results are very similar to the current fleet results because the existing snowcoach mix is already very close to meeting the proposed snowcoach BAT level (75 dBA).

Cumulative Impacts

Impacts on soundscapes from other past, present, and reasonably foreseeable future actions would be the same as described for alternative 1. These impacts are a result of other noise generators outside the park's boundaries. A large contributor is aircraft overflights (including commercial jets, research flights in low-flying propeller planes, corporate and general aviation aircraft, and medical rescue helicopters). Other large contributors include OSV use on adjacent lands (within a few miles of the park boundary). Planning efforts on lands surrounding the park could also contribute to these impacts, including the Gallatin National Forest Travel Management Plan and the Beartooth District of Custer National Forest Travel Management Plan. The long-term minor adverse effects of these actions, when combined with the long-term negligible to moderate adverse impacts of alternative 2, would result in long-term moderate adverse cumulative impacts on natural soundscapes.

Conclusion

Alternative 2 would have long-term negligible to moderate adverse impacts on soundscapes due to the level of OSV use permitted. Moderate impacts would be limited to travel corridors. There would be long-term moderate adverse cumulative impacts on soundscapes.

Impacts of Alternative 3: Transition to Snowcoaches Meeting BAT Requirements Only

Prior to the transition to all BAT snowcoaches, the impacts of alternative 3 would be the same as described above for alternative 2 (moderate adverse in travel corridors; negligible adverse in backcountry), except the duration would be short term instead of long term.

After the transition to all BAT snowcoaches, within the travel corridors 4.1 percent of the area would have an 8-hour L_{eq} greater than or equal to 35 dBA (compared to 2.2 percent under alternative 1 and 4.5 – 4.7 percent under alternative 2). In the backcountry, 0.9 percent of the area would have an 8-hour L_{eq} between 5 and 15 dBA (compared to 0.2 percent under alternative 1 and 1.1 to 0.9 percent under alternative 2). In 0.1 percent of the backcountry, 8-hour L_{eq} would be between 15 and 25 dBA. Assuming the maximum allowed use levels, OSVs would be audible over 50 percent of the time in approximately 18.8 percent of the travel corridor area, compared to 0.8 percent of the travel corridor area under alternative 1. Alternative 3 would have long-term moderate adverse impacts on soundscapes in the travel corridor and long-term negligible adverse impacts in backcountry areas.

Cumulative Impacts

Impacts on soundscapes from other past, present, and reasonably foreseeable future actions would be the same as described for alternative 1. These impacts are a result of other noise generators outside the park's boundaries. A large contributor is aircraft overflights (including commercial jets, research flights in low-flying propeller planes, corporate and general aviation aircraft, and medical rescue helicopters). Other large contributors include OSV use on adjacent lands (within a few miles of the park boundary). Planning efforts on lands surrounding the park could also contribute to these impacts, including the Gallatin National Forest Travel Management Plan and the Beartooth District of Custer National Forest Travel Management Plan. The long-term minor adverse impacts of these actions, when combined with the long-term negligible to moderate adverse impacts of alternative 3, would result in long-term moderate adverse cumulative impacts on natural soundscapes.

Conclusion

The effects of alternative 3 on soundscapes would be long-term, negligible to moderate and adverse, both before and after the phaseout to BAT snowcoaches only. Moderate impacts would be limited to travel corridors. There would be long-term, moderate adverse cumulative impacts on soundscapes.

Alternative 4: Manage OSV Use by Transportation Events

The impacts of alternative 4 would vary season to season. Within the travel corridors, 3.0 percent to 4.0 percent of the area would have an 8-hour L_{eq} greater than or equal to 35 dBA (compared to 2.2 percent under alternative 1 and 4.5 – 4.7 percent under alternative 2)). In the backcountry, 0 percent to 0.1 percent of the area would have an 8-hour L_{eq} greater than or equal to 15 dBA (compared to 0 percent under alternative 1 and 0.1 percent under alternative 2). Assuming the maximum allowed use levels, OSVs would be audible over 50 percent of the time in approximately 13.5 percent to 17.0 percent of the travel corridor area, compared to 0.8 percent of the travel corridor area under alternative 1. Alternative 4 would have lower audibility impacts in the travel corridor in comparison to all the other action alternatives which involve 19-23 percent of the travel corridor with OSVs audible over 50 percent of the time. Alternative 4 would have long-term moderate adverse impacts on soundscapes in travel corridors. In the backcountry areas, the impact of alternative 4 would be long-term negligible adverse.

Cumulative Impacts

Impacts on soundscapes from other past, present, and reasonably foreseeable future actions would be the same as described for alternative 1. These impacts are a result of other noise generators outside the park's boundaries. A large contributor is aircraft overflights (including commercial jets, research flights in low-flying propeller planes, corporate and general aviation aircraft, and medical rescue helicopters). Other large contributors include OSV use on adjacent lands (within a few miles of the park boundary). Planning efforts on lands surrounding the park could also contribute to these impacts, including the Gallatin National Forest Travel Management Plan and the Beartooth District of Custer National Forest Travel Management Plan. The long-term minor adverse impacts of these actions, when combined with the long-term negligible to moderate adverse impacts of alternative 4, would result in long-term moderate adverse cumulative impacts on natural soundscapes.

Conclusion

The effects of alternative 4 on soundscapes would be long-term, negligible to moderate and adverse. Moderate impacts would be limited to travel corridors. There would be long-term moderate adverse cumulative impacts on soundscapes.

VISITOR USE, EXPERIENCE, AND ACCESSIBILITY

Current laws and NPS policies indicate the following desired conditions in the park with regard to visitor use and experience relative to the presence and operation of OSVs in the park:

- Opportunities are and should continue to be provided for appropriate, high-quality public enjoyment.
- Visitors will have the opportunity to enjoy the superlative natural resources found in the park.

Such opportunities will create ample opportunity for inspiration, appreciation, and enjoyment through personalized experiences.

NPS *Management Policies 2006*, Section 8.2.4 states that:

> All reasonable efforts will be undertaken to make NPS facilities, programs, and services accessible to and usable by all people, including those with disabilities. 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. Specific guidance for implementing these laws is found in the Secretary of the Interior's regulations regarding enforcement of nondiscrimination on the basis of disability in Department of the Interior programs (43 CFR Part 17, Subpart E), and General Service Administration regulations adopting accessibility standards for the Architectural Barriers Act (41 CFR Part 102-76, Subpart C).

Other mandates include the requirement for providing reasonable accommodation for 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) (NPS 1999a, 2000f).

In addition, the NPS requires that those providing commercial services in the parks share the NPS responsibility to provide employees and visitors with the greatest degree of access to programs, facilities, and services that is reasonable, within the terms of existing contracts and agreements (see NPS *Management Policies 2006*, Section 10.2.6.2 "Accessibility of Commercial Services"). This analysis considers whether these opportunities are provided and if they are the desired experiences of those visitors.

ASSUMPTIONS, METHODOLOGY, AND INTENSITY DEFINITIONS

This section includes an analysis of the opportunities to view and experience park resources in the winter. Such opportunities are different than those experienced in the summer. Resources considered in the analysis include opportunities to view wildlife and scenery, behavior of other visitors and safety, quality of road surfaces, availability of information, quiet and solitude, air quality, and stakeholder values.

To evaluate the level of impact on visitor experience under each alternative, the following types of information were referenced:

- Visitor surveys
- Assessment of visitation patterns
- Assessment of opportunities historically available.

This section also includes an analysis of changes to accessibility for the very young, the elderly, and those with mobility impairments. For the very young and the elderly, mobility issues were not considered to be of primary concern; rather, exposure to winter weather, including cold temperatures and high winds, and the need for protection from these elements were considered. Resources considered in the analysis include opportunities to view wildlife and scenery in a safe environment. In

addition to providing a safe environment, the analysis considered whether the opportunity provided for these visitors is their desired visitor experience.

For the analysis of visitor accessibility under alternatives 2, 3 and 4, it is assumed that those providing commercial tours in the park are in compliance with NPS accessibility requirements as mentioned above. This includes larger capacity snowcoaches offering wheelchair accessibility and/or ramps.

For all alternatives, the following assumptions were used in estimating levels of visitor use:

- Snowcoaches:
  - 13.7 average maximum capacity (number of seats)
  - 9.0 average ridership per snowcoach.
- Snowmobiles:
  - 1.4 average riders per snowmobile (3 year average, 2009/2010 through 2011/2012)
  - 2.0 average maximum capacity of single snowmobile (number of seats per snowmobile).

INTENSITY DEFINITIONS

The following definitions for evaluating impacts on visitor use and experience were used for assessing the potential impacts of each alternative.

Negligible: Visitors would be able to experience a wide range of park resources and participate in a wide range of winter use activities, although some visitors may be prevented from a few experiences and/or activities because of limited access, technical difficulty, and/or cost. Visitors would typically be able to fulfill the purpose of their visit. Accessibility for the very young, the elderly, and individuals with disabilities would not be affected, or effects would not be noticeable or measurable. There would be minimal effects on safe opportunities to view wildlife and scenery and for these visitors to fulfill the purpose of their visit.

Minor: Visitors would be able to experience a range of park resources and participate in a range of winter use activities, but would be prevented from some experiences and/or activities because of limited access, technical difficulty, and/or cost. Most visitors would be able to fulfill the purpose of their visit. Changes in accessibility would be noticeable, but would affect only a small portion of the very young, the elderly, and individuals with mobility-related disabilities who visit the park. Impacts would be slight without appreciably limiting critical characteristics of opportunities to safely view wildlife and scenery. Most of these visitors would be able to fulfill the purpose of their visit.

Moderate: Visitors would be able to experience some park resources and participate in some winter use activities, but would be prevented from some experiences and/or activities because of limited access, technical difficulty, and/or cost. Some visitors may not be able to fulfill the purpose of their visit. Changes in accessibility would be readily apparent to many of the very young, the elderly, and individuals with mobility-related disabilities who use the park. Visitors would have some difficulty finding available, safe opportunities to view wildlife and scenery. Some of these visitors may not be able to fulfill the purpose of their visit.

Major: Visitors would be able to experience some park resources and participate in some winter use activities, but would be prevented from most experiences and/or activities because of limited access, technical difficulty, and/or cost. Few visitors would be able to fulfill the purpose of their visit. The effects on accessibility would be readily apparent to most of the very young, the elderly, and individuals with mobility-related disabilities who use the park, and would substantially change their ability to access park features. Visitors would frequently have substantial difficulty finding available, safe opportunities to view wildlife and scenery. Few visitors with mobility impairments would be able to fulfill the purpose of their visit.

Study Area

The geographic study area for the visitor use and experience analysis, including visitor accessibility, includes the entire area within the park boundary.

SUMMARY OF IMPACTS

Impacts on visitor use and experience under the alternatives ranged from long-term major adverse under the no-action alternative, to long-term beneficial under the action alternatives because the levels and types of OSV use permitted in the park would be increased, when compared to the no-action alternative. Impacts under each alternative were as follows:

- Alternative 1 would have long-term major adverse impacts on visitor use and experience because winter access to the interior of the park would not be provided for visitors. Non-motorized visitors would be permitted, but due to the distance into the park and harsh weather conditions, very few visitors would be able to reach features in the interior such as Old Faithful. Winter visitors desiring either or both non-motorized and motorized experiences would be affected by this loss of access. Alternative 1 would have long-term major adverse impacts on visitor accessibility by restricting winter access to the interior of the park to non-motorized methods.
- Alternative 2 would have long-term beneficial impacts on visitor use and experience because permitted use levels would be similar to those allowed from 2009 to 2013 (through the 2012/2013 winter season) and would provide for both motorized and non-motorized (accessing trail heads by motorized means) access into the interior of the park. This use level would meet the demand for winter visitation that occurred for the 2009/2010 through 2011/2012 winter seasons and it would provide limited opportunities for growth. Resource conditions (i.e., wildlife, soundscapes, and air quality) that support a quality visitor experience would experience limited effects. This alternative would have long-term beneficial impacts on accessibility because allowing a mix of OSV types into the interior of the park would provide various opportunities for accessibility. Alternative 2 would have a beneficial impact on visitor use and experience than alternative 1 because it allows for visitor OSV use.
- Alternative 3 would have long-term beneficial impacts on visitor use and experience because motorized access to the interior of the park would continue and, until the transition to snowcoaches only, access would be the same as that from 2009 to 2013. For some snowmobile users, the opportunity to experience a specific, individual snowmobile experience as offered in the past would be lost. After the transition, some park users would be able to obtain their desired experience (snowcoach use) while others would not (snowmobile use) resulting in an overall long-term minor to moderate adverse impact, because the same range of experiences as currently offered may not be available. This alternative would have long-term beneficial impacts on accessibility because of allowing a mix of OSV types into the interior of the park until the winter

season 2020/2021, and snowcoach access after that, which would provide various opportunities for accessibility. Overall, alternative 3 would have beneficial impacts on visitor use and experience compared to alternative 1 because it allows for visitor OSV use. Compared to alternative 2, some visitors may experience adverse impacts as the types of access would be limited to snowcoaches, while others may find this a benefit to their experience.

- Alternative 4 would have the greatest ability to meet winter visitor expectations by including guided snowmobile and snowcoach tours and by management of OSV use of the park's interior by transportation events. Visitor opportunities would increase, resulting 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 operators would have the ability to choose the type of service they provide. Resource conditions would remain unchanged from recent years or would improve as improvements to BAT OSVs are implemented. Overall, alternative 4 would have beneficial impacts on visitor use and experience compared to alternative 1 because it allows for visitor OSV use. Compared to alternatives 2 and 3, the variety of uses, including non-commercially guided use, would be viewed as a beneficial impact. Some visitors who would prefer a difference experience may view this as an adverse impact.

DETAILED IMPACT ANALYSIS

Impacts of Alternative 1: No Action - No Snowmobile/Snowcoach Use

Under alternative 1, all visitor snowmobile and snowcoach use in the park would end. Vehicle access would continue along the route from Cooke City to Gardiner (U.S. Highways 212 and 89), which is plowed during the winter months; however, other roads in the park would be closed to vehicular traffic. Two separate groups of park visitors would be affected by the change in management policies, motorized OSV users and non-motorized winter users.

Under alternative 1, opportunities to experience the park's interior by either snowmobile or snowcoach, an opportunity that has existed at various levels since the 1950s, would cease. For these visitors—who average more than 60,000 people per year— their desired winter visitor experience would no longer be available. Facilities in the interior of the park would be expected to close because reduced visitation would not be able to support the operation of lodges and the provision of other services. Guides would no longer be needed, the visitor center at Old Faithful would be closed, and there would be no need for warming huts to support visitor safety and experience.

Some visitors may choose to use a vehicle to access northern areas of the park for backcountry uses, such as snowshoeing and cross-country skiing. However, because the two uses differ greatly, the percentage of winter visitors likely to adapt to such a change in management is unknown. For the majority of Yellowstone winter visitors, ending access via snowmobile and snowcoach would result in parkwide, long-term major adverse impacts on visitor use and experience.

Non-motorized users would likely experience both adverse and beneficial effects under alternative 1. By eliminating OSV access to the interior of the park, it is anticipated that the experiences of skiers and snowshoers would generally be focused on the fringes of the park or along the highway corridor in the northern part of the park. This reduced access would restrict opportunities to experience the park's geyser field, the Yellowstone River and Yellowstone Falls, iconic wildlife, and peace and solitude associated with the winter season as compared to use under the 2009 to 2013 interim regulations. This would result in parkwide, long-term moderate to major adverse effects on visitor use and experience.

Benefits to non-motorized users may include increased opportunities to enjoy natural sounds and view wildlife compared to recent maximum allowable use conditions. Noise and disturbance generated by snowmobile and snowcoach activities would be limited to those associated with park management and administration personnel use. Therefore, such effects would generally be eliminated from the majority of the park increasing visitors' chance to experience natural sounds. However, non-motorized visitors do not generally concentrate their activities in areas frequented by snowmobiles and snowcoaches, but rather in the backcountry where they can experience the natural sights and sounds of the park. Therefore, the benefits of reduced motorized use for non-motorized users would be limited, localized, and long-term.

Because access to the winter range would require long treks on skis or snowshoes, human intrusion into this area would be infrequent. Visitors capable of making the trip to the winter range may have an increased wildlife experience, which would result in limited long-term benefits to their visitor experience.

Under alternative 1, the interior of the park would be closed to vehicular movements, thereby eliminating possible experiences for most visitors (although skiers and snowshoers could still access northern areas of the park but would have difficulty accessing the interior). This would result in long-term major adverse effects on visitor use and experience.

In terms of visitor accessibility, access for all visitors—whether with or without accessibility needs—to the park's interior would be limited to those capable of snowshoeing or cross-country skiing into the park. In addition, visitor services and amenities within the park would be severely reduced or eliminated. For the very young, the elderly, and those with mobility impairments, this would result in a loss of opportunity to experience the park's iconic features of Old Faithful, Geyser Basin, and Yellowstone River and Yellowstone Falls, among others. This would result in long-term, major adverse impacts for users with accessibility needs.

Cumulative Impacts

Winter visitors to the park often enjoy a variety of experiences and include other destinations in their plans for visiting the area. In the greater Yellowstone area, there are numerous opportunities for winter users to recreate in national forests, view wildlife in wildlife refuges, and visit local communities such as Jackson and Cody, Wyoming; West Yellowstone, Gardiner, and Cooke City Montana; and Island Park and Ashton, Idaho.

Although such destinations may be included in a visitor's itinerary, the experiences inside Yellowstone are not available elsewhere. A wide range of activities exist in Yellowstone in the winter including 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. Park concessioners operate lodging accommodations at Mammoth Hot Springs and Old Faithful and provide other services, including evening programs, snowmobile and snowcoach tours, guided ski and snowshoe tours, wildlife tours, a 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. Until the expiration of the 2009 to 2013 interim regulations, the availability of these services and experiences supported long-term benefits for winter visitor understanding and appreciation of park resources and values and provided access for those with mobility impairments. These experiences have provided long-term beneficial impacts for visitors and would provide beneficial impacts if continued into the future.

However, under alternative 1, only the northern portions of the park—Mammoth Hot Springs and Highways 212 and 89—would be accessible by motorized methods, and all OSV access would end. Visitor services at Old Faithful, Canyon, and other interior park locations would be closed because OSVs serve as the conduit to these experiences. Thus, under alternative 1, because access would be limited for all visitors, the availability and accessibility of the experiences would be eliminated. The impacts of past, present, and reasonably foreseeable future winter experiences, combined with the long-term major adverse impacts of alternative 1, would result in long-term major adverse cumulative impacts on visitor use and experience, of which alternative 1 impacts would constitute a large part.

Conclusion

Restricting winter access to the interior of the park by non-motorized means would result in long-term major adverse impacts on visitor use and experience for all visitors, including those with mobility impairments. Winter visitors desiring either or both non-motorized and motorized experiences would be affected by loss of access. Overall cumulative effects would be long-term major adverse.

Impacts of Alternative 2: Continue Snowmobile/Snowcoach Use at 2012/2013 Winter Season Interim Regulation Limits

Under alternative 2, the level of winter access permitted would remain the same as under the 2009 to 2013 interim regulations. Primary park roads would continue to be used for motorized access with up to 318 snowmobiles and 78 snowcoaches permitted per day, the level of use permitted under the 2009 to 2013 interim regulations. Assuming a maximum of 2 riders per snowmobile and maximum average capacity of 13.7 visitors per snowcoach the maximum number of visitors entering the park per day would be approximately 1,705. Commercial guides and BAT OSVs would be required. Because visitor use in the interior of the park would continue, the Old Faithful Snow Lodge, warming huts, and other winter amenities that help support a safe and high-quality visitor experience would continue to be offered, which would support all visitors, including those with accessibility needs. Access would be provided by snowcoaches equipped with ramps/lifts to accommodate wheelchairs. Visitors with mobility impairments who are capable of operating snowmobiles would have access to this traditional winter activity, and wheelchairs can be transported via snowmobile. In addition, small children could be accommodated on snowmobiles with their parents, providing an exciting and cost effective way for families to experience Yellowstone in winter. While touring by snowcoach and snowmobile, the Canyon can be viewed from accessible locations on the South Rim Drive at Artist Point and at Uncle Tom's Overlook. In addition, Fishing Bridge is partially wheelchair accessible.

Compared to alternative 1, alternative 2 would offer a markedly improved visitor experience—with the exception of the small group of people who could ski the long distances between park entrances and attractions—because it would allow motorized access in the park to continue, which would increase the number of visitors able to access the park's interior features in the winter. For those with mobility impairments, the continued ability to tour the park by OSV would offer a variety of opportunities to have a safe, informative, and enjoyable experience. The ability to tour the park by OSV would offer a variety of opportunities to enhance visitor experience, particularly where many park attractions would not otherwise be accessible. Requirements for using guides and BAT snowmobiles under this alternative would support opportunities to view wildlife and scenery, generally safe touring conditions, access to park information, opportunities for quiet and solitude, and clean air, similar to the conditions that have prevailed in the park since the 2004 winter season. For visitors with mobility impairments, as of the 2011/2012 season (the most recent completed season), the demand for snowcoach ramp/lift capabilities was being met by service providers with equipment suitable to meet these needs. It is anticipated that service providers would expand equipment capabilities to meet an increase in demand should it be necessary in the future.

Guides are familiar with those areas where wildlife viewing is particularly good and routinely make impromptu stops to view wildlife and park scenery. They enforce proper touring behavior and usually provide informative commentary to their clients. Other information would continue to be available at warming huts, contact stations, visitor centers and entrance stations. Because guided groups travel together and many such groups adhere to schedules that leave large periods of time free from OSV noise, periods of quiet and opportunities for solitude would continue. The requirement for using BAT technology would mean that good air quality in the park would also continue. For the majority of winter visitors, alternative 2 would provide long-term beneficial effects for visitor use and experience.

The presence of OSVs could cause wildlife to retreat from corridors where OSVs are used with the possibility of slightly reducing viewing opportunities. However, as described above under "Wildlife and Wildlife Habitat" the level of mechanized access proposed under alternative 2 would not be expected to result in large-scale changes in winter range use by park wildlife, and viewing opportunities would continue.

Visitors seeking non-motorized uses in the park would experience both beneficial and adverse effects. Users would benefit from continued access to the park's interior, maintenance of 35 miles of trails, and use of visitor services and amenities resulting in long-term beneficial effects on visitor experience and access. Localized adverse effects would occur from periodic exposure to OSV sounds and sights. As described in chapter 3 ("Soundscapes and the Acoustic Environment" and "Visitor Use, Experience, and Accessibility"), these intrusions would not be expected to result in measurable reductions in visitor satisfaction or understanding and appreciation of park resources and values. Therefore, impacts on visitor use and experience for those seeking a non-motorized experience would be long-term, negligible to minor adverse.

The daily allocation of OSVs would be fixed under alternative 2. Although the daily allocations for snowmobiles and snowcoaches may not be met on a daily basis, capacity may be reached during traditionally busy periods. Fixed use limits could affect peak season winter visitors, especially on holidays and weekends. During periods of high visitation, some visitors may not be able to enter the park or have the experience they desire at a particular entrance, whereas capacity may be available at another entrance that they cannot access. This could occasionally diminish benefits associated with alternative 2.

Although some visitor expectations for OSV access to the park may not be met under alternative 2, implementation of this alternative would provide adequate access to meet OSV demand because permitted use levels would be the same as those maintained under the 2009 to 2013 interim regulations, which have not been met on a parkwide basis. Resource conditions on which visitor experience is in part dependent, including air quality and natural sounds, would largely be protected (see the "Air Quality" and "Soundscapes and the Acoustic Environment" sections). Although long-term minor adverse impacts associated with unmet expectations for some visitor groups during high visitation periods would persist, alternative 2 would result in long-term benefits for visitor use and experience. For the very young, the elderly, and winter visitors with mobility impairments, alternative 2 would provide parkwide, long-term beneficial impacts for visitor accessibility.

Cumulative Impacts

Impacts on visitor use and experience from other past, present, and reasonably foreseeable future winter visitor experiences would be as described for alternative 1. These impacts are driven by the other recreational opportunities available on lands near the park such as national forests, wildlife refuges, and local communities such as Jackson and Cody, West Yellowstone, Gardiner, Island Park, and Ashton. These long-term beneficial impacts, when combined with the long-term beneficial

impacts of alternative 2, would result in long-term beneficial cumulative impacts on visitor use and experience. Alternative 2 would make a large contribution to these impacts by offering traditional winter visitor use and experience opportunities in Yellowstone, a unique recreational opportunity in the area, as well as providing a range of opportunities for visitors with mobility impairments.

Conclusion

Under alternative 2, continuing OSV use and access at the same levels as the 2009 to 2013 interim regulation limits would meet recent demand for winter visitation, including visitors with mobility impairments. Both motorized and non-motorized winter users would experience the benefits of continued access to the park's interior. Therefore, alternative 2 would result in long-term benefits for visitor use and experience. Cumulative impacts on visitor use and experience under alternative 2 would be long-term and beneficial.

Impacts of Alternative 3: Transition to Snowcoaches Meeting BAT Requirements Only

At the implementation of this alternative, this alternative would have the same use levels as under alternative 2 (up to 318 snowmobiles and 78 snowcoaches) and therefore the impacts would be the same for all park visitors. Beginning in the 2017/2018 winter season, BAT snowcoach access would be allowed to increase over a 3-year period from the 2009 to 2013 interim regulation levels of up to 78 vehicles per day to 120 vehicles per day. Snowmobile use would be correspondingly phased out once all snowcoaches achieve BAT status. Thus, snowmobile use would decrease from up to 318 vehicles per day to 0 over a 3-year period. Assuming a maximum average of 13.7 visitors per snowcoach, a total daily visitation rate of 1,644 visitors would be expected once the full snowmobile phaseout has occurred. Requirements for BAT snowmobiles and guided activities would continue throughout the transition period with all new snowcoaches required to have BAT beginning the 2014/2015 season, and existing snowcoaches to become BAT by the 2017/2018 season. Primary park roads would be groomed for OSV use, with the exception of the Sylvan Pass road, which would be closed to OSV use. Because visitor use in the park's interior would continue, the Old Faithful Snow Lodge, warming huts, and other winter amenities that help support a safe, high-quality visitor experience would continue to be offered. These accessible facilities in the park would continue to be available to support safe and informative park experiences for the very young, the elderly, and visitors with mobility impairments.

Compared to alternative 1, alternative 3 would offer an improved visitor experience. Although attractions and destinations would remain accessible and interpretation provided through guides, the experience of riding a snowmobile, which includes being exposed to the winter weather with no barrier between the visitor and the environment, would be lost. After the transition, some park users would be able to obtain their desired experience (snowcoach use) while others would not (snowmobile use) resulting in an overall long-term moderate adverse impact, because the same range of experiences as offered under the 2009 to 2013 interim regulations would not be available.

During the 3-year transition period, the requirements for using commercial guides and BAT snowmobiles would support opportunities to view wildlife and scenery, generally safe touring conditions, ready availability of information, good opportunities for quiet and solitude, and clean air. This would be similar to the conditions that have prevailed in the park since the 2004 winter season. Guides are familiar with typical wildlife viewing locations and routinely make impromptu stops to view wildlife and park scenery. They enforce proper touring behavior and usually provide informative commentary to their clients. Other information would continue to be available at warming huts, contact stations, visitor centers, and entrance stations. Requirements for BAT technology for snowcoaches would support good air quality.

After full implementation, visitors seeking non-motorized uses inside the park would experience limited beneficial effects. The total number of OSVs in the park would be reduced to 120 snowcoaches. Visitors may notice a reduction in OSV sounds exceeding 35 dBA in the travel corridor under snowcoach only conditions, as compared to the combined presence of snowmobiles and snowcoaches. As a result, backcountry visitors would experience quiet and solitude similar to that currently available in the park. However, non-motorized visitors would continue to benefit from access to the park's interior, maintenance of 35 miles of trails, and use of visitor services and amenities such as warming huts. Limited adverse effects would continue to occur from periodic exposure to snowcoach sounds and sights. As described in the "Affected Environment" chapter (see "Soundscapes and the Acoustic Environment" and "Wildlife and Wildlife Habitat"), these intrusions would be considered minimal.

The daily allocation of snowcoaches provided under alternative 3 would be fixed at 120 maximum when full phaseout occurs and this level may not meet demand during traditionally busy periods or my not allow for increased visitation. This could affect peak season winter visitors, particularly on holidays and weekends. As a result, some potential visitors may not be able to enter the park or have the experience they desire, possibly diminishing overall benefits associated with alternative 3 for those potential visitors. Visitors would be able to engage in OSV use in other areas in the region, but the specific experience of OSV use in Yellowstone would be more limited. Given that there had been unused capacity under the 2009 to 2013 interim regulations for accessible snowcoach tours, the increase would allow for substantial growth in services of accessible snowcoaches, if demand increases.

Some visitor expectations, for visitors with and without mobility impairments, for the type and amount of OSV access to the park may not be met under alternative 3. Additionally, the implementation of this alternative may not meet demand (based on use levels for the 2011/2012 winter season) or allow for increased winter visitation to the park. With only the option of snowcoach touring, alternative 3 would also have the potential to increase the cost of winter use experiences for families with small children. This would result in long-term, minor to moderate adverse effects on visitor use and experience. Alternative 3 would offer the greatest potential for the very young, the elderly, and visitors with mobility impairments to experience an informative "over the snow" adventure in the winter landscape of the park via snowcoach. However, the opportunity to use snowmobiles would be eliminated over the long term. Although there would be long-term minor to moderate adverse effects on visitor use and experience from the removal of the snowmobile experience in the park, alternative 3 would result in parkwide, long-term beneficial impacts on accessibility when compared to the no-action alternative.

Resource conditions that contribute to visitor experience (e.g., air quality and natural sounds) would largely be protected under this alternative. Although long-term minor adverse impacts associated with unmet expectations of some visitor groups would continue or increase with the elimination of snowmobile use, when compared to alternative 1, alternative 3 would result in long-term benefits for visitor use and experience with long-term moderate adverse impacts on users who can no longer have a snowmobile experience in the park. For the very young, the elderly, and winter visitors with mobility impairments, alternative 3 would provide parkwide, long-term beneficial impacts for visitor accessibility.

Cumulative Impacts

Impacts on visitor use and experience from other past, present and reasonably foreseeable future actions would be as described for alternative 1. These impacts are driven by the other recreational opportunities available on lands near the park such as national forests, wildlife refuges, and local

communities such as Jackson and Cody, West Yellowstone, Gardiner, Island Park, and Ashton. These long-term beneficial impacts, when combined with the long-term moderate adverse impacts and long-term beneficial impacts of alternative 3, would result in long-term moderate adverse impacts and long-term beneficial cumulative impacts on visitor use and experience. Alternative 3 would make a large contribution to these impacts by supporting traditional winter visitor use and experience opportunities in Yellowstone, a unique recreational opportunity in the area, as well as providing a range of opportunities for those with mobility impairments.

Conclusion

Under alternative 3, changes in visitor experience created by the transition to snowcoach access only would result in parkwide, long-term benefits compared to the no-action alternative. Both motorized and non-motorized winter users would experience the benefits of continued access to the park's interior. However, the opportunity to experience the park by snowmobile would be lost for all park users, including those with mobility impairments. This would result in some visitors' expectations not being met and result in long-term minor to moderate adverse impacts. Overall, alternative 3 would result in long-term beneficial impacts on visitor experience and access, with long-term moderate adverse impacts from the phaseout of the snowmobile experience but the maintenance of other winter experiences in the park. Cumulative impacts on visitor use and experience would be long-term beneficial and long-term moderate adverse.

Impacts of Alternative 4: Manage OSV Use by Transportation Events

Under alternative 4, OSVs would be managed by transportation events. Guided winter OSV access would continue, and a limited number of non-commercially guided, group snowmobile opportunities would be added.

Alternative 4 would offer a spectrum of opportunities and an increase in total numbers of OSVs compared to those allowed under the 2009 to 2013 interim regulations. The full allocation of snowmobile use would result in 50 snowmobile and 60 snowcoach tours per day. Using a maximum of 10 snowmobiles per snowmobile group (with an average of 7 over the season), up to 480 snowmobiles could enter the park each day, with 60 snowcoaches. On the other end of the spectrum, snowcoach tours could potentially increase from 78 to the full allocation of 106 transportation events, if none of the commercial transportation events on a given day were used for snowmobile access. Four transportation events would continue to be made available to non-commercially guided snowmobile access. Because operators would be able to choose how to use their events, it is possible that a visitor's desired mode of access may not be available, depending on how the operators spend their transportation event allocations. This would result in potential long-term moderate impacts if a visitor's chosen experience is not available, but they would still be able to have another type of winter experience.

Alternative 4 also offers the opportunity for additional numbers of visitors to access the park via OSV should OSVs meet voluntary E-BAT standards. If snowmobiles meet voluntary E-BAT, the seasonal average group size would be able to increase from 7 to 8, with the maximum group size remaining at 10. If snowcoaches meet voluntary E-BAT the group size for snowcoaches could increase from 1 to 2. For snowcoaches, if all meet voluntary E-BAT daily limits and no commercial snowmobile transportation events allocations are being used, the number allowed could rise from 106 to 212. Overall, the increase in the number of visitor opportunities should OSVs meet voluntary E-BAT would have long-term beneficial impacts. With the reduced sound emissions, the 2-snowcoach single transportation event would be expected to have similar impacts to 1 snowcoach that does not meet

voluntary E-BAT standards. Since impacts would be similar, it is not expected that there would be adverse impacts on visitor experience from the increase in snowcoach group size.

A maximum of 2,604 visitors per day could be expected under this alternative when there is maximum use of all snowmobile allocations and all snowcoach events are E-BAT and have 2 snowcoaches in each event. A maximum of 3,218 visitors per day could be expected if all commercial transportation events were E-BAT and had 2 snowcoaches per event and 4 events were non-commercially guided snowmobiles. The number of OSVs allowed in the park could increase or decrease, based on changes in technology. The ability to allow for increases in visitation with improved technology, without increasing impacts on park resources, would result in long-term beneficial impacts.

Under alternative 4, the addition of non-commercially guided tours would increase the variety of winter experiences from those available under the 2009 to 2013 interim regulations and create opportunities for those wishing to enter the park without a commercial guide. Operators would have choice in determining the use of OSV type to meet the demand of their clients. Depending on visitor or operator preference, up to half of these visitors would tour the park on snowmobiles. All guides would be required to complete a snowmobile education and safety course, but the level of interpretation provided by non-commercial guides, who enter the park no more than twice per season, may not be as thorough or in-depth as that offered by commercial guides entering the park daily. The non-commercially guided program would be monitored and if impacts on visitor use and experience increased due to lack of interpretation or other guide training, adjustments would be made to the program. The ability to ride their own BAT compliant snowmobiles in the park is likely to appeal to a portion of winter visitors, providing beneficial effects on visitor use and experience.

Because visitor use in the park's interior would continue, the Old Faithful Snow Lodge, warming huts, and other winter amenities that help support a safe and high-quality visitor experience would continue to be offered. These accessible facilities in the park would continue to be available to support a comfortable and informative park experience for the very young, the elderly, and visitors with mobility impairments. As described for alternative 2, the park's accessible facilities would support a comfortable and educational experience.

It is anticipated that this alternative would meet the expectations of most OSV visitors and provide operators options in providing winter tour services. For visitors with mobility challenges, snowcoaches would be able to accommodate demand and would likely be able to meet the increased need for such services, as necessary. If the number of snowcoaches increases as they meet voluntary E-BAT standards further beneficial impacts would be realized. Those seeking snowmobile experiences would have access to two types of this activity. The very young, the elderly, and visitors with mobility impairments could continue to visit the park during winter.

It is not expected that visitors would notice much reduction in OSV sounds exceeding 35 dBA in the travel corridor (from an average of 123 and a maximum of 237 transportation events allowed under the 2009 to 2013 interim regulations to 110 events per day). As a result, backcountry visitors would experience quiet and solitude similar to that currently available in the park. However, non-motorized visitors would continue to benefit from access to the park's interior, maintenance of 35 miles of trails, and use of visitor services and amenities such as warming huts. Limited adverse effects would continue to occur from periodic exposure to snowcoach sounds and sights. As described in chapter 3 (see "Soundscapes and the Acoustic Environment" and "Wildlife and Wildlife Habitat"), these intrusions would be considered minimal. Should OSVs meet voluntary E-BAT standards, the number of transportation events would not increase and impacts on visitor use, experience, and accessibility would not be expected to increase beyond a minimal level.

Alternative 4 has the greatest potential to meet expectations of OSV visitors to the park and to allow operators to meet client demand by choosing how to use their transportation events, as well as the greatest potential for an increase in visitor opportunities. Also associated with this alternative would be a significant reduction in the total number of transportation events (compared to conditions allowed under the 2009 to 2013 interim regulations which would allow for an average of 123 events and a maximum of 237 events) and associated numbers of disturbances to wildlife and the soundscape as a result of these disturbances. Compared to alternative 1, overall impacts on visitor use and experience would be long-term beneficial.

Cumulative Impacts

Impacts on visitor use and experience from other past, present and reasonably foreseeable future actions would be as described for alternative 1. These impacts are driven by the other recreational opportunities available on lands near the park such as national forests, wildlife refuges, and local communities such as Jackson and Cody, West Yellowstone, Gardiner, Island Park, and Ashton. These long-term beneficial impacts, when combined with the long-term beneficial impacts of alternative 4 would result in long-term beneficial cumulative impacts on visitor use and experience. Alternative 4 would make a large contribution to these impacts by supporting traditional winter visitor use and experience opportunities in Yellowstone, options for operators, and a range of opportunities for visitors with mobility impairments.

Conclusion

Under alternative 4, management by transportation events and the inclusion of non-commercially guided snowmobile tours would increase visitor opportunities, resulting in parkwide, long-term beneficial impacts compared to the no-action alternative for visitor use and experience and visitor accessibility. If visitors are able to experience winter use, but not in the mode they desire due to how operators use their allocations, there would be a potential for long-term moderate adverse impacts. The number of visitors who have access to the park would increase compared to the other alternatives. Impacts on all resources, including visitor use, experience, and accessibility, would remain the same or decrease compared to recent maximum allowable use due to a decrease in the number of transportation events compared to the conditions allowed under the 2009 to 2013 interim regulations. Both motorized and non-motorized winter users would experience the benefits of continued access to the park's interior, and operators would have the ability to choose the type of service they provide. Overall, alternative 4 would result in long-term benefits for visitor experience and access. Cumulative impacts would be beneficial.

HEALTH AND SAFETY

GUIDING REGULATIONS AND POLICIES

NPS *Management Policies 2006* address providing a safe and healthful environment for visitors and employees, as further described below. *Management Policies 2006* also state, "the Service will reduce or remove known hazards and apply other appropriate measures, including closures, guarding, signing, or other forms of education" (NPS 2006a, Section 8.2.5.1). For Yellowstone winter use, this would relate to the air and sound emissions, avalanche danger, and safety concerns between different modes of winter transportation (including conflicts between users and safety concerns related to motorized use in winter driving conditions) experienced by staff and visitors.

Air Emissions. The Occupational Safety and Health Administration (OSHA) sets enforceable permissible exposure limits (PELs) to protect workers against the health effects of exposure to

hazardous substances. PELs are regulatory limits on the amount or concentration of a substance in the air, and are based on an 8-hour time-weighted average (TWA) exposure (OSHA 2006). Table 64 shows the PELs established by OSHA. In addition to these standards, studies at Yellowstone also consider the limits of the American Conference of Governmental Industrial Hygienists (ACGIH), which is an industry standard setting organization. ACGIH details threshold limit values (TLVs) for various air emissions, which are also presented in table 64.

Noise Emissions. Various standards exist for occupational exposure to noise including the OSHA PELs, EPA standards, and the National Institute for Occupational Safety and Health (NIOSH) standards, each discussed below.

In order to protect the hearing of employees, OSHA has established maximum noise levels for occupational exposure, beyond which mitigation measures or personal protective equipment is required. Table 65 shows the permissible noise exposures established by OSHA. The action level at which a hearing conservation program for employees is warranted, has been identified by OSHA as 85 dBA. The PEL for noise exposure as identified by OSHA is 90 dBA. The impacts analysis considers the 8-hour standard for all agencies, for purposes of comparison.

TABLE 64: OSHA AND ACGIH LIMITS FOR AIR CONTAMINANTS

Substance	8-hour Time-weighted Average OSHA PEL	ACGIH TLV
Acetone	1000 ppm	500 ppm
Benzene	1.0 ppm	0.5 ppm
Carbon Monoxide	50 ppm	25 ppm
Ethyl Alcohol	1000 ppm	1000 ppm
Ethyl Benzene	100 ppm	100 ppm
Formaldehyde	0.75 ppm/2.0 ppm [a]	0.3 ppm [b]
Isopropyl Alcohol	400 ppm	400 ppm
Naphtha	100 ppm	—
Petroleum Distillates	500 ppm	—
Toluene	200 ppm	50 ppm
Xylene	100 ppm	100 ppm

Source: 29 CFR 1910, Radtke 2008 and 2009.

[a] Short-term exposure limit.

[b] Ceiling limits.

— Data not available.

TABLE 65: OSHA PERMISSIBLE NOISE EXPOSURES

Duration per Day (Hours)	Sound Level (dBA Slow Response)
8	90
6	92
4	95
3	97
2	100
1 ½	102
1	105
½	110
¼ or less	115

Source: OSHA 2006.

Although the primary responsibility for the control of noise rests with state and local governments, federal action is essential to deal with major noise sources in commerce, the control of which requires national uniformity of treatment (EPA 2010m). Directed by Congress, the EPA retains authority to investigate and study noise and its effects, disseminate information to the public regarding noise pollution and its adverse health effects, respond to inquiries on matters related to noise, and evaluate the effectiveness of existing regulations for protecting the public health and welfare, pursuant to the Noise Control Act of 1972 and the Quiet Communities Act of 1978 (EPA 2010n). Noise levels necessary to protect public health and welfare against hearing loss, annoyance, and activity interference have been identified and published in a new EPA document, "Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety." The document identifies a 24-hour exposure level of 70 dB as the level of environmental noise that will prevent any measurable hearing loss over a lifetime. Likewise, a level of 55 dB outdoors is identified as preventing activity interference and annoyance (EPA 2010o).

In the Occupational Safety and Health Act of 1970, NIOSH is charged with recommending occupational safety and health standards, including noise exposure, and describing exposure concentrations that are safe for various periods of employment. By means of criteria documents, NIOSH communicates these recommended standards to regulatory agencies, including OSHA and others in the occupational health and safety community. In 1972, NIOSH published *Criteria for a Recommended Standard: Occupational Exposure to Noise*, which provided the basis for a recommended standard to reduce the risk of developing permanent hearing loss as a result of occupational noise exposure. In 1998 NIOSH issued revised recommendations, which go beyond attempting to conserve hearing by focusing on preventing occupational noise-induced hearing loss (NIOSH 1998). The ANSI is a private, non-profit membership organization that serves as administrator and coordinator of the U.S. private sector voluntary standardization system. It facilitates the development of American National Standards by accrediting the procedures of organizations that develop standards. These groups work cooperatively to develop voluntary national consensus standards. ANSI empowers its members and constituents to strengthen the U.S. marketplace position in the global economy while helping to assure the safety and health of consumers and the protection of the environment (ANSI n.d.). The NIOSH and ANSI recommended exposure limit (REL) for occupational noise exposure is 85 dBA as an 8-hour TWA (Noise Pollution Clearinghouse n.d.). With a 40-year lifetime exposure at the 85 dBA REL, the excess risk of developing occupational noise-induced hearing loss is eight percent, which is considerably lower than the 25 percent excess risk at

the 90 dBA PEL currently enforced by OSHA (NIOSH 1998). Table 66 shows a comparison of noise exposure standards set by OSHA, EPA, NIOSH, and ANSI.

TABLE 66: COMPARISON OF NOISE EXPOSURE STANDARDS SET BY DIFFERENT ORGANIZATIONS

	EPA	ANSI and NIOSH	OSHA
dBA	Hours	Hours	Hours
70	24		
73	12		
76	6		
79	3		
82	1		
85		8	
88		4	
90			8
91		2	
92			6
94		1	
95			4
97			3
100			2
102			1

Source: Noise Pollution Clearinghouse n.d.

Avalanche Danger. On August 10, 11, and 12, 2010, seven internal NPS and external avalanche control experts and observers undertook a detailed, systematic review of agency winter operations on Sylvan Pass at Yellowstone, called an Operational Risk Management Assessment (ORMA). This review was a secondary follow-up to the initial ORMA conducted in 2007. The ORMA focused on the following four principles:

1. Accept no unnecessary risk.
2. Accept risk when benefits outweigh the cost.
3. Anticipate and manage risk by planning.
4. Make risk decisions at the right level.

A key feature is that ORMA does not tell you what to do, it gives you an accurate assessment of all risks and asks the question: “What is acceptable to you?” As part of the ORMA, the panel assessed possible operating conditions for Sylvan Pass, including current operations, and scored these various scenarios under the green-amber-red scale. The green-amber-red scale is shown in figure 32. For reference, current Sylvan Pass operations received a green-amber-red score of 34.67, or approximately 35, the high end of green.

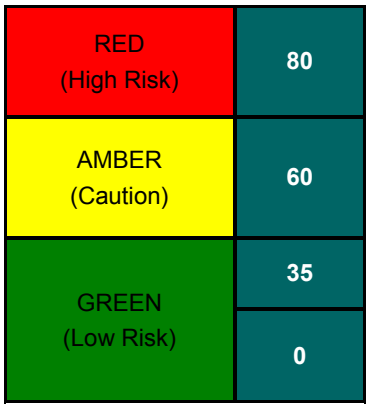


FIGURE 32: GREEN-AMBER-RED SCALE FOR THE ORMA PROCESS

Visitor Use Conflict/Exposure to the Elements. NPS *Management Policies 2006* address health and safety for both NPS staff and visitors. For NPS staff, Section 1.9.1.4 "Employee Safety and Health" states,

> The safety and health of employees, contractors, volunteers, and the public are core Service values. In making decisions on matters concerning employee safety and health, NPS managers must exercise good judgment and discretion and, above all, keep in mind that the safeguarding of human life must not be compromised. The Service must ensure that all employees are trained and informed on how to do their jobs safely, and that they have the necessary clothing, materials, and equipment to perform their duties with minimal personal risk.

In relation to visitor safety, Section 8.2.5.1 states in part:

> While recognizing that there are limitations on its capability to totally eliminate all hazards, the Service and its concessioners, contractors, and cooperators will seek to provide a safe and healthful environment for visitors and employees. The Service will work cooperatively with other federal, tribal, state, and local agencies; organizations; and individuals to carry out this responsibility. The Service will strive to identify and prevent injuries from recognizable threats to the safety and health of persons and to the protection of property by applying nationally accepted codes, standards, engineering principles, and the guidance contained in Director's Orders 50B, 50C, 58, and 83 and their associated reference manuals. When practicable and consistent with congressionally designated purposes and mandates, the Service will reduce or remove known hazards and apply other appropriate measures, including closures, guarding, signing, or other forms of education. In doing so, the Service's preferred actions will be those that have the least impact on park resources and values.
>
> The Service recognizes that the park resources it protects are not only visitor attractions, but that they may also be potentially hazardous. In addition, the recreational activities of some visitors may be of especially high-risk, high-adventure types, which pose a significant personal risk to participants and which the Service cannot totally control. Park visitors must assume a substantial degree of risk and responsibility for their own safety when visiting areas that are managed and maintained as natural, cultural, or recreational environments.

ASSUMPTIONS, METHODOLOGY, AND INTENSITY DEFINITIONS

The area of analysis is the park. To assess the level of impact on employee and public health and safety for each alternative, the following types of information were used:

- Safety policies and guidelines
- Results of air monitoring near the West Entrance in Yellowstone
- Results of personal exposure and sound monitoring
- Reports from employees and guides
- Past and current avalanche analyses and the result of recent ORMA proceedings.

Overall impacts on health and safety, including impacts for avalanche control in the Sylvan Pass area of Yellowstone, are defined below. Because personal and occupational exposure to air quality and noise contaminants has been monitored in Yellowstone, the alternatives are compared qualitatively, using the monitoring data (Jensen and Meyer 2006; Spear, Hart, and Stephenson 2006; Radtke 2008, 2009).

Intensity Definitions

The following intensity definitions for evaluating impacts on health and safety were defined.

Negligible: Air and noise emissions would be well below applicable standards. There would be limited risk to employees conducting avalanche control activities during the winter use season at Sylvan Pass (green as defined by the ORMA). There would be no risk to minimal risks to visitors as a result of conflicts with other uses, as well as from the harsh winter elements.

Minor: Air and noise emissions would remain below applicable standards. If mitigation were needed, it would be relatively simple and would likely be successful. There would be limited to moderate risk to employees conducting avalanche control activities during the winter use season at Sylvan Pass (green as defined by ORMA). There could be occasional risks to visitors as a result of conflicts with other uses, as well as from the harsh winter elements, but reported incidents of these conflicts to law enforcement would remain infrequent.

Moderate: Applicable air and noise standards may be approached occasionally. Mitigation measures would probably be necessary and would likely be successful. There would be a moderate to high risk to employees conducting avalanche control activities during the winter use season at Sylvan Pass (amber as defined by ORMA). There could be occasional to frequent risks to visitors, reported to law enforcement, as a result of conflicts with other uses, as well as from the harsh winter elements.

Major: Applicable standards for air and noise would be exceeded at least rarely, and could not be mitigated with simple measures. Extensive mitigation measures would be needed, and their success would not be guaranteed. There would be a high risk to employees conducting avalanche control activities during the winter use season at Sylvan Pass (red as defined by ORMA). There could be frequent risks to visitors, reported to law enforcement, as a result of conflicts with other uses, as well as from the harsh winter elements.

Study Area

The geographic study area for health and safety for the impact analysis and cumulative impact analysis is within the boundary of the park.

SUMMARY OF IMPACTS

Impacts on health and safety under the alternatives ranged from long-term moderate adverse, under alternatives 2 and 4 from potential use conflicts and the operation of Sylvan Pass, to long term and beneficial for alternatives that include the closure of Sylvan Pass (alternatives 1 and 3). Impacts under each alternative were as follows:

- Alternative 1 would have long-term negligible adverse impacts on health and safety from noise and air emissions because air pollution and noise levels would be limited to administrative OSV use and would be minimal. There would also be long-term beneficial impacts on health and safety from the closure of Sylvan Pass. Long-term minor adverse impacts would occur from the possibility of non-motorized users being out in harsh winter conditions with minimal support facilities.
- Alternatives 2 and 4 would have long-term negligible adverse impacts on health and safety from air and noise emissions because levels would be well below all regulatory standards for human health. Because both of these alternatives would include the operation of Sylvan Pass, there would be long-term moderate adverse impacts due to the inherent risk of staff working in a known avalanche zone. OSV use levels and types (both snowmobile and snowcoach use) under these alternatives would result in long-term minor to moderate adverse impacts from user conflicts and exposure to the elements. Overall, compared to alternative 1, these alternatives would have a greater adverse impact to health and safety as allowing visitor OSV use in the park would result in inherent risks, including staff working at Sylvan Pass, user conflict, and exposure to the elements.
- Alternative 3 would have long-term negligible adverse impacts on health and safety from air and noise emissions because levels would be well below all regulatory standards for human health. The closure of Sylvan Pass would have long-term beneficial impacts because staff would not be working in a known avalanche zone. Because more users would be in snowcoaches, exposure to the elements would be reduced and long-term minor adverse impacts from user conflicts and exposure to the elements would occur. Overall, compared to alternative 1, alternative 3 would have a greater adverse impact to health and safety as allowing visitor OSV use in the park would result in inherent risks, including user conflict and exposure to the elements. Impacts would be less than those under alternatives 2 and 4 because Sylvan Pass would be closed.

DETAILED IMPACT ANALYSIS

Impacts of Alternative 1: No Action - No Snowmobile/Snowcoach Use

Under alternative 1, snowmobile use would be limited to administrative uses. The few administrative snowmobiles used in the park would meet BAT guidelines, with road grooming being completed on an as-needed basis (greatly reduced from current operations). Non-motorized uses would continue in the park, but would likely be limited to the outer edges due to the distance between the park entrance and Old Faithful, because many park visitors would not have the physical ability to cover this distance. Because no recreational or administrative OSV use would occur, Sylvan Pass would be closed to visitor use and would not require staff for daily avalanche control operations.

With this minimal level of use, exposure to air pollutants would be limited compared to recent maximum allowable use. As noted above under "Air Emissions," emissions levels would be well below OSHA PELs and ACGIH TLVs. Likewise, employees at the entrances would not be exposed to benzene or formaldehyde since recreational OSVs would no longer be going through the park entrances. As a result, there would be long-term negligible adverse impacts to health and safety in terms of air emissions.

Under the no-action alternative, noise would also be limited to administrative use. As described above under "Soundscapes and the Acoustic Environment," these noise levels would be minimal and well below OSHA, NIOSH, and EPA noise standards. As a result, there would be long-term negligible adverse impacts on health and safety in terms of sound emissions and there would be an improvement in air emissions over the recent maximum allowable use (alternative 2).

With the closure of Sylvan Pass, avalanche control operations would not be necessary and park employees would not be exposed to the inherent risks of avalanche control operations (as described in chapter 3). During the 2010 ORMA, existing operations were considered, with the panel ranking them in the green category, but at the very high end. With the closure of Sylvan Pass, these operations would no longer be required, resulting in long-term beneficial impacts on staff health and safety, because staff members would no longer be forecasting in this area on a daily basis, reducing the amount of risk they would encounter. The 2010 ORMA also addressed the spring opening of Sylvan Pass in the context of winter avalanche management at Sylvan Pass, and additional challenges were identified for the spring opening of Sylvan Pass if avalanche forecasting and control operations did not occur in the winter.

Visitor use in the park would be limited to non-motorized use, the majority of which would occur on the periphery of the park. Non-motorized users may encounter administrative OSV use, but this use would be limited to a few trips a day and these encounters would be infrequent. In general, there would be long-term negligible adverse impacts, because the potential for conflict between uses would be minimal. However, non-motorized users could face increased risks in the interior of the park, because there would be limited facilities or other users to assist should weather conditions change, resulting in long-term minor adverse impacts. In addition, the limited staff that would be in the park during the winter season would not have back up should an emergency occur, because staffing within the park would be extremely limited.

Overall, air pollution and noise levels would be limited to administrative OSV use and would be minimal, and the closure of Sylvan Pass would reduce the avalanche risk to staff. Therefore, impacts on health and safety would be long-term negligible adverse and long-term beneficial, with the potential for long-term minor adverse impacts from the possibility of non-motorized users being out in harsh winter conditions with minimal support facilities.

Cumulative Impacts

Past, present, and reasonably foreseeable future actions that could impact health and safety include recreation occurring on adjacent lands (including use in consolidated forest lands). This recreation would require the use of vehicles or other equipment that create air and/or noise emissions in the region, but would not create any avalanche danger to be mitigated. All of these actions occur on lands outside of the park and do not extend into the park, and result in long-term negligible adverse impacts.

Multiple construction projects currently occurring or planned in the park would also contribute to impacts on health and safety. These projects would include construction of the new West Entrance and reconstruction of the East Entrance Road (underway). Overall, although construction sites could have temporary adverse impacts on park visitors related to health and safety, construction would not be occurring during the winter months and would not impact park staff and visitors during this time. Some of these projects would have beneficial impacts related to winter use because the reconstruction of the East Entrance Road has moved the road farther away from avalanche slide areas, and the construction of new facilities at the West Entrance has included new staff kiosks with improved ventilation systems, if needed. Overall, these construction projects would have long-term beneficial impacts on health and safety.

The long-term negligible adverse impacts and long-term beneficial impacts of these past, present, and reasonably foreseeable future actions, combined with the long-term negligible to minor adverse impacts and long-term beneficial impacts of alternative 1, would result in long-term negligible adverse cumulative impacts on health and safety. Alternative 1 would contribute a minimal amount to the overall cumulative impacts because many of these actions occur across a larger region of which Yellowstone is a part.

Conclusion

Overall, air pollution and noise levels would be limited to administrative OSV use and would be minimal, and the closure of Sylvan Pass would reduce the avalanche risk to staff. Therefore, impacts on health and safety would be long-term negligible adverse and long-term beneficial, with the potential for long-term minor adverse impacts from the possibility of non-motorized users being out in harsh winter conditions with minimal support facilities. Cumulative impacts would be long-term, negligible adverse.

Impacts of Alternative 2: Continue Snowmobile/Snowcoach Use at 2012/2013 Winter Season Interim Regulation Limits

Under alternative 2, use levels in the park would allow for up to 318 snowmobiles per day and 78 snowcoaches, the level of use permitted under the 2009 to 2013 interim regulations. Existing OSV management measures that include BAT guidelines for snowmobiles, guiding requirements, and hours of operation restrictions would continue. In addition to the current management measures employed, BAT guidelines would be developed and implemented for snowcoaches by the 2017/2018 season. Non-motorized uses would continue in the park throughout the interior, as currently occurring. Under alternative 2, Sylvan Pass would be open to visitor use and would require staff for daily avalanche control operations.

Staff exposure to air and noise emissions in the winter was measured during an exposure assessment conducted at the entrance stations during Presidents' Day weekend of 2008 (a peak use period). Use volume over the three-day weekend was 691 snowmobiles and 71 snowcoaches total (Radtke 2008). A similar exposure assessment was again conducted during President's Day weekend of 2009. During

the 2009 assessment, use volumes were 635 snowmobiles and 64 snowcoaches total for the three-day weekend. In addition to a slightly lower level of use, the 2009 study differed from the 2008 study with a new entrance station configuration; also, during one day of the assessment (February 15), the emissions from snowcoaches were separated from those of snowmobiles to determine whether exposure levels would differ (Radtke 2009).

The 2008 and 2009 exposure assessments looked at air emissions through the measurement of CO, hydrocarbons, and aldehydes. At these use levels, the exposure assessments found that results for all VOCs, aldehydes, and CO were well below the occupational exposure limits (for OSHA and ACGIH) and in most cases were below the detection limits of the analytical method (Radtke 2008). In the 2008 assessment, results for VOCs showed that most were below the detection limit, with the relative highest exposure being to benzene, which was approximately 2 percent of the PEL. Employees on snowmobiles did show measurable CO exposures, but those levels were still below applicable standards (approximately 10 percent of the PEL). During this survey, three of nine aldehydes had detectable levels of formaldehyde (limit of detection was 1 μg/sample). Although detectable, these measurements were still only 2–3 percent of the PEL and 5–7 percent of the ACGIH TLV. No other aldehydes, such as acrolein or acetaldehyde were above the detection limit (Radtke 2008). In the 2009 assessment, similar results occurred with personal exposures to these contaminants well below OSHA PELs and ACGIH TLVs and with most being below detectable limits. In looking at the separation of snowcoaches and snowmobiles in 2009, these vehicles were separated by lane at the West Entrance with 19 snowcoaches in lane B and 241 snowmobiles in lane A over the three-day weekend. The results of this separation showed that CO was slightly higher over the sampling period for the snowmobile lane, but the peak reading was higher for snowcoaches (although the peak reading did not reach the NIOSH ceiling of 200 ppm). There was no difference evident in aldehydes or VOCs between the two vehicle types.

Results showing that air emissions were well within all applicable standards from the 2008 and 2009 assessments are due, in part, to the OSV management occurring in Yellowstone. Requirements for BAT, as well as required guides and limits on the number of OSVs in the park, contribute to keeping emissions well within regulatory levels. Also contributing to these low levels are the kiosk ventilation systems, where the employees work. Under alternative 2, use levels would be lower than those reported in the 2008 and 2009 exposure assessments and management measures that have kept emissions low, described above, would be continued. With lower levels of use (up to 318 snowmobiles and 78 snowcoaches, compared to over 600 snowmobiles and a similar level of snowcoach use), it is expected that air emissions under alternative 2 would continue to be well below the detection limit and within OSHA PELs and ACGIH TLVs. As shown in the 2009 study, peak levels of CO would likely be higher for snowmobiles than snowcoaches, but still within established levels. Because use would likely be within OSHA PELs and ACGIH TLVs with no exceedances, based on past monitoring, impacts on health and safety from air emissions would be long-term negligible adverse.

The 2008 and 2009 assessments looked at noise emissions at the West Entrance as well as for employees using OSVs on a daily basis. In both 2008 and 2009, personal noise exposures in the two kiosks at the West Entrance ranged from 67.1 dBA to 70.6 dBA. These levels are below the OSHA action level/PEL as well as EPA and NIOSH standards (Radtke 2008, 2009). The 2008 assessment also monitored a maintenance employee riding a four-stroke snowmobile for a full shift, and found that the full shift exposure was close to the OSHA action level (85 dBA) (Radtke 2008). Under alternative 2, use levels would be lower than those assessed in the 2008 and 2009 exposure assessments, and management measures that have kept noise emissions low, such as BAT and set use levels, would be continued. With lower levels of use, it is expected that noise emissions under

alternative 2 would continue to be below the OSHA action level, and impacts on health and safety from noise emissions would be long-term negligible adverse.

Alternative 2 would provide for the continued operation of Sylvan Pass, with avalanche control operations continuing at their current levels. As described in chapter 3, avalanche work is inherently dangerous and risks to employees may be greater than those generally posed to visitors because (1) employees conducting avalanche hazard mitigation spend more time in the pass and (2) avalanche control work, by its very nature, is hazardous. Under alternative 2, the risk would be addressed through the implementation of a strict, safety-based risk reduction program, continuing the program that is currently in place and that was rated in the recent ORMA on the high end of green, getting close to amber. The pass would not be open unless safety criteria are met and, in the professional judgment of park managers, operations can be conducted within acceptable levels of risk.

When park staff members perform avalanche mitigation, a combination of avalanche mitigation techniques could be used, including risk assessment analyses as well as forecasting and helicopter- and howitzer-dispensed explosives. Area staff would use whichever tool is the safest and most appropriate for a given situation, with the full understanding that safety of employees and visitors comes first. Employees in the field would make the operational determination of when safety criteria have been met and operations can be conducted with acceptable levels of risk. The NPS would not take unacceptable risks. When safety criteria have been met, the pass would be open; when they have not been met, the pass would remain closed. As with past winters, extended closures of the pass may occur. Also, during the winter season, the pass would not be open for administrative travel unless it is also open to public travel, further reducing employee exposure to risk. Because current operations were rated by the ORMA as green (at the high end, getting close to amber) (NPS 2010n), impacts on NPS health and safety staff from avalanche operations would be long-term moderate adverse.

Visitor use in the park would include both motorized and non-motorized use. As noted in chapter 3 (figure 23), since OSV management that has included guiding requirements was implemented, the number of OSV moving violations and arrests has continued to decline. Alternative 2 would continue OSV management measures put in place since 2004, including requiring guided use of all OSVs. Guided use also ensures that guides have been trained (as part of their agreement with the NPS) in operation in winter conditions and in avoiding conflict with non-motorized users. Guiding requirements would have long-term beneficial impacts on health and safety. Alternative 2, as with all action alternatives, would not advise non-essential work/OSV travel at below −20°F, which would reduce the amount of time both visitors and staff would spend in harsh winter conditions. Because OSV use would still occur and staff and visitors would still be exposed to the winter elements, impacts would be long-term minor adverse, because OSV management and park practices would minimize both user conflict and risk from the elements.

Overall air pollution and noise levels would be below applicable standards, and conflicts between users and exposure to harsh winter conditions would be minimized through OSV management measures under alternative 2. NPS employees working in Sylvan Pass would still be exposed to avalanche risk, which has been rated at the high end of green, getting close to the amber (caution) level in a recent ORMA process (NPS 2010n). Under alternative 2, impacts on human health and safety would be long-term negligible adverse from air and noise emissions, long-term moderate adverse from the operation of Sylvan Pass, and long-term minor adverse from user conflicts and exposure to the elements.

Cumulative Impacts

The long-term negligible adverse impacts and long-term beneficial impacts on the health and safety of NPS staff and visitors from other past, present, and reasonably foreseeable future actions would be the same as described for alternative 1. These impacts are a result of recreational activities on adjacent lands that contribute to noise and air emissions, although these contributions are minimal because the activities do not extend into the park. Construction projects occurring within the park that improve roads and other facilities contribute to the beneficial impacts of these actions. The effects of these actions, when combined with the long-term negligible to moderate adverse impacts of alternative 2, would result in long-term minor adverse cumulative impacts on health and safety. Alternative 2 would contribute a minimal amount to the overall cumulative impacts because many of these actions occur across a larger region of which Yellowstone is a part.

Conclusion

Under alternative 2, impacts on human health and safety would be long-term negligible adverse from air and noise emissions, long-term moderate adverse from the operation of Sylvan Pass, and long-term minor adverse from user conflicts and exposure to the elements. Cumulative impacts under alternative 2 would be long-term minor adverse.

Impacts of Alternative 3: Transition to Snowcoaches Meeting BAT Requirements Only

Under alternative 3, until all snowcoaches in the current fleet meet BAT requirements use levels and their impacts on health and safety would be the same as under alternative 2, 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.

After all snowcoaches have met BAT requirements, OSV use would transition to snowcoach use only after three years and would result in use levels of 120 snowcoaches and 0 snowmobiles at the end of the transition. During this transition, the provisions of the interim regulations would continue to be in effect, including BAT guidelines for snowmobiles, guiding requirements, and hours of operation restrictions. In addition to the current management measures employed, BAT guidelines would be developed and implemented for snowcoaches by the 2017/2018 season, with any new snowcoaches coming on line starting in the 2014/2015 being required to meet BAT standards. Non-motorized uses would continue within the park, throughout the interior as occurring under the 2009 to 2013 interim regulations. Under alternative 3, Sylvan Pass would be closed to visitor use and would not require staff for daily avalanche control operations.

As described above under alternative 2, exposure assessments were conducted over Presidents' Day weekend 2008 and 2009. These assessments found that at use levels between 635 and 691 snowmobiles and 64 and 71 snowcoaches over a three-day weekend, exposures to air emissions were below all occupational exposure limits (Radtke 2008, 2009). Because use levels for OSV would be lower (approximately one-sixth of less than the measured use), it is expected that air emissions exposure from OSV for alternative 3 would continue to be below all occupational exposure limits. As shown in the 2009 study, peak levels of CO were higher for snowmobiles than snowcoaches, but still within established levels. As the number of snowcoaches permitted increases above the levels studied, additional exposure assessments would occur to ensure that emission levels stay below occupational exposure limits. However, because the additional 42 snowcoaches would be offset by the elimination of 318 snowmobiles, it is expected that these limits would be not be exceeded. Because use would likely be within OSHA PELs and ACGIH TLVs with no exceedances, based on past monitoring, impacts on health and safety from air emissions would be long-term negligible adverse.

The 2008 and 2009 assessments also looked at noise emissions at the West Entrance as well as for employees using OSVs on a daily basis. As described in alternative 2, personal noise exposures within the two kiosks at the West Entrance were below the OSHA action level/PEL as well as EPA and NIOSH standards (Radtke 2008, 2009). With lower levels of total OSV use proposed after the transition to snowcoaches only than the use levels assessed in 2008 and 2009, it is expected that noise emissions under alternative 3 would continue to be below the OSHA action level and impacts on health and safety from noise emissions would be long-term negligible adverse.

With the closure of Sylvan Pass under alternative 3, avalanche control operations would not be necessary and park employees would not be exposed to the inherent risks of avalanche control operations (as described in chapter 3). During the 2010 ORMA, existing operations were considered, with the panel ranking them in the high end of green, getting close to the amber (or caution) category (NPS 2010n). With the closure of Sylvan Pass, these operations would no longer be required, resulting in long-term beneficial impacts on staff health and safety because staff members would no longer be forecasting in this area on a daily basis reducing the amount of risk they encounter. The 2010 ORMA also addressed the spring opening of Sylvan Pass in the context of winter avalanche management at Sylvan Pass, and additional challenges were identified for the spring opening at Sylvan Pass if avalanche forecasting and control operations did not occur in the winter.

Visitor use in the park would include both motorized and to non-motorized use. As noted in chapter 3 (figure 23), since guiding requirements have been implemented, the number of OSV moving violations and arrests has continued to decline. Alternative 3 would continue OSV management measures put in place since 2004, including requiring guided use of all OSVs, and after the transition would include snowcoaches only. Guided use also ensures that guides have been trained (as part of their agreement with the NPS) in operation in winter conditions and in avoiding conflict with non-motorized users. The continuation of guiding requirements would have long-term beneficial impacts on health and safety. Alternative 3, as with all action alternatives, would not advise non-essential work/OSV travel at below −20°F, which would reduce the amount of time both visitors and staff would spend in harsh winter conditions. Because OSV use would still occur and staff and visitors would still be exposed to the winter elements, impacts would be long-term minor adverse, because OSV management and park practices would minimize both user conflict and risk from the elements.

Overall, air pollution and noise levels would be expected to be below applicable standards, and conflicts between users and exposure to harsh winter conditions would be minimized through OSV management measures under alternative 3. NPS employees working in Sylvan Pass would not be exposed to avalanche risk because Sylvan Pass would be closed. Under alternative 3, impacts on human health and safety would be long-term negligible adverse from air and noise emissions, long-term beneficial from the closure of Sylvan Pass and long-term minor adverse from user conflicts and exposure to the elements.

Cumulative Impacts

The long-term negligible adverse impacts and long-term beneficial impacts on the health and safety of NPS staff and visitors from other past, present, and reasonably foreseeable future actions would be the same as described for alternative 1. These impacts are a result of recreational activities on adjacent lands that contribute to noise and air emissions, although these contributions are minimal because the activities do not extend into the park. Construction projects within the park that improve roads and other facilities would contribute to the beneficial impacts of these actions. The effects of these actions, when combined with the long-term negligible to minor adverse and long-term beneficial impacts of alternative 3, would result in long-term negligible adverse cumulative impacts on health and safety.

Alternative 3 would contribute a minimal amount to the overall cumulative impacts because many of these actions occur across a larger region of which Yellowstone is a part.

Conclusion

Under alternative 3, impacts on human health and safety would be long-term negligible adverse from air and noise emissions, long-term beneficial from the closure of Sylvan Pass, and long-term minor adverse from user conflicts and exposure to the elements, both before and after the transition to snowcoach only. Cumulative impacts would be long-term negligible adverse.

Impacts of Alternative 4: Manage OSV Use by Transportation Events

Alternative 4 would manage OSV use in the park based on transportation events. One event would initially equal 1 group of snowmobiles (maximum of 10 per group, an average of 7 over the winter season) or 1 snowcoach. A maximum of 110 transportation events would be allowed each day; however, no more than 50 events could be snowmobile groups. Forty-six of the snowmobile events would be guided groups with a seasonal average size of 7 and a maximum of 10 snowmobiles. The remaining 4 snowmobile events would be non-commercially guided groups with a limit of 5 snowmobiles per group. Operators would decide whether to "spend" their daily allotments of transportation events on snowmobile groups or snowcoaches. As a result, the daily makeup and number of OSVs in the park could range from 0 to 480 snowmobiles and from 60 to 106 snowcoaches. At maximum daily snowmobile use, OSVs could increase to a maximum of 540 OSVs (480 snowmobiles and 60 snowcoaches), an increase over the most recent interim rule (alternative 2), which allowed for 396 OSVs (318 snowmobiles and 78 snowcoaches); however, this level of OSV use is within the range experienced at the park during historical (pre-2004) and recent (2004–2009) use periods. If snowcoaches were maximized on a given day, their numbers would increase over those allowed in alternative 2; but total OSVs for that day (106 snowcoaches, 0 commercially guided snowmobiles, and 20 non-commercially guided snowmobiles) would be less than one-third of the number of vehicles allowed under the most recent interim rule (alternative 2). Regardless of the daily makeup of OSVs, the maximum number of daily transportation events would be less under alternative 4 (110 events) compared to the maximum number allowed under the 2009 to 2013 interim regulations (potential for 123 transportation events assuming an average snowmobile group size of 7, and a potential for a maximum of 237 transportation events). If technologies were to improve and OSVs meet voluntary E-BAT standards (which would reduce the sound emissions from OSVs) the total number of snowmobiles would stay the same, with the potential to increase the number of snowcoaches from 106 to 212. If the snowcoach group size were to increase from 1 to 2 coaches, the 2 coaches would travel as close together as possible allowing for safety and would be considered 1 transportation event for the purposes of managing OSV use. Additional impacts are not expected under this scenario, because the number of transportation events would remain the same as allowed under non-E-BAT standards.

In addition, if snowmobiles meet voluntary E-BAT standards the average group size would be able to increase from 7 to 8. If snowcoaches meet voluntary E-BAT standards the group size for snowcoaches could increase from 1 to 2. This would result in larger overall snowmobile groups, with no increase in the overall number of snowmobiles. For snowcoaches, if all meet voluntary E-BAT standards, daily limits could rise to 120 (if all snowmobile allocations are being used) to 212 (if no snowmobile allocations are being used). While an increase in snowcoach group size from 1 to 2 may result in a very slight increase in impacts, the 2 coaches would be traveling close together in a group and would still be a single transportation event. With the reduced sound, this single transportation event would be expected to have similar impacts to 1 snowcoach that does not meet voluntary E-BAT standards.

As stated above, up to four groups of non-commercially guided snowmobiles would be permitted each day. Each group would have a non-commercial guide, who would go through NPS training and would

ensure that the group follows all rules and regulations and would be trained to handle emergency situations. With this training, no additional impacts beyond those occurring with commercial guiding would be expected to occur as a result of non-commercial guiding, because all use would be guided. The NPS notes that commercial guides are trained and regulated by concession contracts with the park that ensure compliance with all park regulations. Non-commercial guides are not governed by such contracts. Although they do not have this contractual method of regulation enforcement, non-commercial guides would be monitored by park law enforcement, which would ensure that they are complying with all regulations. Should impacts on the resource increase or infractions of regulations occur under the non-commercially guided program, this program would be altered or discontinued through adaptive management.

Non-motorized uses would continue in the park, throughout the interior as currently occurring. Under alternative 4, Sylvan Pass would be open to visitor use and would require staff for daily avalanche control operations.

As described above under alternative 2, exposure assessments were conducted over Presidents' Day weekend 2008 and 2009. These assessments found that at use levels between 635 and 691 snowmobiles and 64 and 71 snowcoaches over a three-day weekend, exposures to air emissions were below all occupational exposure limits (Radtke 2008, 2009). Snowmobile numbers under alternative 4 could range from 0 to 480, and snowcoach numbers from 60 to 106. Under any scenario, snowmobile numbers could be higher than measured in 2008 and 2009, but with the implementation of BAT for snowcoaches and New BAT for snowmobiles, the overall level of exposure is expected to be similar. Although snowcoach numbers could be higher, this would result in a decrease in snowmobile use; therefore, it is expected that air emissions exposure from OSVs for alternative 4 would continue to be below all occupational exposure limits. As shown in the 2009 study, peak levels of CO were higher for snowmobiles than snowcoaches, but still within established levels, and this would be expected to continue. Because use would likely be within OSHA PELs and ACGIH TLVs with no exceedances, based on past monitoring, impacts on health and safety from air emissions would be long-term negligible adverse.

The 2008 and 2009 assessments also looked at noise emissions at the West Entrance as well as for employees using OSVs on a daily basis. As described in alternative 2, personal noise exposures in the two kiosks at the West Entrance were below the OSHA action level/PEL as well as EPA and NIOSH standards (Radtke 2008, 2009). With similar levels of exposure as those assessed in 2008 and 2009, even if OSV levels increase, it is expected that noise emissions under alternative 4 would continue to be below the OSHA action level and impacts on health and safety from noise emissions would be long-term negligible adverse.

Alternative 4 would provide for the continued operation of Sylvan Pass, with avalanche control operations continuing at their current levels, as described in detail under alternative 2. These operations were rated by the recent ORMA at the high end of green, getting close to amber (or caution) in terms of the risk to NPS staff (NPS 2010n); therefore, impacts on NPS staff health and safety from avalanche operations would be long-term moderate adverse.

Visitor use in the park would include both motorized and non-motorized use, as well as the introduction of non-commercially guided snowmobile use. As noted in chapter 3 (figure 23), since requirements for guiding have been implemented, the number of OSV moving violations and arrests has continued to decline. Alternative 4 would continue OSV management measures put in place since 2004, including requiring guided use of most OSVs. Guided use also ensures that guides have been trained (as part of their agreement with the NPS) in operation in winter conditions and in avoiding conflict with non-motorized users. In addition, alternative 4 would allow for non-commercially guided

use. Under a non-commercially guided program, all non-commercial guides also receive training. The NPS notes that commercial guides are trained and regulated by concession contracts with the park that ensure compliance with all park regulations. Non-commercial guides are not governed by such contracts. Although they do not have this contractual method of regulation enforcement, non-commercial guides would be monitored by park law enforcement. Should impacts on the resource increase or infractions of regulations occur under the non-commercial guided program, this program would be altered or discontinued through adaptive management.

Alternative 4, as with all action alternatives, would not advise non-essential work/OSVs travel at below −20°F, which would reduce the amount of time both visitors and staff would spend in harsh winter conditions. Because OSV use would still occur, and staff and visitors would still be exposed to the winter elements, impacts would be long-term minor adverse, because OSV management and park practices would minimize both user conflict and risk from the elements.

Overall air pollution and noise levels would be expected to be below applicable standards and conflicts between users and exposure to harsh winter conditions would be minimized through OSV management measures under alternative 4. NPS employees working in Sylvan Pass would still be exposed to avalanche risk, which has been rated at the high end of green, getting close to amber (caution) level in a recent ORMA process (NPS 2010n). Under alternative 4, impacts on human health and safety would be long-term negligible adverse from air and noise emissions, long-term moderate adverse from the operation of Sylvan Pass and long-term minor adverse from user conflicts and exposure to the elements. These impacts would be expected to stay the same should all OSVs meet voluntary E-BAT standards and OSV use levels increase.

Cumulative Impacts

The long-term negligible adverse impacts and long-term beneficial impacts on the health and safety of NPS staff and visitors from other past, present, and reasonably foreseeable future actions would be the same as described for alternative 1. These impacts are a result of recreational activities on adjacent lands that contribute to noise and air emissions, although these contributions are minimal because the activities do not extend into the park. Construction projects occurring within the park that improve roads and other facilities contribute to the beneficial impacts of these actions. The effects of these actions, when combined with the long-term negligible to minor adverse impacts of alternative 4, would result in long-term minor adverse cumulative impacts on health and safety. Alternative 4 would contribute a minimal amount to the overall cumulative impacts because many of these actions occur across a larger region of which Yellowstone is a part.

Conclusion

Under alternative 4, impacts on human health and safety would be long-term negligible adverse from air and noise emissions, long-term moderate adverse from the operation of Sylvan Pass, and long-term minor adverse from user conflicts and exposure to the elements. Cumulative impacts would be long-term minor adverse.

SOCIOECONOMIC VALUES

GUIDING REGULATIONS AND POLICIES

The NPS Director's Order 12 Handbook (NPS 2001) requires analysis of economic and social impacts as part of the NEPA process. The document specifies that economic and social analysis includes "employment, occupation, income changes, tax base, infrastructure" (NPS 2001, Appendix 1). Indirect

effects on concessioners and other businesses that may be affected by the alternatives must be considered.

ASSUMPTIONS, METHODOLOGY, AND IMPACT DEFINITIONS

This section analyzes how winter use management alternatives would likely impact recreational use in the greater Yellowstone area and how change in recreational use would impact economic activity (expenditures and employment) within the area. Past reports, including Duffield and Neher (2006 and 2007) and the 2008 environmental assessment prepared by the NPS (NPS 2008a), present a host of results on the economic impacts of different alternatives, along with the data on recreational use and visitor expenditure levels used in the analysis. The current analysis draws on these past reports, updating the results with more recent visitation and economic data. The impacts were estimated using the most recent version of IMPLAN (IMPLAN 2008). The analysis looks at impacts for five geographic regions: the three state area (Idaho, Montana, and Wyoming), the five county area (Fremont County in Idaho, Gallatin and Park counties in Montana, and Park and Teton counties in Wyoming), and three individual communities (Cody and Jackson, Wyoming, and West Yellowstone, Montana). The community regions are approximated using zip code boundaries.

IMPLAN Modeling

As in the previous reports, the socioeconomic analysis relies on IMPLAN modeling. The 2008 EA (NPS 2008a) describes IMPLAN as follows: IMPLAN is an “input/output” economic model designed by the USFS and is commonly used by state and federal agencies for planning and evaluation purposes. For example, Dean Runyan and Associates (2006) used IMPLAN modeling in a report to the State of Wyoming on the economic impact of travel in Wyoming. Among other outputs, IMPLAN generates estimates of output and employment. Output is the total business revenue generated by a given activity such as park visitation, and employment is the resulting number of jobs (all jobs, both full and part time) associated with that activity.

There are five important caveats that are relevant to the interpretation of the IMPLAN model estimates generated for this analysis. First, the model is static in nature and measures only those effects resulting from a specific activity change at one point in time. Thus, IMPLAN does not account for any subsequent behavioral adjustments that may occur in the economy. For example, a change in the NPS plan for snowmobile management within the park may encourage local businesses to diversify or modify their operations. These changes could thereby abate potential reductions in output and employment, a change not captured by IMPLAN. Further, IMPLAN does not estimate any potential re-employment of the labor force that may be displaced by management changes (for example the increased employment opportunity provided by guiding). Therefore, the long-run net output and employment impacts resulting from the modeled changes in winter use management would likely be smaller than those estimated by the model. The second caveat to the interpretation of the IMPLAN model estimates generated for this analysis is that they rely on the economic relationships derived from the latest data available, which are from 2008 (prior analyses relied on earlier IMPLAN data sets). Third, IMPLAN information is based on year-round data; winter seasonal information may not be as accurate. Fourth, for small analysis areas (West Yellowstone, Montana, for example) the IMPLAN data may not be an accurate representation of the actual local economy due to lack of information in IMPLAN. Finally, the multipliers contained in 2008 IMPLAN data that define the relationship between spending in one industry and spending in another industry are assumed to be constant over the range of economic activity encompassed by the full set of alternatives. However, the most powerful use for economic modeling is in the comparisons between alternatives. The impacts of the three action alternatives on economic resources can be modeled and compared and the decision maker can understand the effects of the different alternatives relative to each other.

IMPLAN Model Application

The modeling of the regional economic impacts associated with changes in visitation (and associated visitor spending) on an economic area requires several types of information.

1. **The change in the number of visitors to the different analysis areas in the greater Yellowstone area**. The percentage of visitors to the park who did not live in each of the economic analysis areas was taken from the results of the 1997-1998 survey of winter park visitors (Duffield and Neher 2000). Specifically, 82.5 percent of visitors lived outside of the five-county area, 65.5 percent lived outside the three-state region, and 99 percent lived outside each of the three communities (Cody, Jackson, and West Yellowstone). Only non-local visitation was included in the IMPLAN model since only their spending drives local economic growth. In addition, assumptions about how visitation to the communities of Cody, Jackson, and West Yellowstone will change are needed. Assumptions about the distribution of visitors across the communities were updated for this analysis using data on snowmobile and snowcoach riders provided by businesses that offer these services from the last 3 years (2009/2010, 2010/2011 and 2011/2012). Based on this data, it was assumed that 64.5 percent of the change in visitation would occur in West Yellowstone and 25.1 percent would occur in Jackson and 0.3 percent in Cody. The East Entrance is closed to motorized OSV traffic under alternative 3.
2. **The change in visitation is multiplied by the average spending per visitor**. As in past reports, the analyses assume spending of $175.33 per visitor per day (Duffield and Neher 2006). Duffield and Neher estimated per-visit expenditures using a time series model of West Yellowstone resort tax collections and NPS data on West Entrance visits (Duffield and Neher 2006). This regression model of winter visitation and tax receipts estimates that for every West Entrance winter visit, $175.33 is spent on taxable goods and services in the community of West Yellowstone, which is applied to all park visitors. This spending does not represent total trip spending for an individual because he or she may visit the park more than once on a trip or may visit other areas in the vicinity such as national forest lands.
3. **The IMPLAN model divides economic activity into industry categories, so the per visitor spending must be divided between categories**. The distribution of spending across economic sectors is also drawn from the 1997-1998 winter visitor survey (Duffield and Neher 2006). That survey asked winter park visitors to detail their spending patterns within the greater Yellowstone area. Based on these responses, visitor spending was allocated as 27.5 percent lodging, 24.6 percent automotive and gas stations, 17.1 percent miscellaneous retail expenditures, 14.3 percent eating and drinking establishments, 11.5 percent scenic and recreational transportation, and 5 percent other amusement services.

Using the change in visitation, per visitor spending, and the distribution of spending across industry categories, an estimate is calculated for direct changes in non-resident visitor spending for an action alternative and relative to the no-action alternative. The direct spending changes by sector are then input into the IMPLAN program.

The IMPLAN program estimates total output and employment impacts, including indirect and induced impacts arising from the initial direct spending impact, and allocates these impacts across the sectors of the analysis area. Direct impacts reflect the initial spending at local businesses by visitors from outside the greater Yellowstone area (the change in direct spending described above). Indirect impacts reflect the ripple effect of this spending, as businesses pay for the inputs they need such as capital and labor. The induced effects reflect the resulting changes in household income for local residents.

At its most aggregated level, IMPLAN modeling applies output and employment multipliers to the initial visitor spending to arrive at estimated total output and employment impacts. In general, the smaller and less diverse the analysis area is, the closer its expenditure multiplier is to 1.0. Conversely, the larger and more diverse an economy, the larger are its multipliers.

Recent Use Levels

Recent visitation data and trends are presented in the "Visitor Use, Experience, and Accessibility" section of chapter 3. For the economic impact estimates, the average visitation for the years 2009/2010 and 2010/2011 (a total of 91,332) was selected as the baseline level of use.

Assumptions for Recreational Use Levels by Alternative

Table 67 summarizes upper and lower bound visitation estimates for each alternative. For all the upper bounds, 2 people per snowmobile and 12.3 people per snowcoach (based on the current fleet capacity) were assumed for a 90 day season.

TABLE 67: LOWER AND UPPER BOUND VISITATION FORECASTS AND VISITOR SPENDING PER DAY ASSUMPTIONS

	Lower Bound Estimate	Upper Bound Estimate	Visitor Spending per Day
Alternative 1	48,925	48,925	$175.33
Alternative 2	88,968	192,511	$175.33
Alternative 3	66,451	181,765	$175.33
Alternative 4 (current technology)	88,968	152,820	$175.33
Alternative 4 (all OSVs meet voluntary E-BAT standards)	88,968	219,240	$175.33

Alternative 1 would allow no snowmobile or snowcoach access. Historically, motorized OSV use has made up more than 70 percent of the total winter visitation in the park. Nearly all visitors entered via the West, South, and North Entrances. An analysis of the distribution of recreational use since the winter use management plan changes began in 2001 suggests little evidence of substitution between park entrances. Additionally, an analysis of snowmobile use on national forest land near the West Entrance suggests that snowmobile use in national forests is possibly a complement to snowmobiling in the park rather than a direct substitute. For these reasons, the level of recreational use under the no-action conditions represented by alternative 1 was assumed to be equal to the average of North Entrance wheeled vehicle entries plus average entries by skiers park wide during the last 3 winters (2009/2010, 2010/2011 and 2011/2012) for a total of 48,925 visits.

For alternative 2, the lower bound was set at the average visitation for the years 2009/2010 and 2010/2011 (a total of 91,332). The upper bound is the maximum number of visitors possible under the alternative (318 snowmobiles and 78 snowcoaches per day plus the average over the last 3 winters for wheeled vehicle passengers at the North Entrance and skiers parkwide).

Under alternative 3, winter visitation would transition to snowcoaches only over a 3-year period starting in the 2017/2018 season. The upper and lower bounds on visitation are based on the period after the transition when visitation would be by snowcoach only. The lower bound assumes no change

in snowcoach visitors compared to recent maximum allowable use and uses average visitation for the last 3 winters for snowcoaches (2009/2010, 2010/2011 and 2011/2012) plus the average over the last 3 winters for wheeled vehicle passengers at the North Entrance and skiers parkwide. The upper bound is again the maximum possible visitors, which is 120 snowcoaches per day plus the average over the last 3 winters for wheeled vehicle passengers at the North Entrance and skiers parkwide.

Finally, under alternative 4 there would be a mix of up to 480 snowmobiles and 60 snowcoaches per day or up to 120 snowcoaches per day if the snowcoaches meet stricter noise thresholds. These limits exceed recent maximum allowable use, so current visitation is defined as alternative 2 for the lower bound. Two upper bounds were modeled for alternative 4. The first upper bound (current technology upper bound) assumes that the snowcoaches do not meet the stricter noise thresholds, and it equals the maximum possible visitation under this assumption (480 snowmobiles and 60 snowcoaches per day plus the average over the last 3 winters for wheeled-vehicle passengers at the North Entrance and skiers parkwide). The second upper bound (low noise technology upper bound) assumes 480 snowmobiles and 120 snowcoaches per day plus the average over the last 3 winters for wheeled vehicle passengers at the North Entrance and skiers parkwide.[4]

IMPLAN Results by Alternative

The resulting IMPLAN estimates for output and employment impacts relative to alternative 1 are presented in tables 68 and 69 for the lower and upper bounds, respectively, for the three-state and five-county areas. Table 70 presents the results of the analyses for the communities of Cody and Jackson, Wyoming, and West Yellowstone, Montana. The size of the impacts in each area depend on the size of the multipliers used by the IMPLAN model, which can change over time based on changes in interrelationships between sectors of the economy and assumptions about the size of the revenue change within the region of interest. Because visitation from outside the region of interest is driving the regional economic impacts, the distribution of changes in visitation between resident and non-resident visitors is a key determinant of estimated impacts. Past visitor surveys found that the non-resident visitor population increases relative to the resident visitor population as the size of the region of interest decreases. Because 66 percent of the total of new visitors come from outside the three state area, only 66 percent of the new visitor spending is assumed to be new spending in the region that flows through the entire three-state economy. In the county model, the assumption was made that 82.5 percent of the visitors live outside the five counties, so 82.5 percent of the total new visitor spending is circulated within the smaller five-county region. Similarly, 99 percent of the total new visitor spending is injected into the each of the three individual communities. Although the multipliers are larger at the three-state level than the five-county level, the amount of new money injected into the five-county economy is larger than the amount of new money injected into the three-state economy. In some cases, the result is larger total impacts for the smaller geographic areas even though the multipliers are smaller. The same holds for the analysis at the community level.

[4] For snowmobiles, if the snowmobiles meet stricter technology standards there could be an additional snowmobile in each group, but the total daily maximum number of snowmobiles would not change.

TABLE 68: IMPACTS OF ACTION ALTERNATIVES RELATIVE TO NO-ACTION ALTERNATIVE (ALTERNATIVE 1) AND PERCENT CHANGE FROM TOTAL FOR THE 3-STATE AND 5-COUNTY REGIONS, LOWER BOUND VISITATION

Lower Bound	5-County Area		3-State Area	
	Total Output	Total Employment	Total Output	Total Employment
Alternative 2	$6,242,026	97	$5,661,755	87
% change	0.036%	0.074%	0.002%	0.004%
Alternative 3	$2,732,007	43	$2,478,034	38
% change	0.016%	0.033%	0.001%	0.002%
Alternative 4 (current technology and all OSVs meet voluntary E-BAT standards)	$6,242,026	97	$5,661,755	87
% change	0.036%	0.074%	0.002%	0.004%

TABLE 69: IMPACTS OF ACTION ALTERNATIVES RELATIVE TO NO-ACTION ALTERNATIVE (ALTERNATIVE 1) AND PERCENT CHANGE FROM TOTAL FOR THE 3-STATE AND 5-COUNTY REGIONS, UPPER BOUND VISITATION

Upper Bound	5-County Area		3-State Area	
	Total Output	Total Employment	Total Output	Total Employment
Alternative 2	$22,382,628	349	$20,301,894	313
% change	0.128%	0.267%	0.007%	0.016%
Alternative 3	$20,707,509	323	$18,782,498	289
% change	0.118%	0.247%	0.006%	0.015%
Alternative 4 (current technology)	$16,195,421	252	$14,689,862	226
% change	0.093%	0.193%	0.005%	0.012%
Alternative 4 (all OSVs meet voluntary E-BAT standards)	$35,708,833	426	$31,668,663	384
% change	0.204%	0.326%	0.010%	0.020%

TABLE 70: AVERAGE IMPACTS OF ACTION ALTERNATIVES RELATIVE TO NO-ACTION ALTERNATIVE (ALTERNATIVE 1) AND PERCENT CHANGE FROM TOTAL FOR THREE GATEWAY COMMUNITIES

Average	Cody, Wyoming		Jackson, Wyoming		West Yellowstone, Montana	
	Total Output	Total Employment	Total Output	Total Employment	Total Output	Total Employment
Alternative 2	$46,749	1	$3,920,618	52	$9,383,322	173
% change	0.003%	0.007%	0.115%	0.230%	4.805%	9.968%
Alternative 3	0	0	$3,210,428	43	$7,683,605	142
% change	0	0	0.094%	0.188%	3.934%	8.163%
Alternative 4 (current technology)	$36,644	1	$3,073,178	41	$7,355,121	136
% change	0.002%	0.006%	0.090%	0.180%	3.766%	7.812%
Alternative 4 (all OSVs meet voluntary E-BAT standards)	$68,606	1	$5,813,396	41	$13,939,039	201
% change	0.004%	0.008%	0.171%	0.180%	7.137%	11.543%

Cost of Meeting New Standards for Snowcoaches

No later than December 15, 2017, every snowcoach would be required to have EPA Tier 2 compliant engines and exhaust emission controls. *Tier 2 Rule* (65 FR 6697, February 10, 2000) instituted a comprehensive regulatory program designed to significantly reduce the emissions from new passenger cars and light trucks, including pickup trucks, vans, minivans, and sport-utility vehicles. These reductions provide for cleaner air and greater public health protection, primarily by reducing ozone and PM pollution. The program treats vehicles and fuels as a system, combining requirements for much cleaner vehicles with requirements for much lower levels of sulfur in gasoline. The program phases in a single set of tailpipe emission standards that apply to all passenger cars, light trucks, and larger passenger vehicles operated on any fuel. Tier 2 engines and emission control equipment include vehicle computers, a full complement of sensors including engine control module computers, onboard diagnostics systems equipped, and have exhaust after treatment equipment that is standard original equipment manufacturer equipment included with on-road vehicles or engines. The emissions standards for BAT snowcoaches would therefore be based on technology specifications (technical standards). Technical standards would differ depending on whether the vehicle was gasoline or diesel powered and in the case of gasoline snowcoaches, the gross vehicle weight rating of the vehicle.

This requirement would not apply to alternative 1 (with no OSV use). Under the action alternatives, between 60 and 212 snowcoaches would be allowed to operate in Yellowstone per day.

This requirement could involve replacing engine and emission control systems so that the vehicle is in compliance with Tier 2 technical standards or purchasing new vehicles that are Tier 2 compliant. Coaches would also need to meet a sound emission requirement. Once approved, a snowcoach could operate for 10 years without being upgraded or replaced. See appendix B for a full discussion of BAT standards for snowcoaches.

During the winter season 2011/12, out of the 78 snowcoaches that were in operation, 22 were Bombardiers (28 percent of the fleet), 37 were full size vans and SUVs (47.4 percent of the fleet), and 19 were small and mid-sized coaches such as Glavals, Krystals, and Vanterras (24.4 percent of the fleet).

To calculate the cost of the snowcoach upgrades required by the alternatives, the NPS assumed that snowcoach BAT standards would be required starting in December 2017 and that:

- The 22 Bombardiers would continue to operate and their engine and emission control systems would be upgraded to meet 2007 EPA Tier 2 requirements for spark ignition engines. The cost would be approximately $35,000 per vehicle for a total of $770,000.
- Of the current 37 standard size vans and SUVs, 30 would be 10 or more years old by December 2017 (model year 2006 or older) and would be replaced through normal replacement. No additional cost is assumed because these vehicles would need to be replaced anyway. Of the remaining 7 vehicles in this class that are 2007 or newer, 6 are gasoline and would therefore meet EPA Tier 2 standards and not need to be replaced. The remaining vehicle, a 2009 diesel van, would not meet the 2010 Tier 2 standard and would need to be replaced. The cost of replacement of this vehicle and associated track systems would be approximately $125,000.
- Of the 19 small and mid-sized snowcoaches, 4 would be 10 or more years old by December 2017 (model year 2006 or older) and would be replaced through normal replacement. No additional cost is assumed because these vehicles would need to be replaced anyway. Of the remaining 15 vehicles in this class that are 2007 or newer, 5 are diesel, and model year 2007 to 2009, and would not meet the proposed BAT standard and would therefore need to be replaced. The cost of

replacing these 5 vehicles and associated track systems is $825,000 ($165,000/each). All of the remaining 10 vehicles would meet EPA Tier 2 standards and would not need to be replaced.

Based on these assumptions, the total cost of converting the current fleet to meet the new requirements would be approximately $1,720,000.

Intensity Definitions

The following intensity definitions for evaluating impacts on socioeconomic values were defined.

Negligible: The impact is at the lower levels of detection (< 5 percent change in either total output or employment).

Minor: The impact is slight, but detectable (5–10 percent change in either total output or employment).

Moderate: The impact is readily apparent and has the potential to become major (10–20 percent change in either total output or employment).

Major: The impact is severe, or if beneficial, has exceptional beneficial effects (>20 percent change in either total output or employment).

Study Area

The geographic area for the socioeconomic analysis includes the three state-area of Wyoming, Montana and Idaho; the five-county area of Fremont County in Idaho, Gallatin and Park counties in Montana, and Park and Teton counties in Wyoming; and the communities of Cody and Jackson, Wyoming, and West Yellowstone, Montana.

SUMMARY OF IMPACTS

A brief summary of the impacts on socioeconomic values is presented below, followed by the detailed impact analysis.

- Under alternative 1, the impacts would be long-term negligible adverse for the three-state area, the five-county area, and Cody and Jackson, Wyoming. West Yellowstone is projected to experience long-term minor adverse impacts. The adverse impacts would be most directly felt by communities and businesses near the park, especially in areas that have a higher proportion of business tied directly to park visitation. At the North Entrance, Gardiner, Montana, might experience beneficial impacts if visitors who would have visited the other entrances switch to the North Entrance.
- Under alternative 2 there would be long-term beneficial impacts for the three-state area, the five county area, and the communities of Cody and Jackson. In West Yellowstone, the long-term beneficial impacts would be much larger on average. Overall, alternative 2 would have greater beneficial impacts than alternative 1, as allowing visitor OSV use would result in more economic activity in the area.
- Under alternative 3 there would be long-term beneficial impacts for all the geographic regions and communities. In order for the beneficial impacts to approach the upper bound under this alternative, demand for snowcoach tours must increase to more than make up for the eventual

phaseout of snowmobiles. In West Yellowstone, the long-term beneficial impacts would be much larger on average. Overall, alternative 3 would have greater beneficial impacts than alternative 1, as allowing visitor OSV use would result in more economic activity in the area. After the phaseout, visitation is expected to be higher than under alternative 1, but lower than under alternatives 2 and 4, resulting in less beneficial impacts than those alternatives.

- Under alternative 4 there would be long-term beneficial impacts for all the geographic regions and communities. The alternative allows for the most snowmobile and snowcoach traffic if snowcoaches achieve low noise technology standards, so the upper bound impacts for the low noise technology standards are the largest of the action alternatives. In West Yellowstone, the long-term beneficial impacts would be much larger on average. Overall, alternative 4 would have greater beneficial impacts than alternative 1, as allowing visitor OSV use would result in more economic activity in the area. Because alternative 4 allows for more overall OSVs, while minimizing impacts through management by transportation events, the long-term potential for beneficial impacts is higher under this alternative than the others.

DETAILED IMPACT ANALYSIS

Below, the impacts of each alternative are discussed. The impacts of alternative 1 (the no-action alternative) are described relative to conditions allowable under the 2009 to 2013 interim regulations (which are assumed to be the same as alternative 2). The impacts of alternatives 2, 3, and 4 are described relative to the no-action alternative (alternative 1).

Impacts of Alternative 1: No Action - No Snowmobile/Snowcoach Use

Under alternative 1, no motorized OSV recreational access would occur. Wheeled-vehicle access would continue to occur through the North Entrance of Yellowstone to as far east as Cooke City, Montana. Of the four entrances, the West Entrance and the community of West Yellowstone would experience the largest impacts over time, because the West Entrance is the most popular entrance point into Yellowstone for snowmobiles and snowcoaches. Although some visitors would still visit the area to snowmobile in the national forests or cross-country ski in Yellowstone and on trails near West Yellowstone, traffic through the West Entrance would be almost completely shut down. Similarly, traffic through the East and South Entrances is almost completely via snowmobiles and snowcoaches in the winter season. With no motorized OSV access, the Old Faithful Snow Lodge and the yurt camp at Canyon would be closed for the winter. The North Entrance would experience the smallest change in visitation, since visitors could still drive in by car.

If visitation is low enough, the resulting reduction in business in the affected communities would lead to a loss of year-round population. A year-round population provides a more stable tax base and gives the community the ability to provide public services that may not be possible with a very small year-round population.

Alternative 1 represents what would happen if no new rule is passed, and motorized OSV access for visitors is prohibited. Compared to the levels permitted under the 2009–2013 interim rules and alternative 2, alternative 1 would result in lower visitation. Table 67 lists the visitation projections under each alternative. Visitation under alternative 1 is projected to be about half of 2009/2010 levels. This projection assumes that the North Entrance would continue to receive approximately the same number of visitors, but the other entrances would service the small number of non-motorized visitors to the park. The number of cross-country skiers and other non-motorized visitors might increase if new visitors who want a non-motorized experience start visiting, but the increase is not expected to be large.

Based on the visitation numbers in table 67 and the impacts of alternative 2 relative to alternative 1 in tables 68, 69, and 70, the impact of alternative 1 over time would be a reduction in output and employment from the levels expected under alternative 2. The impacts are estimated to be negligible, adverse, and long term for Cody and Jackson, Wyoming. West Yellowstone is projected to experience minor, adverse, long-term impacts. At the North Entrance, Gardiner, Montana, might experience beneficial impacts if visitors who would have visited the other entrances switch to the North Entrance. The five-county and three-state regions would experience negligible, adverse, long term impacts.

The terms negligible and minor represent the thresholds defined above, and are not subjective descriptions of how the impacts would feel to individuals who experience a loss of business or employment. For those individuals, the effects may not seem negligible or minor. For example, the 2008 EA reported that business owners along the North Fork of the Shoshone River stated that if the East Entrance is closed under alternative 1, most of them would close their businesses in the winter. Further exacerbating their situation is the downturn in visitation starting in the winter of 2008/2009 that has already caused some of the businesses to curtail operations or close entirely in the winter (NPS 2008a). 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

Increasing population, oil and gas leasing, and economic opportunities over time should provide beneficial impacts to the economy of the greater Yellowstone area. As long as the growth and economic activity are managed in a way that does not harm park resources and potentially park visitation, these trends should boost economic growth. Road construction in the area may depress visitation in the short-term, but should be beneficial once the construction is completed. Plans for improvements to nearby attractions such as ski resorts could also bring additional visitors into the area.

For example, the Sleeping Giant Ski Resort near the East Entrance to the park reopened in 2009. In addition, there is a development plan for the Rendezvous Ski Trail. Activities in the surrounding national forests also impact the greater Yellowstone area. These plans should improve the management of the forests and contribute to the overall wellbeing of the greater Yellowstone area. The Gallatin National Forest Travel Plan, revised in 2006, is being implemented along with the Beartooth District of Custer National Forest Travel Management Plan and thee Gallatin National Forest Travel Plan. Over time, consolidating the checkerboard lands on the Gallatin National Forest should also benefit the forest and the surrounding area. Specific projects in the park that have (or would have) a generally beneficial effect on socioeconomics include the construction of a new West Entrance and reconstruction of the East Entrance Road. These longer-term beneficial projects may depress visitation in their implementation phase. For example, road construction projects are aggravating to most drivers, some of whom may avoid the portion of the park (and nearby communities) where road work is occurring. Similarly, replacing visitor centers often means a temporary facility is provided (construction activities may also result in disturbance). This may also be discouraging to some visitors.

Finally, the current economic recession is having a dampening effect on the national and local economy; however, despite the poor economic conditions visitation to Yellowstone increased somewhat in the winter of 2010 compared to 2009. As discussed in chapter 3, unemployment has

increased in the counties and states that border Yellowstone. Timber harvesting on USFS land has also been decreasing.

With the prohibition of motorized OSV recreational use, and the lack of access to the interior of the park, alternative 1 would likely discourage out-of-state visitors from traveling to the area and contributing to local regional economies. It is likely that this alternative would represent an overall negligible adverse impact on regional economic trends. In the current economic conditions, a decline in winter visitors would contribute to the overall weaker economy. When the economy recovers, a reduction in park visitation would be somewhat offset by the beneficial regional economic trend related to resource extraction, residential growth, other recreation opportunities, and wildlife and other natural environment attractions.

The impacts of these past, present, and reasonably foreseeable future actions, combined with the long-term negligible adverse impacts of alternative 1, would result in long-term negligible adverse impacts in the towns of Jackson and Cody. In West Yellowstone, as long as the economic downturn continues, the long-term minor adverse impacts expected from alternative 1 could result in long-term negligible to minor adverse cumulative impacts, to which alternative 1 would contribute a large part.

Conclusion

The impacts are estimated to be negligible, adverse, and long term for the three-state area, the five-county area and Cody and Jackson, Wyoming. West Yellowstone is projected to experience minor, adverse, long-term impacts. As described earlier, the adverse direct impacts would be most directly felt by communities and businesses near the park, especially in areas that have a higher proportion of business tied directly to park visitation. At the North Entrance, Gardiner, Montana, might experience beneficial impacts if visitors who would have visited the other entrances switch to the North Entrance. The IMPLAN modeling captures the indirect and induced effects as well. As individual businesses are adversely affected, they would reduce purchases of other goods and services from suppliers. Conversely if individual businesses are beneficially affected they would increase the purchase of goods and services from suppliers. These feedback effects impact sectors of the economy beyond those that are influenced directly by visitors. Cumulative impacts would be long-term negligible adverse or beneficial cumulative impacts on the socioeconomic environment. In West Yellowstone cumulative negligible to minor adverse impacts could result.

Impacts of Alternative 2: Continue Snowmobile/Snowcoach Use at 2012/2013 Winter Season Interim Regulation Limits

Alternative 2 would allow the recent maximum allowable use levels under the interim regulations, up to 318 snowmobiles and 78 snowcoaches per day. The visitation estimate is based on the average of winter visitation from the 2009/2010 through the 2011/2012 seasons. For these three seasons, the daily limit of 318 snowmobiles was not reached. The peak day for snowmobiles in 2011/2012 saw 261 snowmobiles and the peak day for snowcoaches saw 56 coaches. As discussed in chapter 3, after an initial drop-in visitation after the new rules were implemented, visitation increased for the first three winters. Visitation has gone up and down since 2003/2004, but in general, snowmobile visitation has dropped somewhat, while the numbers of snowcoach passengers and automobiles have increased somewhat. Although winter visitation dropped when the new rules went into place, most communities still saw rising tax revenues through 2006. The exception is West Yellowstone, where tax revenues dropped along with visitation. The initial interim regulation was put in place in the 2009/2010 season, and visitation since then has been within the range of visitation in the managed use era.

Compared to alternative 1, alternative 2 would result in beneficial, long-term impacts for the three-state area, the five-county area, and the three communities. In West Yellowstone, the average beneficial impacts shown in table 70 are larger than those in the other areas (reaching the threshold of minor). Alternative 2 provides for continued growth in visitation, especially through the use of snowcoaches. The beneficial impacts would be tempered by the cost of upgrading the existing snowmobile fleet to meet new requirements by December 2017.

Cumulative Impacts

The impacts of these past, present, and reasonably foreseeable future actions would be the same as under alternative 1. These impacts are a result of actions that contribute to the local economies such as oil and gas leasing throughout the area, and the offering of other tourist attractions, such as the reopening of the Sleeping Giant Ski Resort near the East Entrance of the park. Actions that contribute to negative impacts include the current economic recession and increasing unemployment. The impacts of these actions, combined with the long-term beneficial impacts of alternative 2, would result in long-term beneficial impacts (to which alternative 2 would contribute a large part) in the towns of Jackson, Cody, and West Yellowstone.

Conclusion

Compared to alternative 1, alternative 2 would result in beneficial, long-term impacts for the three-state area, the five county area, and the communities of Cody and Jackson. In West Yellowstone, the beneficial, long-term impacts would be larger on average. Alternative 2 would continue recent management, under which there has been some increase in visitation, especially for snowcoach use. Cumulative impacts would be long-term beneficial.

Impacts of Alternative 3: Transition to Snowcoaches Meeting BAT Requirements Only

Alternative 3 would transition to BAT snowcoaches over a 3-year period starting in the 2017/2018 season. Snowcoach limits would increase while snowmobile limits are reduced during the 3-year phaseout. This alternative also calls for the closure of Sylvan Pass, which would eliminate visitation from the East Entrance by snowmobile or snowcoach. Until the phaseout begins, alternative 3 would have similar impacts to alternative 2, except in the town of Cody, which would lose all the economic benefits associated with motorized OSV winter visitors using the East Entrance (an average of 118 visitors from the 2009/2010 season through the 2011/2012 season). After the phaseout, visitation is expected to be higher than under alternative 1, but lower than under alternatives 2 and 4. Compared to alternative 1, alternative 3 is expected to bring beneficial, long-term impacts for all the communities of West Yellowstone and Jackson, as seen in table 70. Again, West Yellowstone is expected to experience the largest benefits of the different communities included in the analysis (reaching the threshold of minor). There would be no change for the community of Cody relative to alternative 1. The larger beneficial impacts closer to the upper bound limits would only materialize if visitor demand for snowcoach tours increases, because over time snowmobiles would be phased out. Tables 68 and 69 show a similar pattern for the three-state area and the five-county area. At the same time, greater use of snowcoaches would increase the cost to the businesses that would be required to upgrade the existing snowmobile fleet to meet new requirements by December 2017.

Cumulative Impacts

The impacts of these past, present, and reasonably foreseeable future actions would be the same as under alternative 1. These impacts are a result of actions that contribute to the local economies such as oil and gas leasing throughout the area, and the offering of other tourist attractions, such as the

reopening of the Sleeping Giant Ski Resort near the East Entrance of the park. Actions that contribute to negative impacts include the current economic recession and increasing unemployment. The impacts of these actions, combined with the long-term beneficial impacts of alternative 3, would result in long-term beneficial impacts (to which alternative 3 would contribute a large part) in the towns of Jackson, Cody, and West Yellowstone.

Conclusion

Compared to alternative 1, alternative 3 is expected to have on average beneficial, long-term impacts for all the communities except Cody, as seen in tables 68, 69, and 70. In order to generate larger beneficial impacts under this alternative, demand for snowcoach tours must increase to more than make up for the eventual phaseout of snowmobiles. Cumulative impacts would be long-term beneficial.

Impacts of Alternative 4: Manage OSV Use by Transportation Events

Alternative 4 would allow commercial operators permits for a transportation event defined as either one snowmobile tour of no more than ten snowmobiles (with an average group size of up to seven over the season) or one snowcoach tour. It also allows for one non-commercially guided tour with up to five snowmobiles from each entrance each day. The maximum number of transportation events is set at 110, with the maximum number of snowmobile groups set at 50. If snowcoaches can meet stricter technology requirements to reduce noise, a transportation event could include two snowcoaches, instead of just one.[5] If all snowcoaches met the technology requirement, then maximum visitation would be 120 snowcoaches (assuming the maximum number of snowmobiles). If snowcoaches meet the new technology standards, then alternative 4 would allow for the most visitors, although in the short term visitation is expected to be similar to conditions under the 2009 to 2013 interim regulations. The methodology for the economic analysis considers how many visitors could be accommodated by an alternative and the subsequent spending, regardless of how they enter the park (commercially guided snowmobile, non-commercially guided snowmobile or snowcoach). However, the option for non-commercially guided tours should appeal to visitors who want to ride a snowmobile, but do not want to be on a guided tour. For this reason, the NPS expects that the non-commercially guided tours would be popular and would draw additional visitors to the park.

Compared to alternative 1, alternative 4 would result in beneficial, long-term impacts for the three-state area, the five-county area, and three communities. In West Yellowstone, the average beneficial impacts shown in table 70 are larger than the other areas (reaching the threshold of minor to moderate). Alternative 4 would allow for the highest daily maximums, so the long-run potential is higher under this alternative than the others. The beneficial impacts would be tempered by the cost of upgrading the existing snowmobile fleet to meet new requirements no later than December 2017.

Cumulative Impacts

The impacts of past, present, and reasonably foreseeable future actions would be the same as under alternative 1. These impacts are a result of actions that contribute to the local economies such as oil and gas leasing throughout the area, and the offering of other tourist attractions, such as the reopening of the Sleeping Giant Ski Resort near the East Entrance of the park. Actions that contribute to negative

[5] For snowmobiles, if the snowmobiles meet stricter technology standards there could be an additional snowmobile in each group, but the total daily maximum number of snowmobiles would not change.

impacts include the current economic recession and increasing unemployment. The impacts of these actions, combined with the long-term beneficial impacts of alternative 4, would result in long-term beneficial impacts (to which alternative 4 would contribute a large part) in the towns of Jackson, Cody, and West Yellowstone.

Conclusion

Compared to alternative 1, alternative 4 is expected to have on average beneficial, long-term impacts for all the communities, as seen in tables 68, 69, and 70. Cumulative impacts would be long-term beneficial.

PARK OPERATIONS AND MANAGEMENT

GUIDING REGULATIONS AND POLICIES

The NPS, park concessioners, contractors, researchers, and other duly permitted parties depend on snowmobiles and snowcoaches for their administrative functions. In essence, because administrative use of OSVs can adversely impact park resources and values, it is to be limited to the level necessary for the management of public use or to conduct emergency operations, construction, and resource protection activities that cannot be accomplished by other means.

ASSUMPTIONS, METHODOLOGY, AND INTENSITY DEFINITIONS

The topic of park management and operations, for the purpose of this analysis, refers to the quality and effectiveness of park staff in maintaining and administering park resources and providing for an appropriate visitor experience during the winter season. The impact analysis is based on the current description of park operations presented in chapter 3 of this document and uses cost information from the most recently completed winter season, 2011/2012.

To assess the level of impact on winter operations for each alternative, the following were considered:

- NPS staffing requirements
- Available funding to implement the plan
- Operating environment and conditions.

Intensity Definitions

The following are intensity definitions for evaluating impacts on park management and operations.

Negligible: Park operations would not be affected or the effect would be at or below the lower levels of detection and would not have an appreciable effect on park operations.

Minor: The effect would be detectable, but would be of a magnitude that would not have an appreciable effect on park operations. If changes are needed to offset adverse effects, they would be relatively simple and likely successful.

Moderate: The effects would be readily apparent and would result in a change in park operations in a manner noticeable to staff and the public. Changes would probably be necessary to offset adverse effects and would likely be successful.

Major: The effects would be readily apparent and would result in a change in park operations in a manner noticeable to staff and the public and markedly different from existing operations. Changes to offset adverse effects would be needed, would be extensive, and their success could not be guaranteed.

Assumptions

The cost of implementing the alternatives in this plan/SEIS includes the operational costs that would occur if an alternative were implemented. This information can help the reader see the cost differences among the alternatives. For example, the cost of conducting avalanche control on Sylvan Pass, or not, is illustrated in the alternatives.

The costs in this analysis are the total costs of operating the park in the winter at current operational levels, including areas accessible by wheeled vehicles (Gardiner to the Northeast Entrance). The baseline year for analyses was fiscal year 2011 (December 15, 2010 to March 15, 2011). In fiscal year 2011, total wintertime operational costs parkwide were $ 5,586,858 (both base and non-base sources). This cost figure includes all costs related to wintertime operations for all park areas including Gardiner/Mammoth, Tower/Northeast Entrance, Lake/East Entrance, Grant/South Entrance, Old Faithful, and Madison/West Entrance, and general park expenses. These costs include roads and OSVs, maintenance of interior park buildings, visitor information and interpretation, resource monitoring, administration, life safety, resources, and infrastructure protection, entrance station operations, and concession management.

Study Area

The study area for park operations is the boundaries of Yellowstone and areas where winter use occurs.

SUMMARY OF IMPACTS

- Alternative 1 would have long-term negligible adverse impacts on park operations because staffing and resource requirements would be covered by existing funding, as well as long-term benefits from the potential reallocation of staff to other areas of the park during the winter season. In addition, fuel requirements and greenhouse gas (GHG) emissions would be reduced from current levels because the number of staff needed in the interior of the park, and therefore the use of OSVs, would be reduced.
- Alternatives 2 and 4 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 required resources may impact park operations, but through other funding sources or reallocation of resources, would not have a noticeable impact on park operations. Under alternative 4, there would be no additional costs incurred due to the new management scheme because of the lower number of discrete transportation events than the current management paradigm and because the non-commercially guided program would be covered using existing staff and the fees generated from the non-commercially guided program. No additional staff resources or OSVs would be required. Overall, alternatives 2 and 4 would have greater adverse impacts than alternative 1 because of the park resources required for winter use. In addition, the operation of Sylvan Pass would result in additional financial resources.

- Alternative 3 would result in long-term negligible to minor adverse impacts on park operations and management because the staffing and resource requirements for implementation of the alternative would be slightly less than current operations, and would likely be met with existing funding sources. This alternative would represent a slight cost savings (approximately $124,868) over conditions permitted under the 2009 to 2013 interim regulations because of the closure of Sylvan Pass. Overall, alternative 3 would have greater adverse impacts than alternative 1 because of the park resources required for winter use. However, the closure of Sylvan Pass would reduce the financial resources needed for this management.

DETAILED IMPACT ANALYSIS

Impacts of Alternative 1: No Action - No Snowmobile/Snowcoach Use

Under alternative 1, OSV use would be limited to minimal administrative use. No recreational OSV use would be permitted in the park in the winter. With the minimal level of OSV use, the amount of staff resources and funding needed to implement winter management in the park would decrease from levels required under recent maximum allowable use. To implement alternative 1, staff would be needed at each developed area for operation of the housing, garages/offices, water treatment plants, and the wastewater treatment plants and to groom roads to facilitate administrative travel. Winter upkeep, oversight of contracted work, and protection of life, safety, and property would require staff time and the resources to house staff for the winter. Buildings in the interior of the park may need to be operational to allow concessioners to carry out winter maintenance of structures. In total, approximately 77 NPS staff members would be needed in the park at different developed areas to provide seven-day-per-week coverage and an adequate margin of safety under alternative 1. This would include 18 staff members based in Mammoth and 6 staff based in Tower/Northeast Entrance who directly support wintertime park operations. Grooming access routes between developed areas would occur as needed, approximately once per week. The South and East Entrance Roads would not be groomed. A complete shutdown of some buildings, even if they are not being used (such as the newer visitor centers), is not feasible due to the electronics and other systems that were not designed for total shutdown. Costs under alternative 1 would be approximately $3,239,907 (base and non-base sources); therefore, ample funds and staff resources would be available for implementing this alternative. Long-term benefits would also occur because staff currently assigned to winter use activities in the park could be reassigned to other areas, taking the additional burden off park staff and resources in other areas of the park.

Cumulative Impacts

Actions with the potential to impact park operations include the activities within the park that require additional time and resources from NPS staff during the winter months. These activities include past construction projects (the construction of a new West Entrance and of the East Entrance Road) as well as the current and future operation of these projects. In addition to these construction projects, visitor activities occurring outside the interior of the park would require staff time and resources. One example of this type of activity includes managing the park concessioners that operate lodging accommodations at Mammoth Hot Springs and provide other services such as evening programs, 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 currently operated by one of the park's snowcoach outfitters. NPS staff also provides ranger-led winter programs that offer insight into the history, culture, and geography of the park. Winter programs begin when the park opens for the winter season December 15 and end on March 15. All of these actions would require various levels of staff time and resources, however, the funds for these activities are part of annual funding cycles and would be accommodated with existing and expected budgets. If

additional resources are needed for these activities, such as operating a new facility, they would be accommodated by existing funding or by the reallocation of existing staff. The impacts of these actions would have no to little effect on park operations, and if detectable, would be of a magnitude that would not have an appreciable effect on park operations, resulting in long-term negligible to minor impacts.

The impacts of these past, present, and reasonably foreseeable future actions, combined with the long-term negligible adverse impacts of alternative 1, would result in long-term negligible adverse cumulative impacts on park operations and maintenance. Alternative 1 would contribute a large amount to these impacts because the reduction in the need for OSV management during the winter season would impact a large portion of the park's budget during this time.

Conclusion

Alternative 1 would have long-term negligible adverse impacts on park operations because staffing and resource requirements would be covered by existing funding, as well as long-term benefits from the potential reallocation of staff to other areas of the park during the winter season. In addition, fuel requirements and GHG emissions would be reduced from recent levels because the number of staff members needed in the interior of the park, and therefore OSV use, would be reduced. Cumulative impacts under alternative 1 would be long-term, negligible adverse, of which alternative 1 would contribute a large part.

Impacts of Alternative 2: Continue Snowmobile/Snowcoach Use at 2012/2013 Winter Season Interim Regulation Limits

Alternative 2 would continue to allow for the use levels permitted under the 2009 to 2013 interim regulations, which allowed up to 318 snowmobiles per day and 78 snowcoaches. As a result, staffing levels needed under alternative 2 would be similar to those observed over the 2009/2010 to 2012/2013 winter seasons, and would represent the cost of park winter operations in recent years. Sylvan Pass would be open and avalanche control activities would continue. Approximately 131 employees would continue to remain duty stationed in interior locations, including the West Entrance, to execute winter management activities (the other 37 employees are based at Gardiner/Mammoth or Tower/Northeast Entrance). Approximately 118 snowmobiles are in the park's administrative fleet, including 8 snowmobiles suitable for operations in deep snow, along with 14 tracked vehicles and these OSVs would be expected to continue operating using fuel expenditures similar to those in the 2009 to 2013 interim regulations. To further accommodate winter use activities in the park, the park would continue to groom 180 miles of snow roads, currently being groomed an average of every third day. In terms of GHG emissions and fuel consumption, park staff would be kept at levels similar to the 2009/2010 to 2012/2013 winter seasons, and would continue to consume approximately 23,000 gallons of biodiesel and 14,000 gallons of ethanol over the winter season.

In total, costs for operation would be approximately $5,586,858, which reflects the operating costs for the 2011/2012 winter season. Because costs under alternative 2 would be similar to those currently funded for the past three winter seasons (2009/2010 to 2011/2012), it would be expected that the needed funds and staff resources would be available for implementing this alternative. Additional one-time costs could occur that could require additional resources, but it is expected that the impacts from additional costs would have little to no effect on park management and operations. If an effect is detectable, it would not be of a magnitude that would have an appreciable effect on park operations. Therefore, under alternative 2 impacts on park operations and management would be long-term, negligible to minor adverse.

Cumulative Impacts

Impacts on park operations and management from other past, present, and reasonably foreseeable future actions would be the same as described for alternative 1. These impacts would result from activities within the park that require additional time and resources from NPS staff during the winter months. These activities include past construction projects (the construction of a new West Entrance and the East Entrance Road) as well as the current and future operation of these projects. In addition to these construction projects, visitor activities occurring outside the interior of the park would require staff time and resources (managing the park concessioners and other services and providing ranger-led winter programs). The impacts of these past, present, and reasonably foreseeable future actions, combined with the long-term negligible to minor adverse impacts of alternative 2, would result in long-term negligible to minor adverse cumulative impacts, to which alternative 2 would contribute a large amount because winter use management activities constitute a large portion of the park's operating budget during the winter season.

Conclusion

Alternative 2 would result in long-term negligible to minor adverse impacts because the staffing and resource requirements for the implementation of the alternative would likely be met with existing funding sources. Any additional resources required may impact park operations, but through other funding sources or reallocation of resources, would not have a noticeable impact on park operations. Cumulative impacts under alternative 2 would be long-term negligible to minor adverse, to which alternative 2 would contribute a large part.

Impacts of Alternative 3: Transition to Snowcoaches Meeting BAT Requirements Only

Alternative 3 would transition OSV use in the park to BAT snowcoaches starting in the 2017/2018 season. Snowcoach limits would increase and snowmobile limits would be reduced during a 3-year phaseout. Until the phaseout begins, alternative 3 would have impacts similar to alternative 2 and an approximate operating cost of $5,586,858 (the operating costs of the 2011/2012 winter season). Because alternative 3 would ultimately allow for about 40 additional snowcoaches per day, more visitors could be accommodated under alternative 3 than under alternatives 1 and 2, but less than under alternative 4. Although the sum number of OSVs in the park would be reduced, the number and location of routes would stay the same as permitted under the 2009 to 2013 interim regulations with the exception of Sylvan Pass, and grooming requirements would likely increase to every other day because snowcoaches cause more rutting and damage to snow roads than snowmobiles.

Under alternative 3, once phaseout is complete, Sylvan Pass would be closed. Costs associated with the operation of Sylvan Pass that would not be required include grooming and maintaining the East Entrance, avalanche forecasting and management, and staffing the East Entrance. The following represents the conditions and costs that would not occur if Sylvan Pass was closed:

1. **OSV use, grooming, and signs**. The East Entrance Road would be closed to all OSV travel from 1/4 mile east of 5-mile bend on the east side of Sylvan Pass to the Fishing Bridge developed area. This road segment would be designated for non-motorized travel at a visitor's own risk. A boundary gate would be installed 1/4 mile east of 5-mile bend demarcating the area beyond the gate as containing an avalanche hazard. The road from the East Entrance to 1/4 mile east of 5-mile bend would be designated for non-motorized travel (skiing and snowshoeing) and maintained by Resource and Visitor Protection staff using snowmobile-towed grooming equipment to set tracks. There would be no grooming between Fishing Bridge Developed Area and 1/4 mile east of 5-mile bend on the east side of Sylvan Pass.

2. **Avalanche forecasting**. Avalanche forecasting for Sylvan Pass would be reduced just to the level needed to understand the snowpack for spring opening. The NPS would still need to maintain a fairly high level of forecaster ability. It is estimated that closure of the East Entrance would reduce the cost associated with avalanche forecasting by approximately 25 percent.

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

4. **Staffing**. The East Entrance would be isolated from the rest of the park and would need to be self-sufficient and considered an isolated duty station. Four individuals would be required to staff the East Entrance from fall closure until spring opening (these dates were defined previously). No staff from other divisions would be required at the East Entrance. The Resource and Visitor Protection division would likely shift permanent staff from the Lake District to the East Entrance in the winter to have expertise and skills necessary for the job considering isolation from other parkwide resources. The lake would be staffed similar to other interior locations, and staffing levels would be commensurate with needs for grooming, life/safety, educational, and other responsibilities in the district. Lake maintenance would include grooming a significant number of miles of road, so staff would need to maintain the current level of groomer coverage (7 days/week).

Under the above operating conditions, it would cost approximately $1,482,277 to operate the Lake/East Entrance District with Sylvan Pass closed to all OSV use from the first Monday following the first full week in November through the first Friday of May. The net cost savings for Yellowstone National Park should Sylvan Pass be closed, compared to alternatives that allow for it to be open, would be $124,868.

Under alternative 3, the number of employees required for winter use management activities in the interior or the park would stay the same as under the 2009 to 2013 interim regulations minus 3 positions at the East Entrance due to the closure of Sylvan Pass (approximately 128 staff positions). Sylvan Pass would be closed and avalanche control activities would no longer continue. The closure of Sylvan Pass would represent a cost savings of approximately $124,868.

In terms of GHG emissions and fuel consumption, the numbers of park staff and the OSVs to support them would be similar to levels required for the 2009/2010 to 2011/2012 winter seasons, and would therefore not result in an increase in fuel consumption and associated emissions.

In total, costs for operation under alternative 3 would be approximately $5,461,990, which reflects the operating costs for the 2011/2012 winter season minus the estimated cost of operating Sylvan Pass. Because fewer park OSVs would be required under this alternative, actual costs may be slightly lower, but any reduction would not change the overall impact of these costs on park operations. The cost for implementing alternative 3 would be approximately $124,868 less than funding for the past three winter seasons (2009/2010 to 2011/2012). The necessary funds and staff resources would be available for implementing this alternative. It is expected that the impacts from costs under this alternative would have little to no effect on park management and operations because of similar costs for current wintertime operations. Therefore, impacts under alternative 3 to park operations and management would be long-term, negligible to minor adverse.

Cumulative Impacts

Impacts on park operations and management from other past, present, and reasonably foreseeable future actions would be the same as described for alternative 1. These impacts would result from activities within the park that require additional time and resources from NPS staff during the winter months. These activities include past construction projects (the construction of a new West Entrance and the East Entrance Road) as well as the current and future operation of these projects. In addition to these construction projects, visitor activities occurring outside the interior of the park would require staff time and resources (managing the park concessioners and other services and providing ranger-led winter programs).The impacts of these past, present, and reasonably foreseeable future actions, combined with the long-term negligible to minor adverse impacts of alternative 3, would result in long-term negligible to minor adverse cumulative impacts, to which alternative 3 would contribute a large amount because winter use management activities would constitute a large portion of the park's operating budget during the winter season.

Conclusion

Alternative 3 would result in long-term negligible to minor adverse impacts on park operations and management because the staffing and resource requirements for the implementation of the alternative would likely be met with existing funding sources. Cumulative impacts under alternative 3 would be long-term negligible to minor adverse, to which alternative 3 would contribute a large part.

Impacts of Alternative 4: Manage OSV Use by Transportation Events

Alternative 4 would result in changes to OSV management in the park because use would be managed by transportation events. This management paradigm, while slightly different than current management, would not result in a change in the number of park staff members or park OSVs required, compared to what was required during the 2009/2010 to 2012/2013 winter seasons. Any changes to operations would be accommodated through existing staff. Managing OSV use by transportation event would not require additional management compared to recent allowable use, mainly because permitted wintertime concession contract holders would report monthly the number of transportation events each has used. These data would be validated by gate counts and the NPS would ensure that the providers are maintaining the required average group size. This additional effort would be addressed in two ways. First, the providers would be responsible for reporting their monthly numbers to the park's Concession office. Although the average would be looked at over the season, the monthly report would assist the operators in keeping track of their ongoing usage. Second, the existing park staff in the Concessions office would be responsible for reviewing the monthly reports and would be able to identify if any provider is exceeding or likely to exceed their average. This function of the Concessions office would be part of the existing function of that office and would represent a minimal increase over their current responsibility.

The non-commercially guided program is not anticipated to increase the amount of management required under alternative 4. The administration of the lottery system would be managed by Recreation.gov. On-the-ground management of non-commercially guided groups could be handled with existing personnel at the gates. As detailed in appendix C, the non-commercially guided snowmobile access program would be administered by Yellowstone National Park. Entrance permits will be allocated via an online lottery system managed through Recreation.gov. Through this process, applicants for non-commercially guided trips would be required to pay a lottery application fee, lottery selection fee, and a fee for the reduction certificate program. These fees would pay for the necessary staff and additional management for administration of the non-commercially guided program.

Approximately 131 employees would continue to remain duty stationed in interior locations, including the West Entrance, to execute winter management activities. Approximately 118 snowmobiles are in the park's administrative fleet, including 8 snowmobiles suitable for operations in deep snow, along with 14 tracked vehicles and these OSVs would be expected to continue operating using fuel expenditures similar to those in the 2009 to 2013 interim regulations. To further accommodate winter use activities in the park, the park would continue to groom 180 miles of snow roads, currently being groomed on average every third day. In terms of GHG emissions and fuel consumption, park staff members and the OSVs to support them would be kept at levels similar to the 2009/2010 to 2011/2012 winter seasons, and would continue to consume approximately 23,000 gallons of biodiesel and 14,000 gallons of ethanol over the winter season.

Under alternative 4, Sylvan Pass would be open and avalanche control activities would continue under the terms and conditions of the Sylvan Pass Working Group Agreement.

Staffing levels needed under alternative 4 would be similar to those observed over the 2009/2010 to 2012/2013 winter seasons, and would represent the cost of park winter operations in recent years. Any additional costs incurred due to the introduction of non-commercially guided use would be recouped via the fees generated from the non-commercial guided program, and no additional staff resources would be required. In total, costs for operation would be approximately $5,586,858, which reflects the operating costs for the 2011/2012 winter season.

Cumulative Impacts

Impacts on park operations and management from other past, present, and reasonably foreseeable future actions would be the same as described for alternative 1. These impacts would result from activities within the park that require additional time and resources from NPS staff during the winter months. These activities include past construction projects (the construction of a new West Entrance and the East Entrance Road) as well as the current and future operation of these projects. In addition to these construction projects, visitor activities occurring outside the interior of the park would require staff time and resources (managing the park concessioners and other services and providing ranger-led winter programs). The impacts of these past, present, and reasonably foreseeable future actions, combined with the long-term negligible to minor adverse impacts of alternative 4, would result in long-term negligible to minor adverse cumulative impacts, to which alternative 4 would contribute a large amount because winter use management activities would constitute a large portion of the park's operating budget during the winter season.

Conclusion

Alternative 4 would result in long-term negligible to minor adverse impacts on park operations and management because the staffing and resource requirements for the implementation of the alternative would likely be met with existing funding sources. Additional management required under this alternative would be accommodated through existing staff or from lottery fees associated with the non-commercially guided program. Cumulative impacts under alternative 4 would be long-term negligible to minor adverse, of which alternative 4 impacts would contribute a large part.

UNAVOIDABLE ADVERSE IMPACTS

The NPS is required to consider whether the alternative actions would result in impacts that could not be fully mitigated or avoided (NEPA Section 101(c)(ii)).

IMPACTS OF ALTERNATIVE 1: NO ACTION - NO SNOWMOBILE/SNOWCOACH USE

Under alternative 1, the minimal level of administrative use would cause a low (negligible) level of unavoidable adverse impacts on park resources such as wildlife (bison/elk, lynx/wolverines, trumpeter swans/eagles, and gray wolves), air quality, and soundscapes due to the occasional disturbance of these resources from administrative OSVs. There would be long-term, unavoidable adverse impacts on visitor use and experience (including visitor accessibility) because winter access to the interior of Yellowstone would be very limited and would be available only to those who could access it by non-motorized means. For those who could access the interior of the park, visitor services would not be available due to the low levels of visitation without motorized use. There would also be unavoidable adverse impacts on health and safety because those visitors that are able to reach the interior by non-motorized means could be exposed to harsh winter conditions, without any support facilities and less NPS staff to assist them should the need arise. Unavoidable adverse impacts would also be created for socioeconomic values because any resulting decrease in visitation from the discontinuation of OSVs would reduce business in the communities surrounding the park. Under this alternative, minimal administrative use would occur. This minimal level of administrative use would also result in unavoidable adverse impacts because some level of park staff would be needed to maintain the interior of Yellowstone during the winter.

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

Unavoidable adverse impacts under alternative 2 would include impacts to park resources such as wildlife (bison/elk, lynx/wolverines, trumpeter swans/eagles, and gray wolves), air quality, and soundscapes due to continued OSV use in the park during the winter. Visitor use and experience (including visitor accessibility) would also experience unavoidable adverse impacts because at these use levels, visitors may not be able to find the visitor experience they seek, either desiring more or less winter use. Visitors with mobility challenges would be able to experience the interior of the park because some level of OSV use would be available, but it is uncertain if it would be their desired mode. There would be unavoidable adverse impacts to health and safety because visitors and employees would continue to be exposed to air and sound emissions from OSVs, user conflicts (motorized and non-motorized) would still exist, and the operation of Sylvan Pass would still occur, exposing NPS employees in this area to additional risk. Any unavoidable adverse impacts to socioeconomic values under alternative 2 would be greatly reduced compared to alternative 1, because winter use in the interior of Yellowstone would continue and businesses in the neighboring communities would be able to benefit from this economic activity. Impacts to park operations and management would increase compared to alternative 1 due to the increased level of staffing required to carry out winter use management when OSV use is permitted in the interior of the park.

IMPACTS OF ALTERNATIVE 3: TRANSITION TO SNOWCOACHES MEETING BAT REQUIREMENTS ONLY

Unavoidable adverse impacts under alternative 3 would include impacts to park resources such as wildlife (bison/elk, lynx/wolverines, trumpeter swans/eagles, and gray wolves), air quality, and soundscapes due to continued OSV use in the park during the winter. This alternative represents the

least impact of all alternatives that allow OSV use because the overall number of OSVs permitted in the park in the winter would decline. Visitor use and experience (including visitor accessibility) would also experience unavoidable adverse impacts because at these use levels, when a complete transition to snowcoaches is made, visitors may not be able to find the visitor experience they seek, either desiring more or less winter use or desiring to use snowmobiles when only snowcoaches are available. Visitors with mobility challenges would be able to experience the interior of the park because some level of OSV use would be available, but it is uncertain whether it would be their desired mode because snowmobiles would be phased out. There would be unavoidable adverse impacts on health and safety because visitors and employees would continue to be exposed to air and sound emissions from OSVs and user conflicts (motorized and non-motorized) would still exist. The operation of Sylvan Pass would not occur, reducing unavoidable impacts in this area of the park. Any unavoidable adverse impacts on socioeconomic values under alternative 3 could be increased compared to the other alternatives that allow for OSV use because overall, fewer OSVs would be permitted in the park and some visitors may choose not to recreate if no snowmobiles are available. However, visitation would still occur from snowcoach use and would benefit the businesses in neighboring communities. Impacts on park operations and management would increase compared to alternative 1 due to the increased level of staffing required to carry out winter use management when OSV use is permitted in the interior of the park.

IMPACTS OF ALTERNATIVE 4: MANAGE OSV USE BY TRANSPORTATION EVENTS

Unavoidable adverse impacts under alternative 4 would include impacts on park resources such as wildlife (bison/elk, lynx/wolverines, trumpeter swans/eagles, and gray wolves), air quality, and soundscapes due to continued OSV use in the park during the winter. These impacts would be greater than under the other alternatives that allow OSV use due to the high number of OSVs allowed on some days. However, this use would be similar to the level of use permitted under the 2009 to 2013 interim regulations, on average, with only a certain number of days exceeding these levels. The introduction of non-commercial guiding is not expected to increase impacts because these guides would receive training and would ensure their group members follow all rules and regulations put in place to protect park resources. Because non-commercial guiding would be a new use in the park, the program would be monitored to ensure there would be no impacts on visitor use, experience, and accessibility. Should impacts occur, the program would be altered or possibly discontinued.

Visitor use and experience (including visitor accessibility) would also experience unavoidable adverse impacts because at these use levels, visitors may not be able to find the visitor experience they seek, either desiring more or less winter use (including more or fewer non-commercial guiding opportunities). Visitors with mobility challenges would be able to experience the interior of the park because some level of OSV use would be available, but it is uncertain whether it would be their desired mode. There would be unavoidable adverse impacts on health and safety because visitors and employees would continue to be exposed to air and sound emissions from OSVs, user conflicts (motorized and non-motorized) would still exist, and the operation of Sylvan Pass would still occur, exposing NPS employees in this area to additional risk. Any unavoidable adverse impacts on socioeconomic values under alternative 4 would be greatly reduced compared to alternative 1 because winter use in the interior of Yellowstone would continue and businesses in the neighboring communities would be able to benefit from this economic activity, with some of the higher-use days allowing for more recreational use than is currently occurring. Impacts on park operations and management would increase compared to alternative 1 due to the increased level of staffing required to carry out winter use management when OSV use is permitted in the interior of the park and would be higher than under the other action alternatives because the administration of a non-commercially guided program would put additional demands on park staff.

SUSTAINABILITY AND LONG-TERM MANAGEMENT

In accordance with NEPA, and as further explained in NPS Director's Order 12: *Conservation Planning, Environmental Impact Analysis, and Decision-making*, consideration of long-term impacts and the effects of foreclosing future options should be included throughout any NEPA document. According to Director's Order 12, and as defined by the World Commission on Environment and Development, "sustainable development is that which meets the needs of the present without compromising the ability of future generations to meet their needs" (NPS 2012b). For each alternative considered in a NEPA document, considerations of sustainability must demonstrate the relationship between local short-term uses of the environment and the maintenance and enhancement of long-term productivity. This is described below for each alternative. The NPS must consider whether the effects of the alternatives involve tradeoffs of the long-term productivity and sustainability of park resources for the immediate short-term use of those resources. It must also consider whether the effects of the alternatives are sustainable over the long term without causing adverse environmental effects for future generations (NEPA Section 102(c)(iv)).

The impact from all activities analyzed in the plan/SEIS alternatives could be considered local and short-term because they are specific to Yellowstone and are reversible actions. Long-term productivity is construed as the continued existence of the natural resources of the park, at a sustainable and high level of quality, so that they can retain their inherent value and be enjoyed by the public. Depending on the magnitude, extent, and duration of impacts caused by short-term uses, long-term productivity could be affected. The analysis in the plan/SEIS has shown few impacts from possible short-term uses that would affect long-term productivity as defined. It is the function of monitoring and mitigation, incorporated into park management, to ensure that no such impacts result from implementation.

IMPACTS OF ALTERNATIVE 1: NO ACTION - NO SNOWMOBILE/SNOWCOACH USE

Under alternative 1, no OSV use would occur in the park and therefore, the level of the short-term impacts would be negligible to minor. The long-term productivity of the park's resources would not be impacted. Changes in the way visitors use and experience Yellowstone in the winter would occur for the duration of plan implementation, and these changes would be greater under alternative 1 than the other alternatives analyzed.

IMPACTS OF ALTERNATIVE 2: CONTINUE SNOWMOBILE/SNOWCOACH USE AT 2012/2013 WINTER SEASON INTERIM REGULATION LIMITS

Alternative 2 could be considered local and short term because it is specific to Yellowstone and is a reversible action. Long-term productivity is construed as the continued existence of the natural resources of the park at a sustainable and high level of quality, so that they can retain their inherent value and be enjoyed by the public. The analysis in the plan/SEIS has shown few impacts from possible short-term uses over the 20-year period covered by this alternative. Alternative 2 represents the continuation of use limits under the 2009 to 2013 interim regulations, which monitoring has shown did not affect the productivity of the park's resources. In addition, monitoring and mitigation that are part of this alternative would ensure that impacts on sustainability and long-term management would not result from implementation. Similar to the other action alternatives, alternative 2 was developed to be implemented adaptively. Alternative 2 would induce short-term effects on a variety of values or resources that would persist for as long as the impacting activity is undertaken. Under alternative 2, a mix of visitor uses would be available, but due to use limits, visitors may not be able to have their desired experience during their visit. These impacts on visitor experience would continue for the duration of plan implementation.

IMPACTS OF ALTERNATIVE 3: TRANSITION TO SNOWCOACHES MEETING BAT REQUIREMENTS ONLY

Alternative 3 could be considered local and short term because it is specific to Yellowstone and is a reversible action. Long-term productivity is construed as the continued existence of the natural resources of the park, at a sustainable and high level of quality, so that they can retain their inherent value and be enjoyed by the public. The analysis in the plan/SEIS has shown few impacts from possible short-term uses during the 20-year period covered by this alternative that would affect long-term productivity as defined. Alternative 3 represents a level of motorized use in the park that monitoring has shown does not affect the productivity of the park's resources. In addition, monitoring and mitigation that are part of this alternative would ensure that impacts on sustainability and long-term management would not result from implementation.

Alternative 3 would induce short-term effects on a variety of values or resources that would persist for as long as the impacting activity is undertaken. Under alternative 3, a mix of visitor uses would be available, but due to the phaseout of snowmobile use, visitors may not be able to have their desired experience during their visit. These impacts on visitor experience would continue for the duration of plan implementation.

IMPACTS OF ALTERNATIVE 4: MANAGE OSV USE BY TRANSPORTATION EVENTS

Alternative 4 could be considered local and short term because it is specific to Yellowstone and is a reversible action. Long-term productivity is construed as the continued existence of the natural resources of the park, at a sustainable and high level of quality, so that they can retain their inherent value and be enjoyed by the public. The analysis in the plan/SEIS has shown few impacts from possible short-term uses during the 20-year life of this plan that would affect long-term productivity as defined. Alternative 4 represents a level of motorized use that is similar to or greater than recent years but would not have increased impacts on the parks resources compared to the other action alternatives due to the focus on transportation events. In addition, monitoring and mitigation that are part of this alternative would ensure that impacts on sustainability and long-term management would not result from implementation.

Alternative 4 would induce short-term effects on a variety of values or resources that would persist for as long as the impacting activity is undertaken. Under alternative 4, a mix of visitor uses would be available, including non-commercial guiding. Even with the increased diversity of visitor experiences, use limits would be in place and visitors may not be able to have their desired experience during their visit. These impacts on visitor experience would continue for the duration of plan implementation.

IRREVERSIBLE OR IRRETRIEVABLE COMMITMENTS OF RESOURCES

The NPS must consider whether the effects of the alternatives cannot be changed or are permanent (that is, the impacts are irreversible). The NPS must also consider whether the impacts on park resources would mean that once gone, the resource could not be replaced; in other words, the resource could not be restored, replaced, or otherwise retrieved (NEPA Section 102(c)(v)).

An irreversible commitment of resources is defined as the loss of future options. The term applies primarily to the effects of using nonrenewable resources, such as minerals or cultural resources, or to those factors such as soil productivity that are renewable only over long periods. It could also apply to

the loss of an experience as an indirect effect of a "permanent" change in the nature or character of the land.

An irretrievable commitment of resources is defined as the loss of production, harvest, or use of natural resources. The amount of recreation activities foregone is irretrievable, but the action is not irreversible. If the use changes, it is possible to resume production. An example of such a commitment would be the loss of cross-country skiing opportunities as a result of a decision to allocate an area to snowmobile use only. If the decision were reversed, skiing experiences, although lost in the interim, would be available again.

ALTERNATIVE 1: NO ACTION - NO SNOWMOBILE/SNOWCOACH USE

Under alternative 1, the restriction of access to the interior of Yellowstone in the winter would displace those visitors desiring an OSV experience, and would result in an irretrievable loss of this opportunity for all visitors. The displacement of these visitors could also result in the loss of revenue to neighboring communities, resulting in irretrievable losses to socioeconomic values. These losses would be irretrievable, but not irreversible. The losses would also be balanced by benefits to park resources, including reduced disturbance to park wildlife, air quality, and soundscapes. The closure of Sylvan Pass would result in benefits to the health and safety of NPS employees because avalanche mitigation efforts would no longer be required in that area and NPS resources currently allocated for park operations could be reallocated for other management in the park.

ALTERNATIVE 2: CONTINUE SNOWMOBILE/SNOWCOACH USE AT 2012/2013 WINTER SEASON INTERIM REGULATION LIMITS

Under alternative 2, OSV use in the interior of Yellowstone in the winter would occur at levels that would impact park resources such as wildlife, air quality, and soundscapes. These impacts would represent irretrievable, but not irreversible, losses to the quality of the resource. The ability of visitors to experience these resources may also be lost to a certain extent, however compared to alternative 1, visitors would have more opportunities to experience park resources because they would be able to access the interior of the park. Alternative 2 would allow for a mix of uses in the winter, including non-motorized and OSV opportunities, and would not represent a loss in the types of visitor experiences available in the park. OSV use in the winter would provide beneficial impacts to the socioeconomic values of the surrounding communities. Alternative 2 would allow for the continued operation of Sylvan Pass which would continue to put NPS employees working in this area at risk and would continue to expose NPS employees to some level of air and sound pollution, resulting in irretrievable losses. Under alternative 2, while there would be some irretrievable losses, these would not be irreversible.

ALTERNATIVE 3: TRANSITION TO SNOWCOACHES MEETING BAT REQUIREMENTS ONLY

Under alternative 3, OSV use in the interior of Yellowstone in the winter would occur at levels that would impact park resources such as wildlife, air quality, and soundscapes. These impacts would represent irretrievable, but not irreversible, losses to the quality of the resource. The ability of visitors to experience these resources may also be lost to a certain extent; however compared to alternative 1, visitors would have more opportunities to experience park resources because they would be able to access the interior of the park. Alternative 3 would allow for a mix of uses in the winter including non-motorized and OSV opportunities, but would result in the loss of one specific use (snowmobile use). This alternative would represent a loss of the specific desired visitor experience. However, OSV use in the winter would provide beneficial impacts to the socioeconomic values of the surrounding

communities, that may be reduced compared to other action alternatives that allow for a greater mix of uses. The closure of Sylvan Pass would result in benefits to the health and safety of NPS employees because avalanche mitigation efforts would no longer be required in that area and NPS resources currently allocated for park operations could be reallocated for other activities in the park. Under alternative 3, while there would be some irretrievable losses, these would not be irreversible.

ALTERNATIVE 4: MANAGE OSV USE BY TRANSPORTATION EVENTS

Under alternative 4, OSV use in the interior of Yellowstone in the winter would occur at levels that would impact park resources such as wildlife, air quality, and soundscapes. These impacts would represent irretrievable, but not irreversible, losses to the quality of the resource. The ability of visitors to experience these resources may also be lost to a certain extent, however compared to alternative 1, visitors would have more opportunities to experience park resources because they would be able to access the interior of the park and compared to the other action alternatives, more visitors would be able to visit the interior of the park. Alternative 4 would allow for a mix of uses in the winter, including non-motorized and OSV opportunities (including non-commercial guiding), and would not represent a loss in the types of visitor experiences available in the park. OSV use under alternative 4 would provide beneficial impacts to the socioeconomic values of the surrounding communities, with this benefit being greater on days when the maximum number of transportation events is used. Alternative 4 would allow for the continued operation of Sylvan Pass which would continue to put NPS employees working in this area at risk and would continue to expose NPS employees to some level of air and sound pollution, resulting in irretrievable losses. Under alternative 4, while there would be some irretrievable losses, these would not be irreversible.

CHAPTER 5

Consultation and Coordination

CHAPTER 5: CONSULTATION AND COORDINATION

Yellowstone National Park staff place a high priority on meeting the intent of public involvement in the National Environmental Policy Act (NEPA) process and providing the public an opportunity to comment on proposed actions. As part of the National Park Service (NPS) NEPA process, issues associated with this Winter Use Plan / Supplemental Environmental Impact Statement (plan/SEIS) were identified during scoping meetings with NPS staff (including the Interdisciplinary Team, coordination with other affected agencies, public meetings, and public comment). For this project, an Interdisciplinary Team, also called the Project Team, consisted of members from the park, region, and Washington Office.

This chapter describes the consultation that occurred during development of this plan/SEIS, including consultation with stakeholders and other agencies. This chapter also includes a description of the public involvement process and a list of the recipients of the draft document.

THE SCOPING PROCESS

The NPS divides the scoping process into two parts: internal scoping and external public scoping. Internal scoping involved discussions among NPS personnel regarding the purpose of and need for management actions, issues, potential management alternatives, mitigation measures, the analysis boundary, the appropriate level of documentation, available references and guidance, and other related topics.

Public scoping is the early involvement of the interested and affected public in the environmental analysis process. The public scoping process helps ensure that people are given an opportunity to comment and contribute early in the decision-making process. For this plan/SEIS, project information was distributed to individuals, agencies, and organizations early in the scoping process, and people were given a variety of opportunities to express concerns or views and identify important issues or even other alternatives or alternative elements.

Taken together, internal and public scoping are essential elements of the NEPA planning process. All scoping that occurred during the planning process for the 2011 Winter Use Plan/EIS was considered for this supplemental process to prepare the plan/SEIS. The internal and public scoping processes for the 2011 Winter Use Plan/EIS are described in detail in the final 2011 Winter Use Plan/EIS (November 2011). The following sections describe the various ways scoping was conducted for the plan/SEIS process.

SCOPING PROCESS FOR THE SUPPLEMENTAL WINTER USE PLAN/EIS

Public scoping for the plan/SEIS began on February 8, 2012, with the release of the *Federal Register* publication of the Notice of Intent to prepare an environmental impact statement (EIS) (77 FR 6581). The Notice of Intent summarized the history of winter use management at the park, discussed the recent history of the winter use planning process, listed the project website, and announced the upcoming public scoping meetings. The park posted a public scoping newsletter on the NPS Planning, Environment, and Public Comment (PEPC) website at http://parkplanning.nps.gov/yell, sent copies of the newsletter to a list of park stakeholders, and issued a news release inviting the public to comment at the scoping meetings.

The public was invited to submit comments on the scope of the planning process and potential alternative elements from February 8, 2012, through March 9, 2012. During this time, the park received more than 73,000 documents commenting on the scope of the plan/SEIS. Generally, these comments focused on support for or opposition to the draft range of alternatives presented during scoping, with requested modifications to the alternatives presented. Public comments included, but were not limited to, increasing oversnow vehicle (OSV) use throughout the park, allowing for a non-commercially guided use program, and the request to transition to snowcoaches only. Other comments received included suggestions for / opposition to alternative elements (opposition to requiring operators to provide both snowcoaches and snowmobiles, opposition to restricting use during the first two and last two weeks of season, what defines a sound event, how many non-commercially guided vehicles should be allowed, etc.). Additional comments included general support for sound event management, opposition to sound event management, the operation of Sylvan Pass (should it be opened or closed and the impacts of such an action), development of best available technology (BAT) snowcoaches, and support for a transition year.

Additionally, as with public scoping on the 2011 Winter Use Plan/EIS, many comments were received about the experience the visitor would have depending on changes in winter use. Comments indicated the use of OSVs either contributed to or detracted from visitor experiences at the park. Comments were also received that expressed concern for wildlife and their habitat with the use of OSVs in the park.

A full summary and analysis of the public comments received can be found at http://parkplanning.nps.gov/yell.

During the scoping period, four public scoping open houses were held:

- February 13, 2012: Holiday Inn in Cody, Wyoming
- February 14, 2012: The Virginian in Jackson, Wyoming
- February 15, 2012: Holiday Inn in West Yellowstone, Montana
- February 16, 2012: Holiday Inn in Bozeman, Montana

PUBLIC REVIEW OF THE DRAFT WINTER USE PLAN/EIS

The NPS notice of availability for the draft plan/SEIS was published by the NPS and the U.S. Environmental Protection Agency (EPA) on June 29, 2012. The draft plan/ SEIS was also posted online at the NPS Planning, Environment, and Public Comment (PEPC) website on June 29, 2012. The notice of availability opened the public comment period and established the closing date of August 13, 2012, for comments. This public comment period was announced on the park website (www.nps.gov/yell); in a newsletter sent to interested parties, elected officials, and appropriate local and state agencies; and through press releases. The draft plan/SEIS was made available through several outlets, including the NPS PEPC website at http://parkplanning.nps.gov/yell, hardcopies at the parks headquarters and visitor centers, and by request to receive a copy through the mail. After reviewing the draft plan/SEIS, the public was encouraged to submit comments about the draft plan/SEIS through the NPS PEPC website, by postal mail sent directly to the park, or delivered in person directly to the park. Oral statements and written comments were accepted during the hearing-style portion of the meetings. Following the initial 45-day public comment period, the public comment period was re-opened in September 2012 for an additional 30 days.

Four public meetings were held in July 2012 to present the plan, continue the public involvement process, and obtain and community and national input on the draft plan/SEIS for winter use in Yellowstone

National Park. The public meetings held during the public comment period for the draft plan/SEIS are listed below:

- July 16, 2012: The Virginian in Jackson, Wyoming
- July 17, 2012: Holiday Inn in West Yellowstone, Montana
- July 18, 2012: The Wingate by Wyndham in Bozeman, Montana
- July 19, 2012: Holiday Inn in Cody, Wyoming

These meetings were announced to the public and numerous media outlets through a park press release, the NPS PEPC website, and social media, including Twitter.

Some individuals attended more than one meeting. A total of 144 meeting attendees signed in during the four meetings. The meetings began with an open house where displays were stationed around the room and the public was able to ask questions to Yellowstone and NPS personnel. Next, a presentation was given about the draft plan/SEIS and the preferred alternative, followed by question and answer session. The meetings ended with a hearing-style comment period that gave people the opportunity to provide oral comments directed toward the superintendent in a public forum. Members of the public were also given the opportunity to provide comments privately to a court reporter. Those attending the meeting received a handout that described the NEPA process, detailed the alternatives, and listed additional opportunities to comment on the project, such as providing comments on the NPS PEPC website at http://parkplanning.nps.gov/. Park staff were available at the meetings and webinars to answer questions and provide additional information to open house participants.

During the comment period for the draft plan/SEIS, more than 11,900 pieces of correspondence were received with more than 13,000 signatures, including individual letters delivered via the mail delivery service, oral comments or statements submitted at the public meetings, and electronic pieces of correspondence entered directly into the PEPC system. Comments received from the public meetings and all letters delivered individually through the mail or in person were entered into the PEPC system for analysis.

Once the correspondences were entered into PEPC, each was read and specific comments within each correspondence were identified. Over 38,000 individual comments were derived from the correspondences received. During coding, comments were classified as substantive or non-substantive. A substantive comment is defined in the NPS Director's Order 12 Handbook as one that does one or more of the following (NPS 2001, Section 4.6A):

- Question, with reasonable basis, the accuracy of information presented in the EIS;
- Question, with reasonable basis, the adequacy of the environmental analysis;
- Present reasonable alternatives other than those presented in the EIS; and/or
- Cause changes or revisions in the proposal.

As further stated in the Director's Order 12 Handbook, substantive comments "raise, debate, or question a point of fact or policy. Comments in favor of or against the proposed action or alternatives, or comments that only agree or disagree with NPS policy, are not considered substantive." Non-substantive comments offer opinions or provide information not directly related to the issues or impact analysis. Non-substantive comments were acknowledged and considered by the NPS, but did not require responses. Substantive comments were grouped into issues and "concern statements" prepared for responses. Members of the

NPS planning team responded to the concern statements, and these responses are included in "Appendix G: Comment Response Report."

This plan/SEIS will be posted on the NPS PEPC website (http://parkplanning.nps.gov/yell) and copies will be distributed to agencies, organizations, elected officials, and other entities or individuals who requested a copy. The publication of the EPA notice of availability of this final EIS in the Federal Register will initiate a 30-day wait period before the Record of Decision documenting the selection of an alternative to be implemented is signed. After the NPS publishes a notice in the Federal Register announcing the availability of the signed Record of Decision, the implementation of the alternative selected in the Record of Decision can begin.

COOPERATING AGENCIES

In January 2012, the NPS sent invitations to federal and state agencies involved in past winter use planning efforts, including the 2011 Winter Use Plan/EIS, to become cooperating agencies for this plan/SEIS. The following entities responded that they would serve as cooperating agencies for the plan/SEIS: the EPA; the State of Idaho; the 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 U.S. Fish and Wildlife Service (USFWS) declined the invitation to be cooperating agencies for the plan/SEIS.

As a cooperating agency, most entities signed a Memorandum of Understanding to define the role of each party in the process, including providing technical data and reviews. In addition to the roles stated in the Memorandum of Understanding, the cooperating agencies met during the planning process to provide the NPS information. In addition to the five meetings held as part of the 2011 Winter Use Plan/EIS, for which these groups were also cooperating agencies, the meetings included the following:

- Teleconference, January 12, 2012. During this teleconference, cooperating agencies received the initial range of draft alternatives of the plan/SEIS that would be distributed for public comment. Agencies were asked at this time if they had any questions or needed any clarification.
- Teleconference, February 28, 2012. During this teleconference, cooperating agencies received an update on the public scoping meetings and comments received to date.
- Email, March 1, 2012. An email was sent to cooperating agencies from the park requesting information that the agencies would like to see considered in the plan/SEIS.
- Teleconference, March 27, 2012. During this teleconference, cooperating agencies were provided the results of the plan/SEIS scoping comment analysis, progress to date on the plan/SEIS, the revised range of alternatives, and the schedule moving forward.
- Teleconference, June 15, 2012. During this teleconference, cooperating agencies were updated on the range of draft alternatives that were going to be presented in the draft plan/SEIS and informed of when the draft plan/SEIS would be released. Dates and locations for the planned public meetings on the draft plan/SEIS were also discussed.
- Teleconference, July 25, 2012. During this teleconference, cooperating agencies received an update on the public meetings held the prior week, including comments received at those meetings.

- Teleconference, September 10, 2012. During this teleconference, cooperating agencies were updated on the re-opening of the comment period, as well as the schedule for publishing the draft and final rule.
- Teleconference, January 24, 2013. During this teleconference, cooperating agencies were updated on elements of the NPS preferred alternative, the status of the proposed rule, and the schedule for the remainder of the plan/SEIS and rulemaking process.

LIST OF RECIPIENTS

The agencies, organizations, and businesses listed below were notified of the availability of the plan/SEIS. This document was also provided to other entities and individuals who requested a copy.

CONGRESSIONAL DELEGATES

- Raúl Labrador, Idaho, U.S. House of Representatives
- Michael K. Simpson, Idaho, U.S. House of Representatives
- Mike Crapo, Idaho, U.S. Senate
- James Risch, Idaho, U.S. Senate
- Steve Daines, Montana, U.S. House of Representatives
- Jon Tester, Montana, U.S. Senate
- Max Baucus, Montana, U.S. Senate
- John Barrasso, Wyoming U.S. Senator
- Mike Enzi, Wyoming U.S. Senator
- Cynthia Lummis, Wyoming U.S. House of Representative

NATIONAL PARK SERVICE

- Big Hole National Battlefield
- Glacier National Park
- Grand Teton National Park
- Grant-Kohrs Ranch National Historic Site
- Little Bighorn Battlefield National Monument

U.S. FOREST SERVICE

- Beaverhead National Forest
- Bridger-Teton National Forest
- Custer National Forest
- Gallatin National Forest

- Shoshone National Forest
- Targhee National Forest

ENVIRONMENTAL PROTECTION AGENCY

- Region 8 – Denver

U.S. ARMY CORPS OF ENGINEERS

U.S. FISH AND WILDLIFE SERVICE

WESTERN FEDERAL LANDS HIGHWAY DIVISION

STATE OF IDAHO

- C.L. "Butch" Otter, Governor of Idaho
- Idaho Department of Commerce
- Idaho Department of Parks and Recreation
- Idaho Fish and Game Department
- Idaho State Historic Preservation Office
- Freemont County, Idaho, Commissioners

STATE OF MONTANA

- Brian Schweitzer, Governor of Montana
- Montana Department of Commerce
- Montana Department of Fish Wildlife and Parks
- Montana Intergovernmental Review Clearinghouse
- Town of West Yellowstone
- Gallatin County, Montana, Commissioners
- Park County, Montana, Commissioners

STATE OF WYOMING

- Matt Mead, Governor of Wyoming
- Wyoming Department of Environmental Quality
- Wyoming Department of Transportation
- Wyoming Game and Fish Department
- Wyoming Office of Federal Land Policy
- Wyoming State Clearinghouse

- Wyoming State Historic Preservation Office
- Wyoming State Lands and Investments
- Wyoming Travel Commission
- Park County, Wyoming, Commissioners
- Teton County, Wyoming, Commissioners
- Teton County Certified Local Government

AMERICAN INDIAN TRIBES

- Yellowstone's 26 Associated Indian Tribes:
- Assiniboine & Sioux Tribes
- Blackfeet Tribe
- Cheyenne River Sioux Tribe
- Coeur d'Alene Tribe
- Comanche Tribe of Oklahoma
- Confederated Tribes of the Colville Reservation
- Confederated Tribes of the Umatilla Reservation
- Confederated Salish & Kootenai Tribes
- Crow Tribe
- Crow Creek Sioux Tribe
- Eastern Shoshone Tribe
- Flandreau Santee Sioux Tribe
- Gros Ventre and Assiniboine Tribes
- Kiowa Tribe of Oklahoma
- Lower Brule Sioux Tribe
- Nez Perce Tribe
- Northern Arapaho Tribe
- Northern Cheyenne Tribe
- Oglala Sioux Tribe
- Rosebud Sioux Tribe
- Shoshone-Bannock Tribes
- Sisseton-Wahpeton Sioux Tribe
- Spirit Lake Sioux Tribe
- Standing Rock Sioux Tribe

- Turtle Mountain Band of the Chippewa Indians
- Yankton Sioux Tribe

LIBRARIES

- Billings, Montana Public Library
- Bozeman, Montana Public Library
- Cody, Wyoming Public Library
- Jackson, Wyoming Public Library
- West Yellowstone, Montana, Public Library
- Wyoming State Library
- Yellowstone National Park Research Library

OTHER ORGANIZATIONS AND BUSINESSES

- Alliance for Wild Rockies
- American Fisheries Society
- American Wildlands
- Animal Welfare Institute
- Bear Creek Council
- Beartooth Alliance
- Billings Chamber of Commerce
- Bluewater Network
- Bozeman Area Chamber of Commerce
- Buffalo Bill Historical Center
- Center for Urban Affairs
- Cheyenne High Plains Audubon Society
- Citizens for Teton Valley
- Coalition of National Park Service Retirees
- Cody Chamber of Commerce
- Cooke City/Silver Gate Chamber of Commerce
- Defenders of the Rockies
- Defenders of Wildlife
- Fremont County Audubon Society
- Fund for Animals
- Gardiner Chamber of Commerce

- Great Bear Foundation
- Greater Yellowstone Coalition
- Delaware North, Inc.
- Humane Society of the United States
- Idaho Falls Chamber of Commerce
- Idaho Wildlife Federation
- Jackson Hole Alliance for Responsible Planning
- Jackson Hole Chamber of Commerce
- Lander Chamber of Commerce
- Livingston Chamber of Commerce
- Montana Audubon Council
- Montana State Preservation Office
- Montana State University
- Montana Wildlife Federation
- National Audubon Society
- National Parks Conservation Association
- National Wildlife Federation
- Natural Resource Conservation Service – Bozeman and Cody
- Nature Conservancy – Idaho Chapter
- Nature Conservancy – Montana Chapter
- Nature Conservancy – Wyoming Chapter
- Northern Plains Resource Council
- Northern Rockies Conservation Cooperative
- Northwestern University
- Park County Environmental Council
- Pinedale Chamber of Commerce
- Red Lodge Chamber of Commerce
- Riverton Chamber of Commerce
- Sacajawea Audubon Society
- Sierra Club Idaho Chapter
- Sierra Club Northern Plains Regional Office
- Sierra Club Teton Group
- Sierra Club Utah Chapter

- Snake River Audubon Society
- Star Valley Development Association
- Stone Fly Society
- Teton County Historic Preservation Board
- University of Colorado
- University of Wyoming
- Upper Missouri Breaks Audubon Society
- Utah Audubon Society
- Utah Wilderness Association
- Utah Wildlife Federation
- West Yellowstone Chamber of Commerce
- Wild Forever
- Wilderness Society
- Wyoming Association of Professional Historians
- Wyoming Heritage Society
- Wyoming Hospitality and Retail Network
- Wyoming Outdoor Council
- Wyoming Wildlife Federation
- Xanterra Parks and Resorts
- Yellowstone Association
- Yellowstone Park Foundation
- Yellowstone Valley Audubon Society

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NATIONAL PARK SERVICE – PROJECT TEAM

Staff Member	Position	Education/Experience	Role
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David Jacob	Project Manager, Environmental Quality Division Natural Resources, Stewardship and Science	B.A., History, Ohio State University, 1999 J.D., Law, University of Denver College of Law, 2002 9 years NPS	Project management and coordination, NEPA expertise.
Anna Christina Mills	Planning Assistant, Management Assistant's Office, Yellowstone National Park	B.A., Environmental Studies, University of North Carolina M.S., Resource Management, University of Montana - in progress 3 years NPS planning experience	Development of the Non-commercially Guided Snowmobile Access Program, document editing, compiling snowcoach census data, developing comparability analysis, outreach and communication, stakeholder correspondence, and participating in public meetings.
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Sherrie Bell	Technical Editor / Document Designer	Business Management Coursework, New Mexico State University 23 years of experience	Responsible for editing, formatting, and designing text.
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GLOSSARY

adaptive management—A system of management practices based on clearly identified outcomes, monitoring to determine if management actions are meeting outcomes, and, if not, facilitating management changes that will best ensure that outcomes are met or to re-evaluate the outcomes. Adaptive management recognizes that knowledge about natural resource systems is sometimes uncertain and is the preferred method of management in these cases (source: Departmental Manual 516 DM 4.16).

alternatives—Sets of management elements that represent a range of options for how, or whether to proceed with a proposed action. An environmental assessment or environmental impact statement analyzes the potential environmental impacts of the range of alternatives, as required under National Environmental Policy Act (NEPA).

Best Available Technology (BAT)—BAT is a term applied with regulations on limiting pollutant discharges with regard to abatement strategy.

buffer—A protective area or distance surrounding a sensitive resource that limits visitor access.

cumulative effect or impact—The impact on the environment that results from the incremental impact of the action when added to other past, present and reasonably foreseeable future actions regardless of what agency (federal or nonfederal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time (40 CFR 1508.6).

dBA—Noise levels are measured in decibels, abbreviated dB. An "A" filter is used to approximate how the human ear hears noise. The resulting "A-weighted sound level" is abbreviated dBA and is a widely used metric for assessing noise impacts on people.

ecology—The pattern of relations between organisms and their environment.

environmental consequences—Environmental effects of project alternatives, including the proposed action, any adverse environmental effects which cannot be avoided, the relationship between short term uses of the human environment, and any irreversible or irretrievable commitments of resources that would be involved if the proposal should be implemented (40 CFR 1502.16).

Executive Order—Official proclamation issued by the President that may set forth policy or direction or establish specific duties for federal agencies in connection with the execution of federal laws and programs.

Federal Register—Published by the Office of the *Federal Register*, National Archives and Records Administration, the *Federal Register* is the official daily publication for rules, proposed rules, and notices of federal agencies and organizations, as well as executive orders and other presidential documents (http://www.gpoaccess.gov/fr/).

federally listed endangered species—An endangered species is one that is in danger of extinction throughout all or a significant portion of its range. Before a species can receive protection under the ESA, it must first be placed on the federal list of endangered species. All actions leading up to and including listing of a species as endangered are published in the *Federal Register* (USFWS Endangered Species Program).

habitat—The environment in which a plant or animal lives (includes vegetation, soil, water, and other factors).

habituation—The psychological process in humans and other organisms in which there is a decrease in psychological and behavioral response to a stimulus after repeated exposure to that stimulus over a duration of time. In some instances, apparent habituation could also mean an animal is under physiological stress and would, under healthy circumstances, respond to the threat.

IMPLAN—An economic impact assessment modeling system that allows the user to build economic models to estimate the impacts of economic changes.

mitigation—Mitigation, as defined in the National Environmental Policy Act (40 CFR 1508.20), includes: avoiding the impact altogether by not taking a certain action or parts of an action; minimizing impacts by limiting the degree or magnitude of the action and its implementation; rectifying the impact of repairing, rehabilitating, or restoring the affected environment; reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action; or compensating for the impact by replacing or providing substitute resources or environments.

monitoring—A process of collecting information to evaluate whether an objective and/or the anticipated or assumed results of a management plan is being realized (effectiveness monitoring) or whether implementation is proceeding as planned (implementation monitoring).

planning—An interdisciplinary process for developing short- and long-term goals and alternatives for visitor experience, resource conditions, projects, facility type and placement, and other proposed actions.

population (or species population)—A group of individual plants or animals that have common characteristics and interbreed among themselves and not with other similar groups.

preferred alternative— The agency's preferred course of action.

scoping—An early and open process for determining the extent and variety of issues to be addressed and for identifying the significant issues related to a proposed action (40 CFR 1501.7).

soundscape (natural)—The aggregate of all the natural, nonhuman-caused sounds that occur in parks, together with the physical capacity for transmitting natural sounds.

threatened or endangered species—Plants or animals that receive special protection under federal or state laws, including the Endangered Species Act. Species may be listed threatened or endangered in the state, but not by the federal government (USFWS), or vice versa. Some USFWS regional offices also maintain a list of those species of special concern, either nationally or locally, which may be being or may have been previously considered for listing as threatened or endangered.

threatened species—Any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

ungulate—A hoofed, typically herbivorous, animal; includes deer, elk, and bison.

visitor experience—The perceptions, feelings, reactions, and activities of a park visitor in relationship to the surrounding environment.

visitor use—The types of recreation activities engaged in by visitors, including the type of activity, visitor behavior, timing, and distribution of use.

visitor—In this plan, anyone who physically visits a park for recreational, educational or scientific purposes, or who otherwise uses a park's interpretive and educational services.

Index

INDEX

accessibility, 2, 10, 22, 28, 31, 32, 33, 35, 44, 83, 86, 138, 155, 156, 199, 277, 278, 279, 280, 282, 283, 284, 286, 288, 289, 307, 325, 326, 343

adaptive management, 2, 6, 21, 31, 51, 52, 74, 77, 82, 84, 124, 164, 204, 303, 304, 343

air pollutant, 31, 115, 117, 119, 122, 164, 244, 254, 296

air quality, 2, 7, 9, 22, 33, 34, 35, 70, 76, 83, 86, 115, 117, 118, 119, 120, 121, 122, 123, 126, 127, 162, 198, 242, 243, 246, 247, 248, 256, 257, 258, 259, 260, 278, 280, 284, 285, 286, 294, 325, 326, 329, 330, 342, 343, 344

alternatives, 1, 2, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 37, 41, 42, 44, 45, 46, 47, 48, 49, 50, 52, 53, 54, 55, 56, 57, 58, 60, 61, 63, 65, 66, 70, 71, 72, 73, 74, 75, 76, 77, 81, 83, 84, 85, 86, 89, 90, 177, 193, 195, 196, 197, 202, 203, 206, 207, 208, 209, 213, 216, 219, 227, 230, 241, 243, 244, 245, 246, 248, 250, 252, 253, 254, 255, 256, 257, 261, 262, 263, 265, 266, 268, 269, 270, 273, 277, 279, 280, 281, 289, 294, 295, 299, 301, 304, 305, 309, 310, 312, 315, 318, 321, 322, 326, 327, 328, 330, 331, 332, 333, 334

backcountry, 22, 35, 42, 45, 46, 47, 54, 57, 63, 81, 105, 132, 134, 136, 154, 159, 175, 176, 191, 203, 208, 219, 228, 264, 265, 266, 267, 268, 269, 270, 272, 273, 274, 275, 276, 277, 281, 282, 286, 288

best available technology (BAT), 5, 8, 20, 22, 25, 33, 37, 38, 39, 40, 41, 42, 43, 44, 47, 50, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 70, 73, 74, 76, 77, 79, 80, 81, 83, 84, 85, 86, 120, 121, 122, 126, 127, 128, 134, 138, 140, 156, 157, 158, 163, 164, 165, 190, 194, 195, 196, 203, 204, 214, 216, 217, 218, 219, 224, 226, 227, 228, 231, 232, 238, 240, 241, 243, 244, 245, 249, 250, 251, 252, 253, 254, 255, 256, 257, 259, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 275, 276, 277, 281, 283, 284, 285, 287, 288, 296, 297, 298, 300, 302, 303, 304, 307, 309, 310, 315, 321, 325, 328, 329, 332

bison, 9, 18, 31, 32, 33, 67, 68, 85, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 101, 112, 157, 158, 159, 198, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 238, 239, 241, 325, 326

concessioner, 58, 141

conflict, 37, 65, 71, 158, 159, 175, 293, 295, 296, 299, 301, 303, 304

consultation, 8, 23, 24, 202, 242, 331

cross-country skiing, 34, 42, 45, 50, 57, 63, 68, 69, 139, 154, 157, 281, 282, 329

cultural resources, 23, 69, 76, 190, 242, 328

eagle, 9, 19, 30, 108, 110, 111, 112, 155, 230, 231, 233

elk, 9, 14, 17, 18, 33, 85, 89, 90, 91, 92, 93, 97, 100, 101, 104, 105, 112, 114, 198, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 222, 234, 237, 238, 239, 241, 325, 326

enabling legislation, 2, 3

endangered species, 8, 9, 16, 19, 29, 32, 33, 85, 89, 105, 110, 198, 201

environmentally preferable alternative, 76

four-stroke, 121, 129, 140, 162, 163, 164, 166, 167, 255, 298

geologic resources, 12

gray wolf, 9, 112, 235, 238, 239, 241

health and safety, 2, 7, 11, 31, 70, 71, 72, 84, 86, 162, 166, 169, 175, 190, 199, 289, 291, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 325, 326, 329, 330

impairment, 26, 27, 116

IMPLAN, 87, 178, 305, 306, 307, 308, 313, 314

licensing, 47

lynx, 9, 15, 16, 32, 85, 89, 90, 102, 103, 104, 198, 203, 204, 214, 216, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 325, 326

mining, 34, 117, 179, 344

mitigation, 12, 21, 22, 25, 50, 69, 85, 168, 169, 170, 171, 172, 191, 207, 219, 227, 229, 230, 231, 232, 234, 238, 239, 241, 290, 294, 295, 299, 322, 327, 328, 329, 330, 331

noise, 2, 5, 10, 11, 17, 19, 22, 38, 46, 47, 53, 54, 58, 60, 61, 63, 64, 65, 74, 80, 81, 84, 86, 90, 104, 112, 127, 128, 129, 130, 131, 136, 137, 138, 140, 156, 157, 158, 159, 162, 163, 164, 165, 166, 167, 168, 169, 204, 261, 262, 264, 273, 275, 276, 277, 282, 284, 290, 291, 292, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 308, 312, 316, 342

Operational Risk Management Assessment (ORMA), 6, 7, 50, 171, 292, 293, 294, 295, 296, 299, 301, 303, 304

personal protective equipment, 47, 290

preferred alternative, 5, 77, 333, 335

purpose and need, 37, 67, 190

registration, 47

Science Advisory Team (SAT), 6, 7, 37

scoping, 1, 7, 8, 9, 10, 11, 13, 25, 31, 32, 37, 65, 66, 67, 68, 69, 70, 71, 72, 331, 332, 334

socioeconomics, 11, 33, 35, 177, 313

soundscapes, 7, 10, 17, 22, 31, 33, 34, 35, 64, 71, 74, 76, 77, 86, 127, 128, 129, 131, 132, 156, 157, 158, 190, 196, 199, 261, 263, 264, 265, 268, 272, 273, 274, 275, 276, 277, 280, 284, 286, 288, 289, 296, 325, 326, 329, 330, 341, 343

swan, 9, 85, 107, 108, 109, 230, 231, 232, 233, 234

two-stroke, 121, 163, 164, 165, 274

U.S. Fish and Wildlife Service (USFWS), 13, 16, 24, 25, 30, 32, 102, 105, 107, 112, 202, 219, 220, 230, 234, 235, 257, 334, 336

U.S. Forest Service (USFS), 24, 25, 31, 32, 33, 34, 102, 105, 211, 220, 229, 257, 275, 305, 314 334, 335

vegetation, 13, 17, 21, 93, 100, 115, 119, 120, 121, 122, 128, 131, 211, 262

visitation, 15, 38, 40, 57, 68, 72, 77, 83, 86, 87, 91, 110, 140, 141, 142, 153, 154, 169, 177, 180, 181, 182, 183, 184, 185, 187, 206, 278, 280, 281, 284, 285, 286, 288, 305, 306, 307, 308, 309, 311, 312, 313, 314, 315, 316, 325, 326, 341

visitor experience, 6, 7, 9, 10, 38, 43, 57, 69, 72, 75, 77, 86, 128, 139, 156, 157, 158, 166, 261, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 317, 325, 326, 327, 328, 329, 330, 332, 343

water quality, 20, 21, 23, 34, 115, 119

wetlands, 20, 21

wilderness, 2, 22, 28, 29, 32, 33, 46, 74, 76, 84, 105, 106, 115, 161, 207, 257, 275, 278, 340

wolverine, 9, 15, 85, 90, 104, 105, 106, 204, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228

World Heritage Site, 22

Appendices

APPENDIX A: COMPARABILITY ASSESSMENT OF SNOWMOBILE AND SNOWCOACH TRANSPORTATION EVENT IMPACTS TO PARK RESOURCES AND VALUES AND THE VISITOR EXPERIENCE

EXECUTIVE SUMMARY

This appendix was prepared in response to requests made during the public comment period on the Draft Winter Use Plan / Supplemental Environmental Impact Statement (plan/SEIS) that a stand-alone section of the final plan/SEIS be dedicated to discussing the comparability of snowmobile and snowcoach transportation events in terms of their relative impacts to park resources and values and visitor experience.

A transportation event is defined as one best available technology (BAT) snowcoach or a group of seven to ten New BAT snowmobiles traveling together through the park.

The purpose of this appendix is to assess the comparability of transportation event impacts to park resources and values and the visitor experience for the following five impact topics: (1) Wildlife and Wildlife Habitat, including Rare, Unique, Threatened, or Endangered Species, and Species of Concern, (2) Air Quality, (3) Soundscapes and the Acoustic Experience, (4) Visitor Use, Experience, and Accessibility, and (5) Health and Safety. Given best available data, for each of these impact topics it was feasible to meaningfully assess comparability of the two types of transportation events at either the "per person" or "per transportation event" levels for one or more metrics. The existing data did not permit meaningful assessment of comparability for impact topics Socioeconomic Values and Park Operations and Management. These impact topics are reviewed in-depth in chapter 4 of the plan/SEIS.

By "comparable," the National Park Service (NPS) explains how the impacts from the two types of transportation events are relatively close to one another and that neither mode of transportation consistently results in less adverse impacts to park resources and values or provides a more beneficial visitor experience. The NPS does not state the two types of oversnow vehicle (OSV) transportation are *equivalent*; rather, the comparability analysis reveals that:

- One mode of transportation is not conclusively cleaner, quieter, or less harmful to wildlife than the other;
- One mode of transportation does not provide for higher quality visitor experiences than the other;
- One mode of transportation is not conclusively more harmful to health and safety of visitors and employees than the other; and
- At the levels prescribed under the preferred alternative, neither form of oversnow transportation will result in a level of adverse impacts on park resources that would necessitate an outright ban on that type of transportation.

Due to the unique situation in Yellowstone in winter, whenever possible the analyses rely on monitoring and modeling data from peer-reviewed publications and technical reports specific to Yellowstone, and are limited to the "managed use" era (December 2004 through present).

For Wildlife and Wildlife Habitat, Including Rare, Unique, Threatened, or Endangered Species, and Species of Concern:

- White et al. (2009) found that probabilities of movement were greater for bison exposed to snowcoaches than for those exposed to snowmobiles; "the odds of observing a movement response were 1.1 times greater for each additional snowmobile, 1.5 times greater for each additional coach" (p. 587).
- For bison, there are mixed results in terms of percentage of "active" movement responses generated by the two different types of events. In 2006/2007, snowmobiles caused an "active" movement response 3.1 percent of the time verse snowcoaches which caused an "active" movement response 0.7 percent of the time. In 2008, snowmobiles caused an "active" movement response 8 percent of the time to snowcoaches 8.8 percent. In 2009, the percentages were almost event (3.5 percent to 3.5 percent, snowmobiles to snowcoaches).
- For elk, during the winter seasons of 2006/2007 and 2008/2009, no "active" behavioral response (travel, alarm-attention, or flight) was observed from either snowmobile or snowcoach transportation events. During the winter season of 2007/2008, snowmobile transportation events caused an "active" behavioral response 11.4 percent of the time and snowcoaches caused an "active" behavioral response 20.5 percent of the time.
- For trumpeter swans, the results are mixed in terms of percentage of "active" movement responses caused by the two different types of transportation events. For the three years of reporting summarized in this appendix, snowmobiles caused an "active" movement response 3.4 to 4.8 percent of the time while snowcoaches caused swans to exhibit an "active" movement response zero to 13.8 percent of the time.
- The best available evidence strongly indicates that OSV use during the managed use era has had no discernible effect on population dynamics or distribution for the five species (bison, elk, trumpeter swans, wolves, and bald eagles) that have been studied extensively and that other ecosystem stressors, not OSV use, are dominant influences on these wildlife species.

For Air Quality:

- Snowmobile transportation events and snowcoach transportation events both offer some benefits and some drawbacks relative to each other in terms of tailpipe emissions and that there is no universally "cleaner" (less polluting) mode of oversnow transportation.
- During a representative roundtrip from West Yellowstone to Old Faithful, a New BAT snowmobile transportation event produces less carbon monoxide (CO) than a BAT snowcoach event. However, a BAT snowcoach transportation event produces considerably less hydrocarbons (HC) and nitrogen oxides (NO_x) than a New BAT snowmobile transportation event during the same representative roundtrip.
- At the SEIS alternative level, SEIS alternatives 4a–4d are as clean as or cleaner than the other two SEIS alternatives (2b and 3b) at the "per person" level for a maximum use day.

For Soundscapes and the Acoustic Experience:

- Across 10 sites, snowcoach transportation events were audible for, on average, 2 minutes and 21 seconds (2:21) and snowmobile transportation events were audible, on average, for 2 minutes and 36 seconds (2:36), a difference of, on average, 15 seconds.

- When measured at 50 feet at cruising speed, a group of ten New BAT snowmobiles (each producing 67 dBA), measure 3 dBA lower than a single BAT snowcoach at cruising speed (approximately half of the noise energy). The two types of transportation events would have similar noise energy levels at more distant locations.
- At a distance, if vehicles are not visible, trained acousticians, as well as people with less experience, typically cannot differentiate between the noise produced by snowmobile and snowcoach transportation events.
- Once BAT is in place for snowcoaches and New BAT in place for snowmobiles, there is no evidence to support a compelling advantage for one type of OSV transportation event over another in terms of preservation of the natural soundscape.

For Visitor Use, Experience, and Accessibility:

- Visitors, regardless of their chosen mode of transportation, are highly satisfied with their overall experience.
- Given established OSV travel patterns and routes, visitors have comparable opportunities to experience wildlife and other features of interest and to experience natural soundscapes, whether they are on a snowmobile or riding in a snowcoach.

For Health and Safety:

- Employee and visitor exposure levels to air pollutants and elevated noise produced by OSVs do not exceed U.S. Environmental Protection Agency (EPA), Occupational Safety and Health Administration (OSHA) or National Institute for Occupational Safety and Health (NIOSH) standards.
- On February 15, 2009, at the West Entrance, snowcoaches were separated from snowmobiles into two different lanes to determine if employee exposure levels to CO varied by transportation event type. CO readings were slightly higher over the sampling period in the snowmobile lane; however, peak readings for CO were higher in the snowcoach lane. Neither lane reached the NIOSH ceiling of 200 ppm in either entrance lane.

For many of the topics evaluated, the environmental impacts were similar and for other topics the impacts are different. However, in summary for the five impact topics for which assessing comparability at the person or event levels was possible, data indicates that impacts for both modes of transportation are low and that no one mode of transportation is clearly better, in terms of limiting environmental impacts and providing high quality visitor experiences, than the other.

Table of Contents

Executive Summary A-1
Introduction and Purpose A-5
Managing by Transportation Events A-5
Data Sources and Levels of Analyses A-6
Wildlife and Wildlife Habitat, Including Rare, Unique, Threatened, or Endangered Species, and Species of Concern A-7
Introduction A-7
Metrics A-7
Comparability Assessment A-8
Conclusion A-13
Air Quality A-13
Introduction A-13
Metrics A-13
Comparability Assessment A-16
Conclusion A-18
Soundscapes and the Acoustic Environment A-19
Introduction A-19
Metrics A-20
Comparability Assessment A-20
Conclusion A-27
Visitor Use, Experience, and Accessibility A-27
Introduction A-27
Metrics A-27
Comparability Assessment A-28
Conclusion A-31
Health and Safety A-32
Introduction A-32
Metrics A-32
Comparability Assessment A-33
Conclusion A-34
Literature Cited A-35

INTRODUCTION AND PURPOSE

The National Park Service (NPS) preferred alternative for winter use in Yellowstone National Park is to manage oversnow vehicles (OSVs) by transportation events (alternative 4). This Final Winter Use Plan / Supplemental Environmental Impact (plan/SEIS) allows the NPS to conclude that snowmobiles and snowcoaches (collectively "oversnow vehicles" or OSVs) are appropriate means of oversnow transportation in the park and that adverse impacts to park resources and values caused by snowmobile and snowcoach transportation events, at the levels prescribed in the preferred alternative, are acceptable (levels of impact at the SEIS alternative level is provided in chapter 4 of the final plan/SEIS).

This appendix was prepared in response to requests made during the public comment period on the draft plan/SEIS that a standalone section of the final plan/SEIS be dedicated to describing and discussing the comparability of snowmobile and snowcoach transportation event impacts to park resources and values and the visitor experience.

The purpose of this appendix is to assess the comparability (relative effects) of snowmobile and snowcoach transportation events to park resources and values and the visitor experience for the following five impact topics: (1) Wildlife and Wildlife Habitat, including Rare, Unique, Threatened, or Endangered Species, and Species of Concern, (2) Air Quality, (3) Soundscapes and the Acoustic Experience, (4) Visitor Use, Experience, and Accessibility, and (5) Health and Safety. For each of these impact topics it is feasible to meaningfully assess comparability of the two types of transportation events at the "per person" or "per transportation event" levels. The existing data does not allow for meaningful assessments of comparability for impact topics Socioeconomic Values and Park Operations and Management at the "per person" or "per transportation event" levels. These impact topics are reviewed in-depth in chapter 4 of the plan/SEIS.

By "comparable," the NPS explains how the impacts from the two types of transportation events are often close to one another, and that where differences exist, they are not consistent between one transportation event type of another, such that eliminating one type of transportation mode in favor of the other would not result in significant improvements to the park's resources and values and the visitor experience. The NPS does not state the two types of OSV transportation are *equivalent*; rather, the comparability analysis reveals that:

- One mode of transportation is not conclusively cleaner, quieter, or less harmful to wildlife than the other;
- One mode of transportation does not provide for higher quality visitor experiences than the other;
- One mode of transportation is not conclusively more harmful to health and safety of visitors and employees than the other; and
- At the levels prescribed under the preferred alternative, neither form of oversnow transportation will result in a level of adverse impacts on park resources that would necessitate an outright ban on that type of transportation.

MANAGING BY TRANSPORTATION EVENTS

The preferred alternative in the plan/SEIS requires OSVs to be managed by transportation events, or discrete groups of OSVs entering the park. This management framework is impact-centric rather than vehicle number-centric and is more consistent with the science of winter use, particularly the science related to natural soundscape preservation and wildlife disturbance than managing by total or absolute numbers of OSVs. By grouping OSVs together into discrete groups and by setting a maximum number of

transportation events allowed entry each day into the park, the NPS is able to limit and control disturbance to wildlife and increase the time that natural quiet predominates the winter landscape. Managing OSVs by transportation events is practical and advantageous for the following reasons, which are expanded upon in later subsections of this appendix:

1. Managing by transportation events is better aligned with the best available science of winter use rather than managing by absolute numbers of vehicles, and therefore provides the best possible protection for park resources while providing for appropriate visitor experiences. In the past, the NPS and interested parties have focused on the total number of vehicles authorized to access the park. However, this emphasis is misleading because impacts to wildlife and soundscapes stem from groups of vehicles, not individual vehicles. By packaging traffic into transportation events and capping the total daily number of transportation events, the park proactively reduces the amount of time vehicles are audible, therefore reducing impacts to natural soundscapes. By limiting the number of daily transportation events in the park, wildlife would be disrupted fewer times. These steps, in combination with continued 100 percent guiding requirements, best available technology (BAT) standards for snowcoaches, and New BAT standards for snowmobiles, will limit impacts on the park's flora, fauna, soundscape, and air quality into the future.
2. Managing by transportation events provides OSV manufacturers and commercial tour operators with incentives to produce and use cleaner and quieter OSVs. In return, more visitors can visit Yellowstone while impacts to park resources are further reduced through OSV environmental performance improvement incentives.

DATA SOURCES AND LEVELS OF ANALYSES

All information contained in this appendix was obtained from the final plan/SEIS, the Scientific Assessment of Yellowstone National Park Winter Use (March 2011), and other applicable documents and studies such as the Air Quality Modeling Report (ARS 2012) and Yellowstone Over-snow Vehicle Emissions Tests Report (Ray 2012, version 7.0). Data used to assess the comparability of snowcoach and snowmobile transportation events are presented in tables, figures, graphs, and other easily understandable formats. All assumptions and calculations used to support analyses are provided. In some cases, qualitative or expert opinion data were used if quantitative data were nonexistent or inconclusive. These analyses rely on both monitoring and modeling data sources. Data are taken only from Yellowstone-specific literature whenever possible due to the unique situation in the park in winter, and are bound to the "managed use" era (December 2004 through present) in most cases. These studies were considered valid and appropriate for this appendix because they reflect the current and future conditions of the park under which OSVs would operate. For additional information and background studies, the reader is encouraged to review the Scientific Assessment of Winter Use in Yellowstone (2011).

Whenever possible, analyses are at the "per person" and "per transportation event" (defined as a single BAT snowcoach or a group of 7 to 10 New BAT snowmobiles) levels. For some impact topics such as air quality, comparability can be assessed at both the "per person" and "per transportation event" levels. For other impact topics such as Soundscapes and the Acoustic Environment, analyses were only possible at the transportation event level. In a few rare instances, the analyses rely on forecasted impacts at the SEIS alternative level (such as pounds of tailpipe pollutants per person on a maximum use day). All analyses in this appendix disclose if comparability is assessed for a group of seven or ten snowmobiles to one snowcoach (table 1).

TABLE 1: CONSTANTS USED IN COMPARABILITY ASSESSMENTS

	Vehicles / Event	Persons / Vehicle	Persons / Event
Snowmobiles	7 or 10* (depending on metric)	1.4**	9.5**
Snowcoaches	1	9.0**	9.0**

*The three-year average (2009/2010 through 2011/2012 seasons) was 6.7 snowmobiles per group. However, in these analyses either 7.0 or 10.0 snowmobiles per event are used to represent the maximum daily average or maximum number of snowmobiles per transportation event.

**Three-year average (2009/2010 through 2011/2012 seasons).

Not all metrics discussed in the plan/SEIS are used to assess transportation event comparability and not all metrics discussed in this section are discussed in the plan/SEIS. For example, to assess the comparability of tailpipe emissions (under impact topic Air Quality), emission levels are assessed at the "per person" and "per transportation event" levels for a representative roundtrip from West Yellowstone to Old Faithful. This type of assessment is not part of chapter 4 of the plan/SEIS because it addresses the comparability of tailpipe emissions between the two types of events rather than overall levels of emissions at the SEIS alternative level.

WILDLIFE AND WILDLIFE HABITAT, INCLUDING RARE, UNIQUE, THREATENED, OR ENDANGERED SPECIES, AND SPECIES OF CONCERN

INTRODUCTION

Advancing our understanding of impacts to wildlife from OSVs and mitigating adverse impacts has been a topic of interest at Yellowstone for decades (Borkowski et al. 2006; White et al. 2009). Areas of inquiry have focused on (1) whether OSVs have caused population level changes; (2) the behavioral and physiological responses of wildlife to OSVs; (3) whether impacts associated with OSV use have resulted in increased stress for wintering animals; and (4) whether OSV use lowers the ability of wildlife to survive and reproduce. A synopsis of relevant literature can be found in chapter 3 of the plan/SEIS and in the Scientific Assessment of Winter Use at Yellowstone National Park Report (2011).

METRICS

The relative effects of snowmobile and snowcoach transportation events are assessed for bison, elk, gray wolves, trumpeter swans, and bald eagles in this comparability assessment. Insufficient data exists to meaningfully assess the relative impacts of transportation events on lynx and wolverines. The following metrics were deemed suitable for assessing comparability of snowmobile and snowcoach transportation events in terms of their relative impacts to the five wildlife species listed above:

- Behavioral responses
- Physiological responses
- Acoustical interference and masking
- Direct mortality
- Population dynamics and distribution
- Habituation and tolerance.

COMPARABILITY ASSESSMENT

Behavioral Responses

When evaluating the comparability of wildlife behavioral responses to OSVs, it is important to recognize that wildlife responses to disturbance are highly variable, ranging from no response, to increased vigilance, to movement away from stimuli, and that they may vary as much within a species as between species (Scientific Assessment of Yellowstone National Park, 2011). Wildlife in Yellowstone may respond behaviorally to OSVs by increasing their level of vigilance or moving away from the disturbance (White et al. 2009). Displacement through repeated OSV disturbance may be related to the intensity of the disturbance event(s) and levels of habituation and tolerance. Studies of the behavioral responses of five species (bison, elk, trumpeter swans, wolves, and bald eagles) to oversnow traffic in Yellowstone National Park showed these animals rarely showed high-intensity responses (movement or alertness for extended periods of time) to approaching OSVs (White et al. 2009; Borkowski et al. 2006). Although these studies were not designed to assess the comparability of snowmobiles versus snowcoaches, the data can be used to draw certain inferences. Borkowski et al. (2006) observed a total of 6,508 encounters between park wildlife and OSVs (or humans dismounting or exiting) between 1999 and 2004, whereas White et al. (2009) observed 5,688 such encounters between 2002 and 2006. Collectively, all species exhibited non-travel responses (no response, look/resume, or alert response) to human activities at least 90 percent of the time (table 2). All species fled or took flight less than 6 percent of the time. Defensive reactions of wildlife to human activities were rare. For individual animals, 8 to 10 percent of elk and bison show a movement response to snowmobiles and snowcoaches. Approximately 90 percent of elk or bison either show no apparent response or a “look and resume” response. White et al. (2009) reported that human disturbance did not appear to be a primary factor influencing the movement of wildlife species they studied (bison, elk, trumpeter swans, and bald eagles) and concluded that individual responses that resulted in flight or other active behavior were apparently short-term behavioral responses without lasting influence on species distribution patterns. This level of reaction was consistent for a wide range of daily average OSV use (ranging from 156 to 593 vehicles per day). Visitors have been required to travel in groups with guides since the 2004/2005 winter season, which is believed to be the primary factor in reducing the occurrence of inappropriate encounters with wildlife.

TABLE 2: WILDLIFE– BEHAVIORAL RESPONSES TO SNOWMOBILE AND SNOWCOACH TRANSPORTATION EVENTS

	Bison		Elk		Trumpeter Swans	Bald Eagles
Observed Response	Borkowski et al. 2006	White et al. 2009	Borkowski et al. 2006	White et al. 2009	White et al. 2009	White et al. 2009
No Apparent Reponses	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%

Regarding comparability of behavioral responses of wildlife to snowmobile and snowcoach transportation events, White et al. (2009, p. 12) found that probabilities of movement were greater for bison exposed to snowcoaches than for those exposed to snowmobiles; “the odds of observing a movement response were 1.1 times greater for each additional snowmobile, 1.5 times greater for each additional coach.” The maximum probability of movement was reached at the threshold of 1 to 3 snowcoaches depending upon

the wildlife species under consideration. There was no threshold in the numbers of snowmobiles eliciting a movement by elk or swans, but the probability of movement response reached an asymptote (i.e., adding another vehicle produced no additional effect in terms of behavioral response) at 7 snowmobiles for bison and 18 snowmobiles for bald eagles (White et al. 2009).

In addition, a number of annual wildlife reports (McClure et al. 2009; McClure et al. 2008; Davis et al. 2007) analyzed differences in behavioral responses of bison, elk, and swans to snowmobile and snowcoach transportation events. These findings are summarized below in tables 3, 4 and 5. The reader should note that in the original annual monitoring reports, the authors utilized five categories of potential responses of wildlife to OSVs: (1) no apparent response; (2) look-resume; (3) travel; (4) alarm-attention; and (5) flight. For this assessment, categories travel, alarm-attention, and flight were collapsed (added together) to facilitate comparison by the reader.

For elk (table 3), during the winter seasons of 2006/2007 and 2008/2009, no "active" behavioral response (travel, alarm-attention, or flight) was observed as a result of either type of transportation event. During the winter season of 2007/2008, snowmobiles caused an "active" behavioral response 11.4 percent of the time and snowcoaches caused an "active" behavioral response 20.5 percent of the time.

TABLE 3: ELK – BEHAVIORAL RESPONSES TO SNOWMOBILE AND SNOWCOACH TRANSPORTATION EVENTS

	Guided Snowmobile Transportation Events			Snowcoach Transportation Events		
	2007 Annual Report (N=69)	2008 Annual Report (N=61)	2009 Annual Report (N=23)	2007 Annual Report (N=58)	2008 Annual Report (N=44)	2009 Annual Report (N=35)
No apparent response	55.1%	49.2%	80.4%	67.2%	56.8%	80.0%
Look-Resume	44.9%	39.4%	19.6%	32.8%	22.7%	20.0%
Movement Response (sum of Travel, Alarm-Attention, or Flight)	.0%	11.4%	.0%	.0%	20.5%	.0%

Data are from the 2007, 2008, and 2009 "Wildlife Responses to Motorized Winter Recreation in Yellowstone" Reports (available via the Yellowstone National Park website)

For bison (table 4), the results are mixed in terms of percentages of movement responses generated by the two different types of transportation events. For instance, in 2006/2007, snowmobiles caused a movement response from bison in 3.1 percent of the observed instances versus snowcoaches, which caused a movement response 0.7 percent of the time. In 2008 snowmobiles caused a movement response 8.0 percent of the time to snowcoaches 8.8 percent. In 2009, the percentages were almost event (3.5 to 3.7 percent, snowmobiles to snowcoaches). Look-resume responses of bison were similar between transportation event types across the three years.

TABLE 4: BISON – BEHAVIORAL RESPONSES TO SNOWMOBILE AND SNOWCOACH TRANSPORTATION EVENTS

	Guided Snowmobile Transportation Events			Snowcoach Transportation Events		
	2007 Annual Report (N=133)	2008 Annual Report (N=150)	2009 Annual Report (N=72)	2007 Annual Report (N=145)	2008 Annual Report (N=126)	2009 Annual Report (N=82)
No apparent response	90.2%	80.7%	89.4%	92.4%	82.5%	90.2%
Look-Resume	6.7%	11.3%	7.0%	6.9%	8.7%	6.1%
Movement Response (sum of Travel, Alarm-Attention, or Flight)	3.1%	8%	3.5%	.7%	8.8%	3.7%

Data are from the 2007, 2008, and 2009 "Wildlife Responses to Motorized Winter Recreation in Yellowstone" Reports (available via the Yellowstone National Park website)

For trumpeter swans (table 5), the results are mixed in terms of percentage of active movement response caused by the two different types of events. For the three years of reporting summarized in this assessment, snowmobiles caused a movement response in swans 3.4 to 4.8 percent of the time while snowcoaches caused swans to exhibit a movement response zero to 13.8 percent of the time.

TABLE 5: TRUMPETER SWANS – BEHAVIORAL RESPONSES TO SNOWMOBILE AND SNOWCOACH TRANSPORTATION EVENTS

	Guided Snowmobile Transportation Events			Snowcoach Transportation Events		
	2007 Annual Report (N=62)	2008 Annual Report (N=58)	2009 Annual Report (N=58)	2007 Annual Report (N=43)	2008 Annual Report (N=27)	2009 Annual Report (N=58)
No apparent response (none)	93.5%	91.4%	91.4%	93.0%	96.3%	72.4%
Look-Resume	1.6%	5.2%	5.2%	7.0%	3.7%	13.8%
Movement Response (sum of Travel, Alarm-Attention, or Flight)	4.8%	3.4%	3.4%	.0%	.0%	13.8%

Data are from the 2007, 2008, and 2009 "Wildlife Responses to Motorized Winter Recreation in Yellowstone" Reports (available at http://www.nps.gov/yell/parkmgmt/winter_monitoring.htm).

Physiological Responses

Studies conducted to date suggest effects of OSVs on individual animals have not had measurable detrimental effects on physiological stress responses (Scientific Assessment of Yellowstone National Park Winter Use, 2011). Observations of bison, elk, trumpeter swans, and bald eagles, which demonstrate awareness of passing OSVs but typically not displaced, may suggest there are no substantial energetic costs from OSV impacts. Elk and bison near roadways do not appear to exhibit elevated levels of stress hormones attributable to OSV traffic. Chronic elevated glucocorticoid levels may result in long-term adverse effects on immune function and body condition, decreasing survival and reproductive rates. Analysis by Creel and others (2002) from one winter (1999) showed that glucocorticoid 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 et al. 2002). However, Hardy (2001) found that data from winter 2000 showed no obvious trends between daily OSV traffic and glucocorticoid levels in elk. Hardy

(2001) also did not detect any significant links between OSV usage and bison glucocorticoid levels during these two winters (winter 1999 and winter 2000). The studies conducted to date suggest OSV impacts on individual animals have not had measurable detrimental effects and that the effects of OSV use on the dynamics of intensively studied species clearly are subsidiary to effects of ecological processes; hence, effects on individuals are either very slight or affect small proportions of populations such that effects were not detected. In any case, the relative impacts of snowmobile transportation events to snowcoach transportation events appear comparable in that neither has resulted in a detectable level of physiological response in studied wildlife.

Acoustical Interference and Masking

Noise generated by OSVs can interfere with wildlife's auditory perceptions, which may disrupt communications used to advertise reproductive and territorial status, choose mates, warn of potential dangers, or maintain group cohesion (Bowles 1995; Barber et al. 2010). OSV noise may also interfere with natural sounds that animals use for foraging, habitat selection, or avoiding predation (Bowles 1995; Barber et al. 2010). Available monitoring data indicate that the length of time snowmobile and snowcoach transportation events can be heard differs, on average, by only 15 seconds (approximately a 10 percent difference). Soundscape modeling data indicates that snowmobile and snowcoach transportation events generate approximately the same amount of noise energy at distances greater than several hundred feet from the road. Lastly, at a distance, and if the vehicles are not visible, trained acousticians as well as people with less experience typically cannot differentiate between the noise of snowmobile and snowcoach transportation events (S. Burson, personal observation). Based on these similarities, the NPS has concluded that snowmobile and snowcoach transportation events are comparable in terms their likelihood of causing acoustical interference and masking.

Direct Mortality

OSVs can affect wildlife directly through collisions; however, there have been no known instances of OSV-caused animal mortality since institution of the 100 percent guiding requirement in December 2004. Under the preferred alternative, OSV use would continue to be 100 percent guided and the park-wide speed limit would be reduced from 45 to 35. Based on the data from the managed use era (2004 to present), there is no reason to suspect that direct mortalities from OSV strikes would occur from either snowmobile or snowcoach transportation events and that historically (2004-present), both have been comparable in that neither has caused any direct mortality of park wildlife.

Population Dynamics and Distribution

Estimated bison abundance increased exponentially from 1965-1994 despite a 20-fold increase in cumulative OSV use during the same period. Bison population growth was not related to cumulative visitation from 1965-2006 after removing the effect of management culls (White et al. 2009). Bison calf ratios were not significantly correlated with cumulative visitation and survival rates of adult female bison were generally high (mean = 96 percent) from 1995-2001. Likewise, there is little evidence that OSVs and winter use have affected elk populations in Yellowstone National Park. Calf ratios in the Madison headwaters population were not correlated with cumulative OSV use in the period 1991-2006 after the effects of snow water equivalent on calf recruitment were removed (White et al. 2009). Annual survival rates of adult female elk were higher than 90 percent and the population fluctuated around a dynamic equilibrium of about 550 elk during the period 1968-2004, despite increasing OSV use over that time period (White et al. 2009). The prevailing evidence suggests that winter snow pack conditions and heterogeneity of the population is the primary factor influencing winter distribution of elk in central Yellowstone National Park (Messer et al. 2009). Such factors as weather, predators, and plant succession, and not winter recreation, are clearly responsible for most variation in vital rates and abundance of elk

and bison. There is no evidence that OSV use has negatively affected bald eagle populations in Yellowstone. The numbers of nesting and fledgling bald eagles in Yellowstone National Park increased incrementally from 1987-2005 and were not correlated with cumulative winter visitation (White et al. 2009). The number of residents adult and sub adult and cygnet trumpeter swans decreased during 1966-2005 and was negatively correlated with cumulative visitation; however, the decline was likely spurious because numbers of swans decreased regionally throughout the Greater Yellowstone Area during the past several decades (Proffitt et al. 2009; White et al. 2009). Annual population estimates for the reintroduced population of wolves in Yellowstone National Park indicates that the founding population of 31 wolves released during winters 1995 and 1996 increased to more than 160 individuals by 2003 (Smith et al. 2007), a period of high winter use by humans.

Data collected and presented in peer reviewed studies between 1999 and 2006, both before and during the managed use era, indicate that there is no evidence to suggest that OSVs have had population level impacts among studied wildlife species in the park (Borkowski et al. 2006; White et al. 2009). Recreational use of OSVs in Yellowstone increased from <5000 vehicle-use days per annum during the mid-1960s to >100,000 during the late 1990s, then declined to ~30,000 vehicles per annum during recent years (NPS 2012; NPS 2000). Notwithstanding the magnitude of these changes, existing evidence does not suggest any associated changes in vital rates or abundances of key wildlife species stemming from OSV use. Given that more than thirty years of study and more than 50 years of OSV use have failed to change core wintering areas for wildlife in Yellowstone National Park or have any discernible effects on population dynamics or distribution, there is no evidence to suggest that either snowcoach or snowmobile transportation events at the levels prescribed under the preferred alternative would have any impacts to population dynamics and distribution for species studied.

Habituation and Tolerance

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 is more likely to occur in areas subject to predictable noise and disturbance patterns. Habituation should not be confused with tolerance, which is defined as the acceptance of disturbance; whereby animals reduce their reaction to a disturbance to prevent the disturbance from affecting them. An animal may tolerate disturbance stimuli for a variety of ecological reasons separate from the behavioral process of habituation. Studies of ungulate physiology suggest habituation to predictable disturbances like those associated with OSV use in Yellowstone. Some evidence suggests that certain wildlife species in Yellowstone National Park were habituated to OSVs and other human disturbances during winter. Bison were less likely to demonstrate vigilance behavior as cumulative visitation increased during winter, and were less likely to move from OSV-induced disturbances during winters with greatest visitation (White et al. 2009). Similarly, the probabilities of swans responding to OSV use decreased as cumulative visitation increased over winters (White et al. 2009). In contrast, the probabilities of elk responses to OSVs did not change as cumulative visitation increased (White et al. 2009), and elk did not appear to habituate to repeated disturbance by skiers in Mammoth, Lamar, and Stephen’s Creek areas (Cassirer et al. 1992). There is no evidence to suggest that one type of transportation event is more or less likely to cause habituation and tolerance of wildlife in Yellowstone, however, this question may be explored more through the adaptive management and monitoring program detailed in this plan/SEIS.

CONCLUSION

While the studies relied upon were not specifically designed to determine the comparability of relative impacts to wildlife from snowmobile and snowcoach transportation events, the data can be used to draw certain inference. The evidence is clear that OSV use during the managed use era has had no discernible effect on population dynamics, distribution, or physiological responses for the five species that have been studied extensively. The available data indicate that ecological processes, not OSV use, are the dominant influences on wildlife vital rates and rates of increase. The best available data contrasting behavioral effects to trumpeter swans, bison, and elk is inconclusive in terms of one type of event being more harmful than the other. The NPS concludes that in regard to impacts to wildlife species across the various metrics evaluated, there is no clear advantage for one type of transportation versus another. The NPS intends to conduct additional research regarding the relative impacts of the two transportation events to the parks' wildlife as part of the winter use adaptive management and monitoring program.

AIR QUALITY

INTRODUCTION

All internal combustion engines, including those that power snowmobiles and snowcoaches, emit air pollutants such as carbon monoxide (CO), hydrocarbons (HC), nitrogen oxides (NO_x), benzene, butadiene, formaldehyde, and acetaldehyde. These pollutants have the potential to adversely affect the air quality of Yellowstone National Park and are human health concerns (human health and safety are discussed in a subsequent section). Air quality is an important resource that is protected under NPS policy and several provisions of the Clean Air Act. These regulatory requirements are discussed in greater detail in the Air Quality section of chapter 3 of the plan/SEIS.

METRICS

The metrics below were considered suitable for assessing comparability of impacts to air quality from OSV tailpipe emissions:

- Tailpipe emission levels for a representative roundtrip from West Yellowstone to Old Faithful ("per person" and "per transportation event")
- Pounds of tailpipe pollutants "per person" and by SEIS alternative level (maximum use day).

In general, there are three primary methods for obtaining emission measurements from OSVs (Frey et al. 2003), including (1) dynamometer testing, which occurs in a laboratory in a highly controlled environment; (2) remote sensing, which occurs along the roadside and captures place-in-time data as an OSV moves past a pollutant measuring device; and (3) in-use testing via a portable emission measurement (PEM) device, which collects emission measurements while the OSV is in operation. The NPS has determined that both remote sensing and dynamometer (laboratory) collected data are not suitable for comparability assessment purposes. Neither method produces results that can be used for comparability purposes for the following reasons.

The Five-Mode Dynamometer Test is not Representative of Actual Conditions in Yellowstone National Park—To measure snowmobile tailpipe emissions, a five-mode dynamometer test was developed in the 1990s. The test was developed using real-time operating data for five riding styles that ranged from aggressive trail to off-trail freestyle and lake riding (Wright and White 1998). These driving styles do not reflect typical operating practices in Yellowstone where the observed average cruise speed for snowmobiles is approximately 30 to 35 mph and touring only occurs on hard-packed groomed roads.

Yellowstone does not permit any type of aggressive or freestyle riding. The U.S. Environmental Protection Agency (EPA)-approved five-mode duty cycle test for snowmobiles assumes a much more aggressive driving style than occurs in the park. For example, modes one (full throttle), two (85 percent top speed, 51 percent torque) and three (75 percent top speed, 33 percent torque) combined represent 64 percent of total weight in the model (0.64). However, snowmobile operating conditions and driving styles in Yellowstone are most closely represented by mode 4 (65 percent speed and 19 percent torque), yet this mode is only weighted at 0.31 (31 percent) for the five-mode test (table 6).

TABLE 6: FIVE-MODE DUTY CYCLE FOR SNOWMOBILES (40 CFR 1051.501)

Mode	Speed (percent)*	Torque (percent)**	Weighting factors
1	100	100	0.12
2	85	51	0.27
3	75	33	0.25
4	65	19	0.31
5	Idle	0	0.05

* Percent speed is percent of maximum test speed

** Percent torque is percent of maximum torque at maximum test speed

Engine Load Variability—Dynamometer testing does not reliably control low engine loadings (i.e., engine loads much closer to “idle” than “full throttle” and “low” torque rather than “high” torque) because “snowmobile engines can be difficult to run on a dynamometer because engine torque increases sharply as the speed of the engine approaches its power band” (Wright and White 1998). Given this problem, Lela and White eliminated mode 4 of the five-mode test from their analyses (2002).

The Continuously Variable Transmission and Drive Track of a Snowmobile are not Factored into most Laboratory Testing of Snowmobiles—Dynamometer test results can be further called into question for approximating conditions in the park because under the EPA emissions test, snowmobile engines are not tested with the continuously variable transmission or drive track in place. Integrating the continuously variable transmission and rubber track into testing introduces significant variability from transmission belt slippage at low speeds and track inefficiencies (Wright and White 1998).

Conversion Issues between Grams per Horsepower Hour and Grams per Mile—Dynamometer test results are reported in grams per horsepower hour (g/horsepower hour) (alternatively kilowatt hour). This value refers to engine shaft output which cannot be measured directly using a PEM device during in-use measurements of the entire vehicle chassis. A number of highly significant assumptions need to be made when converting from grams per horsepower hour (g/horsepower hour) to grams per mile (g/mile), and therefore conversion of PEM test results cannot be relied upon. These assumptions call into question the legitimacy of any converted data (see Scientific Assessment of Yellowstone National Park Winter Use, 2011).

Weather and Elevation Considerations—Laboratory emission testing for the five-mode test is typically conducted at elevation levels that are unrepresentative of the elevation at Yellowstone National Park. Given that most of the interior of the park is higher than 7,000 feet in elevation and that daytime temperatures are well below freezing on most days, laboratory tests do not reflect typical operating conditions encountered in the park.

Tracks and Rolling Resistance from Snow—EPA on-road vehicle certification is based on road testing in which vehicles are fitted with tires. However, when wheeled vehicles are fitted with tracks, converted

into snowcoaches, and operated on snow, they encounter significant rolling resistance from snow surface and tracks. In addition, track systems add considerable weight to a vehicle. Some converted snowcoaches are also converted to four-wheel drive, which further changes performance characteristics from those reported by manufacturers. In a letter to the NPS dated July 15, 2011, the EPA cautioned that "an original-equipment-manufactured on-road-use 2010 vehicle would likely not be able to achieve the same level of required certified emissions after modification to run with tracks, instead of wheels, in an oversnow operations configuration." Research in Yellowstone on emissions of snowcoaches has validated this statement, showing that road and snow conditions can contribute to large increases in tailpipe pollutants when comparing similar OSVs configured for highway use (Bishop et al. 2009). Lela and White, when discussing this situation, noted that, "running in snow on tracks generates tremendously higher engine loads than on highway operation" and that, "simulation of this (high load) on the chassis dynamometer provides a second emission value (open loop, rich), which may be more typical of real snowcoach operation" (Lela and White 2002, p. 27). The authors concluded that "snowcoach emissions data should be based on in-field measurement" (Lela and White, p. 28). For snowmobiles, dynamometer testing does not include the continuously variable transmission or belt nor does it account for rolling resistance or friction from the snow surface.

Necessity of Snowcoaches needing to Operate at Full Power—Many converted snowcoaches need to be operated at or near full throttle for significant portions of their duty cycle to overcome impediments such as rolling resistance from tracks and snow, elevation, and air temperature (Bishop 2006; Bishop et al. 2006; Bishop et al. 2009; Lela and White 2002). Modern vehicle design tends to emphasize smaller engines to reduce emissions and improve fuel economy. These modern vehicles, when converted into snowcoaches, may not have the power to move a tracked vehicle at a reasonable speed. As a result, converted snowcoach fuel economy is low – typically less than 3 miles per gallon (Bishop et al. 2009).

Remote Sensing Only Collects Place-in-Time Data—Remote sensing devices used previously in Yellowstone to collect emission data (Bishop 2005) are on-the-ground data collections that can only capture "place-in-time" data as a vehicle passes by a stationary device. These types of devices cannot capture the range or levels of pollutants as a vehicle moves through the park experiencing varying engine loads and duty cycles.

For the reasons outlined above, the NPS has concluded that tailpipe pollutants collected via PEM device from in-use OSVs operating in Yellowstone National Park are most valid data source for assessing comparability of OSV transportation event emission levels. Testing OSVs in this fashion involves fitting vehicles with a PEM device and operating those vehicles on a standardized route with equal passenger loading (Bishop et al. 2009; Bishop et al. 2006 and 2007; Ray et al. 2012). PEM devices are composed of a five-gas analyzer (CO, CO_2, HC, NO_x, and O^2), onboard computer, and engine diagnostic scanner (Frey et al. 2003). Bishop, Stadtmuller, and Steadman stated that, PEM are, "the only avenue that can lead one to a meaningful emissions picture" (2007, p. 1). Lela and White concluded that, "chassis-based emission result(s) provide a more real-world emission factor" (2002, p. 26-27). Such testing obtains "real-world, on-road microscale measurements of vehicle emissions during actual vehicle use," and provides representative real-world emission measurements at any location under any weather conditions (Frey et al. 2003, p. 992). This is particularly important because, "vehicle emissions are episodic in nature, indicating that average emissions for a trip are often dominated by short-term events," such as power excursions and open-loop rich fuel cycles, among others. Additionally, "standard driving cycles may not adequately represent real-world driving for a particular location because of failure to represent the influence of real world traffic" (Frey et al. 2003, p. 992). PEM testing has occurred in Yellowstone on three occasions; 2005, 2006, and 2012 (Bishop et al. 2006 and 2007; Ray et al. 2012) and has typically collected the following three tailpipe pollutants:

- Carbon monoxide (CO), a colorless, odorless, and poisonous gas produced primarily by the incomplete combustion of gasoline and other fossil fuels;

- Hydrocarbons (HC), which result from partially burned fuel emitted through the tailpipe and from fuel evaporations from the crankcase, carburetor, and gas tank. When exposed to sunlight, HC or volatile organic compounds contribute to formation of harmful ground level ozone, also known as smog; and
- Nitrogen oxides (NO_x), precursors to the formation of photochemical oxidants such as ozone.

Particulate matter and hazardous air pollutants cannot be used for assessing comparability of OSV transportation events because the PEM devices used to measure emission output of OSVs in Yellowstone do not collect data on these pollutants.

COMPARABILITY ASSESSMENT

Air Quality Impacts at the Person and Event Level for a Representative Roundtrip from West Yellowstone to Old Faithful

All per person and per transportation event levels are based on emissions post-implementation of BAT for snowcoaches and New BAT standard for snowmobiles (described in the plan/SEIS under alternative 4 and appendix B, see also Ray 2012, Table 17, for specific emission factors for each SEIS alternative). Where applicable, averages are based on the 2009/2010 through 2011/2012 winter seasons (a three-year average). The following constants were used in addition to those presented in table 1 of this appendix:

- A standard 65 mile roundtrip from West Yellowstone to Old Faithful includes:
  - 30 minutes of idling;
  - 12.2 miles at low speed (less than 15 mph); and,
  - 52.8 miles at “cruising speed” (~35 mph for snowmobiles and ~25 mph for snowcoaches).
- One gram is equal to 0.00220462 pounds.

Based on PEM testing of snowmobiles conducted in Yellowstone in March 2012, an average New BAT snowmobile was calculated to produce 4.0 grams of CO per mile at cruising speed, 25 grams of CO at low speed, and 216 grams of CO per hour at idle. For HC, an average New BAT snowmobile was calculated to produce 0.10 grams of HC per mile at cruise speed, 1.30 grams of HC at low speed, and 13.32 grams of HC per hour at idle. For NO_x, an average New BAT snowmobile was calculated to produce 11.00 grams of NO_x of per mile at cruise speed, 5.20 grams of NO_x at low speed, and 0.61 grams of NO_x per hour at idle (see Ray 2012, Table 17). Based on PEM testing of snowcoaches conducted in Yellowstone in March 2012, an average BAT snowcoach was calculated to produce 84.0 grams of CO per mile at cruise speed, 10.9 grams of CO at low speed, and 10.6 grams of CO per hour at idle (Ray 2012, Table 17). For HC, an average BAT snowcoach was calculated to produce 0.30 grams of HC per mile at cruise speed, 0.40 grams of HC at low speed, and 1.00 grams of HC per hour at idle. For NO_x, an average BAT snowcoach was calculated to produce 4.98 grams of NO_x per mile at cruise speed, 5.31 grams of NO_x at low speed, and 4.14 grams of NO_x per hour at idle (see Ray 2012, Table 17).

Using the emission values above and constants described earlier, a standard roundtrip from West Yellowstone, MT, to Old Faithful was calculated in terms of pounds of CO, HC, and NO_x per one vehicle, one person, and one event (table 7).

TABLE 7: POUNDS OF TAILPIPE POLLUTANTS PER STANDARD ROUNDTRIP FROM WEST YELLOWSTONE TO OLD FAITHFUL

Pollutant	Event Type	Per Vehicle	Per Person	Per Event
Carbon Monoxide	New BAT Snowmobiles	1.38	0.98	9.63
	BAT Snowcoach	10.08	1.12	10.08
Hydrocarbons	New BAT Snowmobiles	0.06	0.04	0.43
	BAT Snowcoach	0.05	0.01	0.05
Nitrogen Oxides	New BAT Snowmobiles	1.42	1.01	9.95
	BAT Snowcoach	0.73	0.08	0.73

At the "per person" level for a standard roundtrip from West Yellowstone to Old Faithful, a snowmobile transportation event would produce 0.98 pounds of CO per person and a snowcoach transportation event would produce 1.12 pounds of CO per person. At the "transportation event" level for the same roundtrip, a snowmobile event comprised of seven New BAT snowmobiles would produce 9.63 pounds of CO and a snowcoach event would produce 10.08 pounds of CO.

At the "per person" level for the standard roundtrip described above, a snowmobile transportation event would produce 0.04 pounds of HC per person and a snowcoach would produce 0.01 pounds of HC per person. At the "transportation event" level, a snowmobile event comprised of seven New BAT snowmobiles would produce 0.43 pounds of HC per event and a snowcoach event would produce 0.05 pounds of HC per event.

At the "per person" level for the standard roundtrip described above, a snowmobile transportation event would produce 1.01 pounds of NO_x per person and a snowcoach would produce 0.08 pounds of NO_x per person. At the "transportation event" level, a snowmobile event comprised of seven New BAT snowmobiles would produce 9.95 pounds of NO_x and a snowcoach event would produce 0.73 pounds of NO_x.

Air Quality Impacts at the SEIS Alternative Level on a Maximum Use Day

Using data from ARS (2012) and estimates of maximum number of people per day (table 1 from chapter 2 of the plan/SEIS), total pounds of tailpipe pollutants per day per person by SEIS alternative estimation was calculated. Data are presented in table 8 with a visual presentation in figure 1. Alternative 3a was not included because it is identical to alternative 2a. All values are for a maximum use day (maximum number of people and OSVs in the park).

Alternative 2a (prior to the implementation of BAT for snowcoaches) produces the most pollutants per person at 2.54 pounds. Alternative 4 is the cleanest with a range of 1.43 to 1.92 pounds per day (average of 1.63 pounds per person). Alternative 3b produces 1.92 pounds of pollutants per person.

TABLE 8: POUNDS OF TAILPIPE POLLUTANTS PER DAY PER PERSON BY SEIS ALTERNATIVE (MAX USE DAY)

		Carbon Monoxide		Hydrocarbons		Nitrogen Oxides		
Alternative	Max N People per Day	LBS / Day	LBS / Person	LBS / Day	LBS / Person	LBS / Day	LBS / Person	TOTAL LBS of Pollution per Person
Alt 2A	1705	3,299	1.94	150	0.09	873	0.51	2.54
Alt 2B	1705	2,827	1.66	90	0.05	805	0.47	2.18
Alt 3B	1644	2,852	1.74	28	0.02	272	0.17	1.92
Alt 4A*	1782	1,311	0.74	20	0.01	1,227	0.69	1.44
Alt 4B*	1492	2,247	1.51	13	0.01	326	0.22	1.73
Alt 4C*	2640	2,861	1.08	20	0.01	891	0.34	1.43
Alt 4D*	2944	5,233	1.78	18	0.01	413	0.14	1.92

*NPS Preferred Alternative

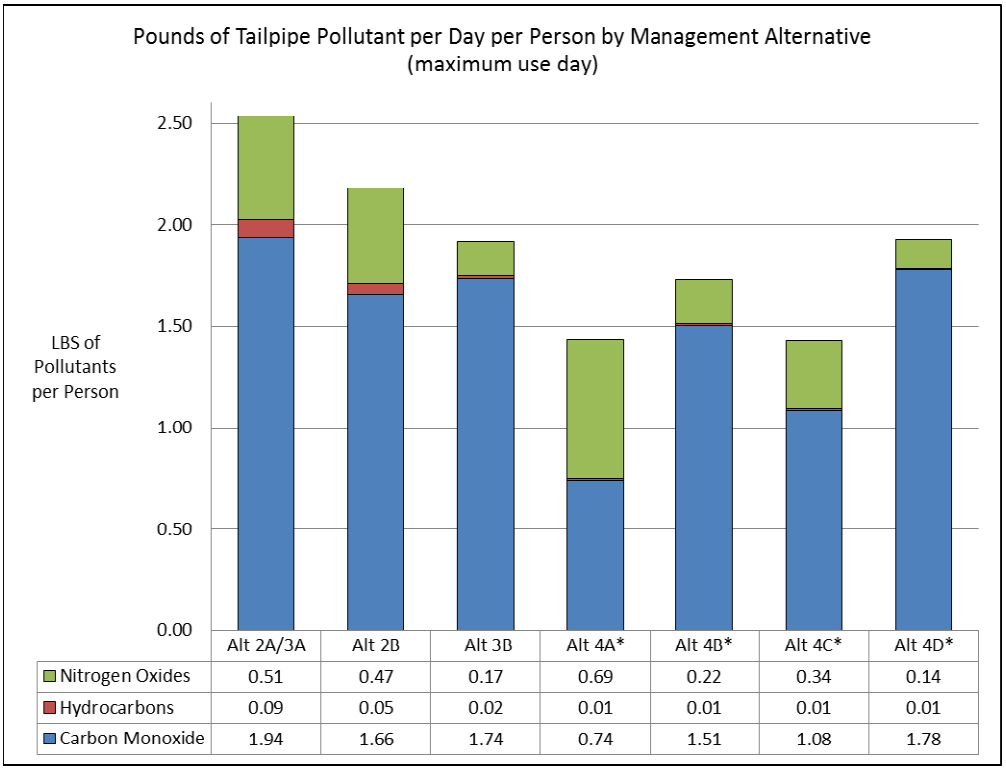

FIGURE 1: POUNDS OF TAILPIPE POLLUTANT PER DAY PER PERSON BY SEIS ALTERNATIVE

CONCLUSION

To assess relative levels of tailpipe pollutants emitted from snowmobile and snowcoach transportation events, the NPS utilized data collected via PEM device to evaluate pollution levels at the "per person" and "per transportation event" levels for three primary pollutants: CO, HC, and NO_x. These analyses indicate that snowmobile transportation events and snowcoach transportation events both offer some benefits and some drawbacks relative to each other and that there is no universally "cleaner" (less polluting) mode of oversnow transportation. New BAT snowmobiles are cleaner than snowcoaches in terms of CO emissions. However, snowcoaches emit less HC and NO_x than snowmobiles. Overall, the suite of

scenarios that encompass alternatives 4a–4d are as clean as or cleaner than the other alternatives at the "per person" level on a maximum use day. Without making a value judgment as to which pollutants warrant more concern relative to others, it is not possible to ascertain that one mode of transportation is cleaner or more desirable than the other or more protective of the park's air quality.

SOUNDSCAPES AND THE ACOUSTIC ENVIRONMENT

INTRODUCTION

Park natural soundscapes, also called acoustic resources, encompass all of the natural sounds that occur in parks. In Yellowstone National Park during winter, OSVs are the most prominent source of anthropogenic (human-made) noise. Substantial efforts have been undertaken to advance the understanding of acoustic resources, the impact of OSVs on these resources and visitor experience, and to devise management strategies and technological solutions to minimize the effects of anthropogenic noise. Acoustical monitoring has been conducted every winter since the 2002/2003 season with the primary purpose of describing the park's natural acoustical environment and measuring the impacts of OSV noise on Yellowstone's acoustic resources. Additional measurements of various OSVs have been made under a variety of operating conditions. Acoustical modeling activities have been undertaken in conjunction with various winter use planning efforts to characterize the noise output of OSVs and to model the effects of various SEIS alternatives on natural soundscape conditions.

The Effect of Grouping Vehicles on OSV Noise Output

By packaging traffic into transportation events and capping the total daily number of transportation events, the park proactively reduces the amount of time vehicles are audible within a day, reducing impacts to natural soundscapes. By limiting the number of daily transportation events in the park, wildlife would be disrupted fewer times. There are however, tradeoffs to packaging OSV traffic into events. The higher the numbers of OSVs in the park, the more noise energy there will be if the total noise energy emitted per vehicle remains constant. The total noise energy emitted by OSVs remains the same so long as the number of vehicles, the routes traveled, and travel speeds remain the same. For this reason, grouping vehicles has no effect on the total amount of noise energy radiated in the park. However, the way that noise energy is packaged into discrete events influences the distance at which OSV noise can be heard, the percentage of time OSVs are audible, and how loud those OSVs seem to observers. Further, dividing a fixed number of vehicles into fewer, larger groups reduces the number of noise disturbance events experienced by visitors and wildlife, increases the duration of noise-free intervals, and limits to 3 dBA or less the increase in the expanded areas in which OSVs can be heard as a result of grouping traffic. Grouping vehicles does cause OSV noise to propagate greater distances from road corridors. However, each time the number of OSVs doubles, the maximum distance at which they can be heard increases by less than 40 percent, creating efficiency. The speed at which OSVs operate also influences how long vehicles can be heard. Generally, slower vehicles radiate less noise, but also take longer to travel the same distance; thereby increasing the length of time audible (duration) the event can be heard.

METRICS

The following metrics were utilized for assessing the comparability of OSV transportation events on natural soundscapes. These metrics were selected because they represent relatively simple, easy to understand measures for assessing comparability, and allow direct comparisons of the relative effects of the two types of OSV events on natural soundscapes:

- Length of time a discrete transportation event is audible (how long can an average person hear an OSV transportation event?);
- Noise energy emitted by a snowmobile transportation event compared to the noise energy emitted by a snowcoach transportation event;
- Tonal qualities produced by the two types of OSV transportation events (are the noise produced by both types of OSVs similar?).

The percentage of time OSVs are audible (percent time audible) at a given location is not suitable for assessing the comparability of transportation events because it measures the proportion of a defined period of time that OSVs can be heard, and cannot easily be separated by noise source or attributed to one OSV type or another. Percent time audible is influenced by the noise level of the vehicle and the number of vehicles and groups on the road during a given time. Wind affects the propagation of noise, interacts with vegetation and terrain to elevate background natural sound levels, and wind flowing around the ears generates additional sound that makes it harder to hear OSV noise. In the 2008 Interim Winter Use Plan/Environmental Assessment (NPS 2008), Figure 3-1 in NPS 2008 shows a general positive relationship between snowmobile traffic levels and the percent time audible for all OSVs. However, there is substantial scatter in the data. Less than 9 percent of the overall variation is explained by the fitted straight line, meaning that the relationship between snowmobile traffic levels and the percent time audible for all OSVs is weak. On one date, approximately 260 snowmobiles had nearly 10 percent less audibility than another date that only had 140 snowmobiles. The total percent time OSVs are audible can be lowered by clustering vehicles so that audible events overlap (NPS 2008). Snowmobiles travel in groups, and several groups may overlap with each other (in audibility) during high traffic intervals and routes such as morning travel to Old Faithful or afternoon travel back to the entrance gates. For these reasons, percent time audible is a highly variable metric that is not suitable for assessing comparability of noise from the two types of transportation events.

COMPARABILITY ASSESSMENT

Length of Time a Discrete Transportation Event is Audible

The length of time a discrete transportation event is audible is a direct measure of how long a transportation event can be heard as the event moves past a fixed location, from when the event is first audible to when it can no longer be heard. Length of time a discrete event is audible is a valuable measure because it allows a direct, linear comparison of how long, on average from multiple locations, the discrete OSV transportation events are audible. Between 2005 and 2011, observers documented noise emissions near the road at 14 different locations throughout Yellowstone National Park. Observers recorded start times when OSVs were first heard and stop times when they could no longer be heard. Nearly all measurements were for discrete guided snowcoach or snowmobile events. That is, only one OSV tour was audible during the measurement. For a few measurements, other OSVs may have overlapped slightly with the beginning or end of an event, yielding a shorter duration than would have been measured without overlap. These abbreviated measurements are unlikely to bias comparison of the durations of snowcoach

and snowmobile noise events (Burson pers. comm. 2012). On average, there were 6.7 snowmobiles per event and one snowcoach per event.

Results for all locations are shown in table 9. A total of 1,127 events were recorded, however, locations with fewer than 10 events recorded for a specific OSV transportation event type were excluded from these analyses due to limited sample size leaving 1,012 events for analyses. Snowmobile transportation events were heard, on average, for 2 minutes and 36 seconds, while snowcoach transportation events were heard for an average of 2 minutes and 21 seconds. The overall difference in elapsed time between snowmobile and snowcoach transportation events averaged 15 seconds (approximately 10 percent).

TABLE 9: AVERAGE ELAPSED TIME AUDIBLE PER OSV PASSBY IN MINUTES: SECONDS (2005-2011)

Location	Guided Snowmobiles	n	Guided Snowcoaches	n	Difference
West Yellowstone	1:22	56	1:00	24	0:22
Madison Junction	2:52	106	2:20	128	0:32
Mallard Lake	1:40	12	2:13	10	-0:33
Daisy	1:47	44	1:33	51	0:14
Mary Mountain Trailhead	2:30	44	2:20	30	0:10
Kepler Falls	2:00	41	1:52	15	0:08
Tuff Cliff	3:03	68	2:03	51	1:00
Spring Creek	3:09	79	3:38	60	-0:29
Lewis Lake	3:00	67	2:29	45	0:31
Cygnet Lake	4:44	50	4:05	31	0:39
Average	2:36		2:21		0:15
Total Sample Size		567		445	

Average time audible, sample size n, and difference in time audible for guided snowmobiles and guided snowcoaches in Yellowstone National Park. Average time audible and sample size n is for groups of guided snowmobiles and for individual guided snowcoaches.

Noise Energy Impacts (Transportation Event Level)

A second way to compare the relative effects of the two types of transportation events is to examine the noise energy emitted by both under controlled conditions. The noise energy generated from individual OSVs has been measured many times in Yellowstone National Park, most notably by the John A. Volpe National Transportation System Center in February 2008 and January 2009 as well as by NPS acoustical specialists in 2010 and 2012. These measurements focus on A-weighted noise level – a commonly used filter used to approximate how humans hear noise – measured at a standard distance of 50 feet (15 meters). Although acoustical specialists attempted to measure snowmobiles and snowcoaches at standardized speeds, the actual speeds during the measurements varied slightly as did environmental conditions. As a result, raw measurements required some additional processing to extract standardized measurements for each vehicle. This processing estimated the effect of vehicle speed on noise output for snowcoaches and snowmobiles, corrected the noise increment due to differences in testing procedures for snowmobiles – some measured at full throttle – and snowcoaches – measured at cruising speed, and estimated differences between the 2008 and 2009 measurement conditions. After controlling for these

factors[1], standardized noise output levels for each OSV were estimated through a soundscape model that is representative of operating conditions. A compilation of these data is presented in table 10, ordered by dBA at 25 mph.

For the three snowmobile models shown in table 10 (which represent three of the most popular snowmobiles in the park) at typical cruising speed of 35 mph, the model predicts a 5-6 dBA difference between the Arctic Cat T660, measured at 69 dBA, and Arctic Cat TZ1, measured at 74 dBA. These differences reflect aggregated measurements for the snowmobiles across all model years. A three dBA increase represents a doubling of noise energy. Snowcoaches, on the other hand, exhibited a much more dramatic range of noise output; the *quietest* and *noisiest* OSVs in the park were snowcoaches. The quietest snowcoach, a 1994 Dodge Van with Snowbuster Tracks, produced 64 dBA at cruising speed. The loudest snowcoach, a 1988 Prinoth Powder Cat TR, produced 83 dBA at cruising speed. To put this range in perspective, it would take 79 of the 1994 Dodge Van snowcoaches fitted with Snowbuster Tracks to radiate as much noise as a single 1988 Prinoth TR.

This analysis, which accounts for differences in environmental conditions and testing procedures, documents meaningful differences in noise output among snowmobiles, and dramatic differences among snowcoaches. Further evidence of differences among snowmobiles in noise output is provided by the SAE J192 noise levels reported to Yellowstone National Park by snowmobile manufacturers, as shown in figure 2. SAE J192 is a full throttle test designed to represent the maximum noise output of a snowmobile (SAE, 1985). As part of Yellowstone's BAT certification requirements for snowmobiles in effect since 2004, manufacturers Arctic Cat (A), Bombardier (B), Polaris (P), and Yamaha (Y) all reported noise emissions for BAT-compliant models manufactured between 2003 and 2012. In addition to manufacturer reported noise outputs, Yellowstone also conducted controlled experiments to measure snowmobile noise emissions within the park under typical operating conditions. Measurements made at Yellowstone during this monitoring reveal a noise emission level difference between two snowmobiles – the Arctic Cat T660 (model years 2004, 2006, 2008) and the Arctic Cat TZ1 (model year 2010) – that spans the entire range of emissions reported by manufacturers. In figure 2, single letters represent cases in which manufacturers reported a single value. When the manufacturer reported a range of values, the vehicle is represented by a vertical line segment with letters on each end. The solid horizontal line represents the current snowmobile noise BAT standard, and the dotted horizontal line represents the BAT standard plus the 2 dBA tolerance specified by SAE J192.

[1] The method that was used was a Generalized Additive Model, abbreviated as GAM (T. J. Hastie and R. J. Tibshirani 1990. Generalized Additive Models. Chapman and Hall/CRC, Boca Raton, FL. 335 pages.). A GAM is an extension of the concept of a regression, which in this case allowed the contribution of speed to have a nonlinear relationship with noise output. Separate nonlinear relationships were modeled for snowmobiles and snowcoaches.

TABLE 10: STANDARDIZED NOISE OUTPUT LEVELS BY OSV

Vehicle Study Name	Vehicle Type	Vehicle Description	Engine	Fuel	Drive System	dBA at:		Source(s)
						25 mph	35 mph	
YSExp	Snowcoach	1994 Dodge B-350 Van	318ci V8	Gasoline	Snowbusters	64	--	Volpe 2010
T660	Snowmobile	Arctic Cat T660	660cc	Gasoline	Track	66	69	Volpe 2008* & 2010
Ski Doo 600 Ace	Snowmobile	2011 Ski Doo 600 Ace	600cc	Gasoline	Track	--	70	Burson 2012
AlpineGuide (Kitty)	Snowcoach	1956 Bombardier B-12	5.3L V8 (“02)	Gasoline	Bombardiers	67	--	Volpe 2010
YellowstoneExpedition_Hayden	Snowcoach	1997 Dodge B-350 Van	5.2L V8	Gasoline	Snowbusters	69	--	Volpe 2010
Xanterra165	Snowcoach	2001 Chevy Van	5.7L V8	Gasoline	Snowbusters	70	--	Volpe 2008*
YSSC	Snowcoach	2002 Ford Van	6.8L V10	Gasoline	Mattracks	71	--	Volpe 2008*
SeeYellowstoneTours_#4	Snowcoach	2000 Ford E-350 Van	6.8L V10	Gasoline	Mattracks	71	--	Volpe 2010
RockyMt	Snowcoach	1999 Ford Econoline	6.8L V10	Gasoline	Mattracks	71	--	Volpe 2008*
YellowstoneExpedition_Eleanor	Snowcoach	1999 Ford E-150 Van	4.6L V8	Gasoline	Snowbusters	71	--	Volpe 2010
TZ1	Snowmobile	Arctic Cat TZ1	1056cc	Gasoline	Track	72	73-74	Volpe 2008* & 2010, Burson 2012
GooseWing	Snowcoach	2006 Ford Van	6.0L V8	Diesel	Mattracks	72	--	Volpe 2008*
XanteraMattTrack_430	Snowcoach	2008 Chevy Express Van	6.0L V8	Gasoline	Mattracks	73	--	Volpe 2010
YellowstoneSnowcoach_SNOVAN5	Snowcoach	2001 Ford E-350 Van	6.8L V10	Gasoline	Mattracks	73	--	Volpe 2010
YellowstoneSnowcoach_SNOVAN4	Snowcoach	2001 Ford E-350 Van	6.8L V10	Gasoline	Mattracks	73	--	Volpe 2010
Xantera431	Snowcoach	2006 Chevy Express Van	6.0L V8	Gasoline	Mattracks	73	--	Volpe 2008*
BuffaloBusTouring_#4	Snowcoach	2009 Ford F-550 Krystal	6.4L V8	Diesel	Griptracks	73	--	Volpe 2010
Xantera_Bombardier_710	Snowcoach	1966 Bombardier B-12	5.7L V8	Gasoline	Bombardier	74	--	Volpe 2010
BuffaloBusTouring_#T2	Snowcoach	2005 Ford E-350 Vanterra	6.8L V10	Gasoline	Mattracks	75	--	Volpe 2010
BuffaloBusTouringCo_#3	Snowcoach	2006 Ford E-350 Vanterra	6.8L V10	Gasoline	Mattracks	75	--	Volpe 2010
Xantera_713	Snowcoach	1968 Bombardier R-12	5.7L V8	Gasoline	Bombardier	75	--	Volpe 2010
NPSSC	Snowcoach	2003 International Bus	6.0L V8	Diesel	Griptracks	76	--	Volpe 2008*

Vehicle Study Name	Vehicle Type	Vehicle Description	Engine	Fuel	Drive System	dBA at:		Source(s)
						25 mph	35 mph	
SeeYellowstoneTours_#6	Snowcoach	2005 Ford E-350 Van	6.8L V10	Gasoline	Mattracks	76	--	Volpe 2010
Xantera707	Snowcoach	1966 Bombardier B-12	5.7L V8 (“90)	Gasoline	Bombardier	77	--	Volpe 2008*
Xantera_709	Snowcoach	1966 Bombardier B-12	5.7L V8	Gasoline	Bombardier	78	--	Volpe 2010
SeeYellowstoneTours_#9	Snowcoach	2006 Ford Odyssey	6.0L V8	Diesel	Tank Tracks	80	--	Volpe 2010
Prinoth_537	Snowcoach	1988 Prinoth Powder Cat TR	350ci V8 (“08)	Gasoline	Pirnoth	83	--	Volpe 2010

*Vehicles measured by Volpe in 2008 were on average 6 dBA quieter than corresponding vehicles reported in Volpe 2010. This 6 dBA difference is believed to be a function of a high snowberm present during measurements in 2008 that dampened noise output of OSVs. Those rows that contain data from 2008 were shaded gray for illustrative purposes.

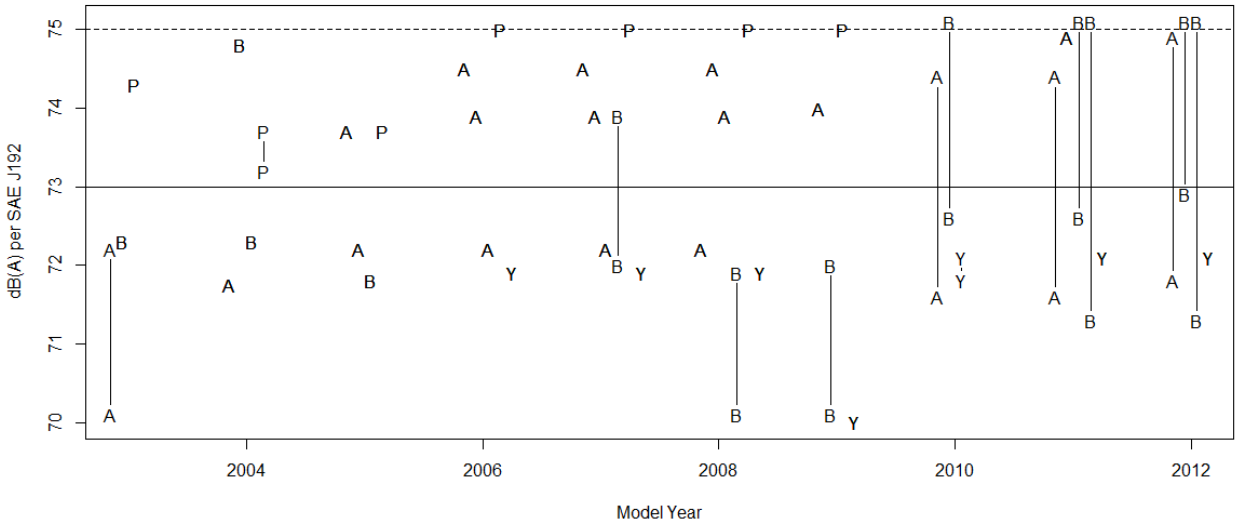

FIGURE 2: MANUFACTURE REPORTED NOISE EMISSIONS FOR BAT-COMPLIANT MODELS

As shown, the quietest BAT snowmobiles generated about 5 dBA less noise than the loudest (the quietest snowmobile presented in figure 2 (Arctic Cat T660) was last manufactured in 2008). At a 35 mph cruising speed, the Arctic Cat T660 (model years 2004, 2006, 2008) had an average noise level of 69 dBA at 50 feet, and the Arctic Cat TZ1 (model year 2010) had a noise level of 73 dBA (Hastings et al. 2008; Volpe 2010; Burson 2012 unpublished). This means that three of the quietest snowmobiles running in a compact group would generate less noise than one of the loudest snowmobiles. For this reason, all BAT snowmobiles cannot be considered the same. In many cases earlier BAT snowmobile models were considerably quieter than later models. The NPS has also conducted multiple studies of the noise output of OSVs at typical cruising speeds. The NPS demonstrated that snowmobile noise output ranges from 69 to 73 dBA at 35 mph and snowcoach noise output ranges from 64 to 83 dBA at 25 mph (see table 10).

To determine whether transportation events have comparable noise energy emissions, the park compared the noise energy generated by an average snowcoach transportation event against the average noise energy generated by both seven and ten snowmobile transportation event at typical operating speeds, 25 mph and 35 mph, respectively. However, prior to undertaking these analyses, two adjustments had to be made to snowmobile noise data. The first is the effect of having seven vehicles in the group. The second adjustment involves the speed of the vehicles. In general, a group of N vehicles produces a noise level that is equal to 10*log10(N) dBA greater than the output of a single vehicle. Consider for example a single snowmobile producing 67 dBA at 35 mph (the New BAT standard maximum at cruising speed). Two identical snowmobiles traveling side by side would emit 70.0 dBA total – a result of the multiplying factor shown below in table 11. Seven of these identical vehicles, if it were possible to stack them on top of each other, would be approximately 8.5 dBA higher (75.5 dBA) than a single snowmobile (table 12). The second factor that influences noise energy output for transportation events is the speed of travel. If two vehicles radiate the same noise, and one travels faster than the other, then the total received noise (Sound Equivalent Level or SEL) will be smaller for the faster vehicle. If we account for this difference in vehicle speed by assuming an average snowmobile speed of 35 mph and an average snowcoach speed of 25 mph, the difference in vehicle speed results in an adjustment of about -0.8 dBA for groups of snowmobiles. This is true from any vantage point alongside the route, or for the route as a whole. In other words, because they operate faster, snowmobile transportation events are heard for less time and sound about 0.8 dBA quieter than snowcoach transportation events.

TABLE 11: TOTAL DBA BY NUMBER OF SNOWMOBILES PER TRANSPORTATION EVENT

Snowmobile(s) in Transportation Event	Formula	dBA Increase above 67 dBA	Total Noise Energy (dBA) of Snowmobile Transportation Event
1	=10*log10(1)	--	67.00
2	=10*log10(2)	3.01	70.01*
3	=10*log10(3)	4.77	71.77*
4	=10*log10(4)	6.02	73.02*
5	=10*log10(5)	6.99	73.99*
6	=10*log10(6)	7.78	74.78*
7	=10*log10(7)	8.45	75.45*
8	=10*log10(8)	9.03	76.03*
9	=10*log10(9)	9.54	76.54*
10	=10*log10(10)	10.00	77.00*

*Assumes no spacing between vehicles.

By taking both the group multiplier and the speed adjustment together, if the future maximum noise limit for snowcoaches at cruising speed is 75 dBA, a group of 7 snowmobiles will have comparable noise output if *each* machine radiates 8 dBA less than a single snowcoach, or 67 dBA at typical cruising speeds of each respective vehicle, as envisioned under the preferred alternative.

Within the soundscape modeling data set, several vehicles can be found that meet or nearly meet the proposed BAT standards under the preferred alternative; snowcoaches at a maximum of 75 dBA noise output limit and snowmobiles at a maximum of 67 dBA noise output limit (both measured at cruising speed). By comparing these vehicles, the NPS can model transportation events comprised of vehicles at proposed levels to determine the comparability between transportation events, as well as comparability between individual vehicles. For snowcoaches, the NPS modeled one of the most popular fleet snowcoaches for which Yellowstone has acoustical data: a Ford Vanterra with a 6.8L V10 gasoline motor and a large raised roof with large windows. Other snowcoaches, such as the Dodge Vans with Snowbuster Tracks or converted Bombardiers were not used because these vehicles do not meet the proposed snowcoach BAT standard for emissions under the preferred alternative. These vehicles are also unable to operate on bare pavement sections of snowroads because they have metal tracks. As such, they were not viewed as sufficiently representative of snowcoaches that would operate under the transportation event framework once BAT is implemented for snowcoaches. As evident in table 10, the Ford Vanterra (Buffalo Bus T2) produced approximately 75 dBA at 50 feet.

The soundscape modeling data indicate that seven snowmobiles traveling together, each producing the maximum allowable (under New BAT standards) noise output of 67 dBA at 35 mph, will produce a maximum noise energy level of 75.5 dBA (for the transportation event, see table 12). A group of ten snowmobiles traveling together, each producing the maximum allowable noise output of 67 dBA at 35 mph, will produce a maximum noise energy level of 77 dBA (for the transportation event). However, because snowmobiles do not travel within the park side-by-side, but with a several second gap between each machine for safety purposes, at 50 feet from the road the maximum noise created both a seven and ten snowmobile transportation events traveling at 35 mph is approximately 72 dBA, or 3 dBA less than a snowcoach. Because a 3 dBA increase is a doubling of noise energy, a snowcoach event at the maximum allowable BAT noise level of 75 dBA generates two times the noise energy of a snowmobile transportation event comprised of ten snowmobiles when measured at 50 feet, but the two types of transportation events would have similar noise levels at distant locations.

Tonal Qualities of Snowmobile and Snowcoach Transportation Events

At a distance, if the vehicles are not visible, trained acousticians as well as people with less experience typically cannot differentiate between the noise of snowmobile and snowcoach transportation events (S. Burson, personal observation). This is likely because current BAT compliant snowmobiles have lower frequency noise emissions than two stroke snowmobiles and are similar to the tonal qualities of snowcoaches. Snowmobiles and snowcoaches both have 4- stroke engines, fuel injected motors, mufflers, and similar propulsion and steering mechanisms which further reduces the likelihood that a listener can differentiate between the two transportation events.

CONCLUSION

The best available data regarding noise emissions of New BAT snowmobiles and BAT snowcoaches indicate that:

- The length of time snowmobile and snowcoach transportation events can be heard is similar and differs, on average, by only 15 seconds (approximately 10 percent);
- A group of ten New BAT snowmobiles, when grouped together with space between vehicles for safety, measure 3 dBA lower than a single BAT snowcoach when measured from 50 feet but noise energy levels are similar at greater distances;
- And that at a distance if the vehicles are not visible, trained acousticians as well as people with less experience typically cannot differentiate between the noise of snowmobile and snowcoach transportation events (S. Burson, personal observation).

In conclusion, once BAT is in place for snowcoaches and New BAT in place for snowmobiles, there is no evidence to support a compelling advantage for one type of OSV transportation event over another in terms of preservation of the natural soundscape. Therefore, based on these data and assessments, the NPS has concluded that snowmobile and snowcoach transportation events are comparable in terms impacts to soundscape resources.

VISITOR USE, EXPERIENCE, AND ACCESSIBILITY

INTRODUCTION

For many, a wintertime trip into the interior of Yellowstone National Park is an once-in-a-lifetime experience (Nickerson et al. 2006). Visitors who plan a trip intending to travel by OSVs have the choice to travel by snowmobile or snowcoach under the preferred alternative. This section assesses the comparability of the snowmobile and snowcoach transportation events as they relate to the visitor experience. This includes evaluating opportunities for visitors to view wildlife, experience natural soundscapes, and their expectations for the different types of transportation.

METRICS

The following metrics were deemed suitable for assessing the comparability of snowmobile and snowcoach transportation events in regards to the visitor experience:

- Experience satisfaction
- Opportunities to view wildlife and other features of interest

- Opportunities to experience natural soundscapes
- Expectations regarding the OSV transportation event experience
- Trends in visitor use during the managed use era (2004/2005 to present).

COMPARABILITY ASSESSMENT

Experience Satisfaction

As demonstrated repeatedly in numerous studies of wintertime visitors, visitors are highly satisfied with their experience in Yellowstone National Park in winter (Borrie et al. 1999; Davenport 1999; Freimund et al. 2009). Freimund et al. (2011) states, "One hundred percent of visitors stated that they were either very satisfied (87 percent) or somewhat satisfied (13 percent)," with their experience and, "no visitor registered even the slightest "dissatisfaction" with their experience" (Freimund et al. 2011, p. 12). Because overall levels of experience satisfaction are so high, one can infer that there is no difference in the experience satisfaction of visitors by snowmobile versus a snowcoach.

Opportunities to View Wildlife and Other Features of Interest

The opportunity to view wildlife and other features of interest is an important component of the Yellowstone winter visitor experience (Freimund et al. 2009). The NPS concludes that regardless of the chosen mode of transportation, visitors have similar opportunities to view wildlife and other features of interest. This is because snowcoaches and snowmobiles share the same roads in Yellowstone and visitors would see the same wildlife on a given day regardless of the OSV type they were transported by. Snowmobiles and snowcoaches frequently congregate at features of interest and at wildlife viewing areas and are led by guides. Because of this, the NPS concludes snowcoach and snowmobile visitors have comparable opportunities to view wildlife and other features of interest in the park.

Opportunities to Experience Natural Soundscapes

Natural soundscapes are a valued resource in Yellowstone National Park. A study conducted in 2008 found that 99 percent of respondents stated that opportunities to experience natural sounds were important components of their experience, and 81 percent of respondents indicated that natural sounds have a positive effect on their experience (Freimund et al. 2009, 2011). Both types of OSVs frequently congregate at the same points of interest to observe and experience the natural phenomena of Yellowstone, including natural soundscapes. Because of this, the NPS concludes snowcoach and snowmobile visitors have comparable opportunities to experience natural soundscapes in the park.

Expectations Regarding OSV Transportation Event Experience

The noise produced by an OSV while a visitor is on or in the vehicle touring the park has the potential to negatively affect the visitor experience. Noise can obscure the human voice by masking the sound of the voice, making it difficult to hear and increasing the likelihood of speech interference (listeners missing portions of what is being said in conversation). People with average voice strengths in open air conversation discussing unfamiliar material face-to-face raise their voices when background noise reaches approximately 50 to 60 dBA (i.e., the point at which background noise causes speech interference). In telephone conversations, speech interference has been found to begin at background noise levels as low as 60 dBA.

Research on Yellowstone BAT-compliant snowmobiles indicates that machines produce from 69 dBA at idle to 93 dBA at 35 mph at the operator's ear while at cruising speed (these tests did not account for the

muffling effect of the helmet or ear plugs). However, it is likely that visitors via snowmobile do not expect to be able to communicate verbally while the vehicles are under power and traveling through the park. Instead, snowmobiles stop frequently at attractions within the park and turn off their engines in order to communicate verbally with each other.

Research on six different Yellowstone snowcoaches indicates that these machines produce from 70 dBA to 86 dBA inside the passenger cabin while at cruising speed (22 to 28 mph) on snow-covered groomed roads in the interior of Yellowstone National Park. Measurements were taken using a calibrated Larson Davis Type 1 sound level meter and microphone in the front seat and the back seat of each snowcoach at approximate ear level as the snowcoach traveled at typical cruising speed on a snow-covered road. Average dBA was calculated as the logarithmic mean of the front and back seat measurements (figure 3).

TABLE 12: AVERAGE SNOWCOACH INTERIOR NOISE LEVELS

Snowcoach Model	Average Interior Noise Level (dBA)	Cruising Speed (mph)	Measured
2011 Ford F-F550 32 Passenger, Grip Tracks	70.4	22	March 2012
2011 Ford Vanterra, Mattracks	74.2	24	March 2012
2008 Chevy Express Van, Mattracks	76.6	24	March 2012
2011 Ford F-450 Glaval	80.8	21	March 2012
1956 Bombardier B-12, 2002 V8 EFI Motor	84.0	26	March 2012

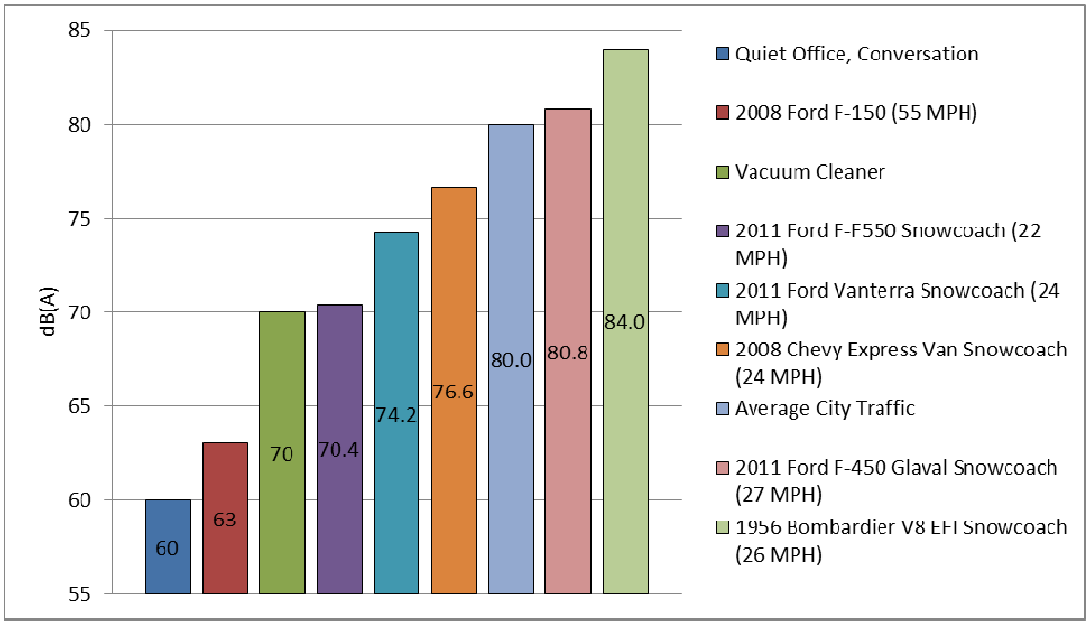

FIGURE 3: INTERIOR NOISE LEVELS OF POPULAR SNOWCOACHES WITH PROXIES

The available data indicate that speech interference, as a result of interior snowcoach noise, is highly likely while the vehicle is at cruising speed and that observed interior noise levels would interfere with spoken communication. That is, without amplification or raising of voices, operators and passengers would likely only able to successfully communicate with one another when the OSV is traveling slower than typical cruising speed or stopped. The average snowcoach interior noise of the quietest snowcoach was 70 dBA, levels similar to those a room with a running vacuum cleaner. Two of five were louder than

average city traffic. The bar chart in figure 3 shows dBA measurements for reference sounds (quiet office, vacuum cleaner, Ford truck at 55 mph) and the measured interior noise of five measured snowcoaches.

Unlike visitors traveling via snowmobiles, visitors traveling via snowcoach may expect to be able to communicate while vehicles are under power and traveling through the park. That is, visitors may purposefully select a snowcoach because they expect to be able to talk with one another and their guide but their expectation may be unmet given the high interior noise levels of snowcoaches.

Trends in Visitor Use and Preferences for Transportation Modalities during the Managed Use Era (2004-present)

Visitor use statistics show relatively even distribution patterns between the types of transportation events used in the park across the 2004/2005 to 2011/2012 winter seasons. For example the eight-year average has been 2,980 snowmobile transportation events per season and 2,937 snowcoach transportation events per season, a 50.4 percent to 49.6 percent split, respectively. Within individual years, percentage of transportation events has ranged from 58 percent snowmobile events to 42 percent snowmobile events (2005/06) and from 42 percent snowmobile events to 58 percent snowcoach events (2011/12). Over the past eight years, there has been a general trend towards more snowcoach events than snowmobile events (figure 4).

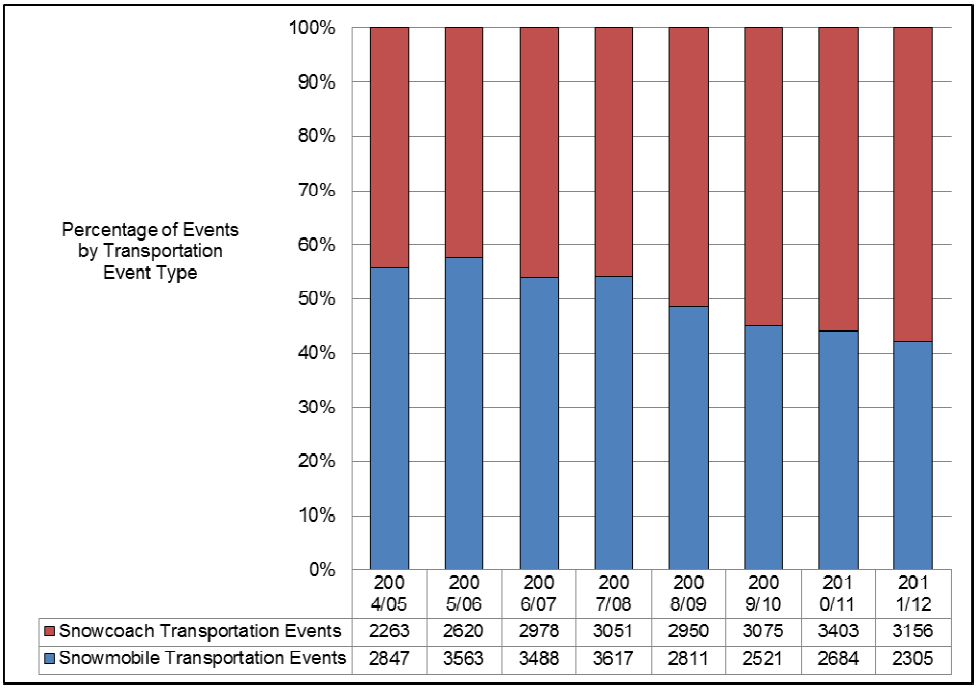

FIGURE 4: PERCENTAGE OF EVENTS BY TRANSPORTATION EVENT TYPE

Table 13 provides the average daily number of snowmobiles and snowcoaches in the park during the previous eight seasons as well as each season's peak numbers of OSVs. During the winters of 2004/2005 through 2008/2009, the maximum number of snowmobiles permitted in the park was 720. The daily average during this period ranged from 213 snowmobiles to 303, an average daily utilization rate of 30 percent to 42 percent. Peak use during this period ranged from 429 to 560 snowmobiles for a peak utilization rate of 59 percent to 77 percent. From the 2009/2010 season to the 2011/2012 season, the daily limit for snowmobiles was 318 and the daily average ranged from 187 to 197 snowmobiles, an average daily utilization rate of 59 percent to 62 percent. Peak use of snowmobiles during these years ranged from

258 to 294 for a peak utilization rate of 81 percent to 92 percent. Snowcoach daily limits remained at 78 throughout the managed use era, until the 2011/2012 winter season when they dropped to 76 due to termination of a snowcoach contract with 2 snowcoach allocations at the South Entrance. The daily average ranged from 26 to 39 snowcoaches, an average daily utilization rate of 33 percent to 50 percent. Peak us of snowcoaches during these years ranged from 56 to 63, for a peak daily utilization rate of 72 percent and 81 percent. Overall, these measures of average and peak day utilization rates illustrate that visitors to Yellowstone appear to value having both modes of transportation available to them.

TABLE 13: AVERAGE DAILY NUMBER OF OSVS (WINTER SEASONS 2004/2005 TO 2011/2012, THE MANAGED USE ERA)

Winter Season	Snowmobiles					Snowcoaches				
	Daily Limit	Daily Average	Daily Average Utilization Rate	Peak	Peak Utilization Rate	Daily Limit	Daily Average	Daily Average Utilization Rate	Peak	Peak Utilization Rate
2004/2005	720	243	34%	430	60%	78	26	33%	58	74%
2005/2006	720	279	39%	494	69%	78	33	42%	60	77%
2006/2007	720	290	40%	552	77%	78	37	47%	58	74%
2007/2008	720	303	42%	560	78%	78	38	49%	63	81%
2008/2009	720 (540)*	213	30% (39%)	429	60% (79%)	78	33	43%	55	71%
2009/2010	318	188	59%	294	92%	78	35	44%	59	76%
2010/2011	318	197	62%	281	88%	78	39	49%	59	76%
2011/2012	318	188	59%	261	82%	76	35	46%	56	74%
Managed-Use Era Average	569	238	46% (47%)	413	76% (78%)	78	34	44%	58	75%
720-Snowmobile Era Average	720	266	37% (39%)	493	68% (73%)	78	33	43%	59	75%
318-Snowmobile Era Average	318	191	60%	279	88%	77	36	47%	58	75%

Source: MN Spreadsheet (concessions data except for peak numbers, which are Visitor Service Office).

*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.

CONCLUSION

Based on the analyses described above, the NPS concludes that snowcoach and snowmobile transportation events are comparable in terms of contributing to positive visitor experiences in Yellowstone in winter and that both offer uniquely different ways to see the park. Visitors, regardless of whether they were transported via snowmobile or snowcoach, are highly satisfied with their visit to the park in winter. Given established travel patterns and routes, visitors have comparable opportunities to experience wildlife and natural soundscapes. For visitors travelling via snowmobile, there is likely little expectation to be able to communicate while moving through the park. For snowcoaches, it is possible that visitor expectations are not met given the interior noise levels of snowcoaches and the difficulty this presents for spoken communication.

While some stakeholders have expressed a desire to eliminate snowmobiles as a mode of transportation within Yellowstone, visitor surveys have found strong opposition to such a management action (Borrie et al. 1999). Freimund found that prohibiting snowmobiles in Yellowstone was “opposed” or “strongly opposed” by a majority of respondents. Nearly 70 percent of those respondents *transported by snowcoach* were either neutral or indicated they were opposed to closing the roads to snowmobiles (Freimund et al. 2011). The park supports two different yet appropriate modes of travel within the interior of the park. Given that both forms of transportation both have resulted in satisfactory visitor experience, the park’s winter use rules and policies are designed to ensure long-term resource protection while providing a choice for opportunities for the visiting public to experience and to be inspired by Yellowstone’s unique winter resources and values.

HEALTH AND SAFETY

INTRODUCTION

This section focuses on assessing the comparability of snowmobile and snowcoach transportation events on the health and safety of NPS employees, visitors, and other duly authorized parties. It is important to note that this examination does not evaluate the health and safety impacts of avalanche mitigation through Sylvan Pass. These issues were addressed in Occupational Risk Management Assessments conducted in 2007 and 2010. Additionally, Sylvan Pass is closed to all OSV traffic during periods of inclement weather and during avalanche mitigation missions.

METRICS

This analysis utilizes personnel exposure assessments conducted at Yellowstone National Park between 2004 and 2009. The following metrics were used to assess comparability between snowmobile and snowcoach transportation events in regard to their impact to the health and safety of visitors and employees. These metrics were selected because they represent relatively simple, easy to understand measures for assessing the comparability of snowmobile and snowcoach transportation events on human health and safety.

- Exhaust emission exposure levels
- Noise emission exposure levels.

The Occupational Safety and Health Administration (OSHA) sets enforceable permissible exposure limits to protect workers against the health effects of exposure to hazardous substances; this includes those in exhaust emissions from OSVs. In addition to these standards, studies at Yellowstone also consider the limits of the American Conference of Industrial Hygienists, which is an industry standard-setting organization. A list of these standards for each air contaminant can be found in table 58 of the plan/SEIS and a list of the air quality intensity definitions can be found in table 38, and some are detailed in the analysis below.

Various standards also exist for occupational exposure to noise, including the OSHA permissible exposure limits, EPA standards, and the National Institute for Occupational Safety and Health (NIOSH) standards. The permissible exposure limit for noise exposure as identified by OSHA is 90 dBA. Noise levels necessary to protect public health and welfare against hearing loss, annoyance, and activity interference have been identified and published by the EPA. Full discussion of the various standards can be found in chapter 4 of the plan/SEIS.

COMPARABILITY ASSESSMENT

Exhaust Emission Exposure Levels

Measurements of exposure levels to air pollutants CO, volatile organic compounds, particulate matter, and aldehydes have been taken at entrance stations over several winters and summer periods to evaluate human exposure to several air pollutants (Spear and Stephenson 2005; Jensen and Meyer 2006). In the winter of 1997, when park entrance station staff was exposed to substantially greater amounts of pollutants due to significantly higher snowmobile numbers without BAT standards in place, CO exposure was not found to be above workplace health standards set by OSHA (Radtke 1997). This finding was upheld in subsequent studies that found that after implementation of BAT snowmobiles, concentrations of all airborne contaminants measured well below current standards.

Another exhaust emission exposure assessment of the entrance station employees was conducted during President's Day weekends of 2008 and 2009, typically one of the busiest weekends of the winter seasons. The survey included personal exposure measurements of CO, HC, aldehydes and noise levels (Radtke 2008; Radtke 2009). Entrance station employees" exposures to contaminants in exhaust emissions and to noise were well below accepted occupational exposure limits for both years of monitoring, even though the kiosk ventilation system was not operating at the time of the study. Results for all volatile organic compounds, aldehydes, and CO were well below the occupational exposure limits and in most cases were below the detection limits of the analytical method. Results of volatile organic compounds measurements showed most were below detection limit. As a sub-study of the 2009 study, researchers separated snowmobiles from snowcoaches on February 15th, 2009 to determine if there were any differences in exhaust emission exposure levels for gate personnel. Nineteen snowcoaches entered lane B and 241 snowmobiles entered lane A. The exposure results indicated that CO was slightly higher over the sampling period for the snowmobile lane, however, peak readings for CO was higher for the snowcoaches (table 14). The CO peak readings never reached the NIOSH ceiling of 200 ppm (Radtke 2009).

TABLE 14: 2009 CARBON MONOXIDE EXPOSURE RESULTS AT SELECTED GATE KIOSKS (ALL IN PPM)

Date/Kiosk	CO time-weighted average for time sampled	CO 8-hr time-weighted average	Peak Reading
2/14 Kiosk A	2	1.6	48
2/14 Kiosk B	2	0.5	42
2/15 Kiosk A (snowmobiles only)	10	2.3	91
2/15 Kiosk B (snowcoaches only)	6	1.3	126
2/16 Kiosk A	4	1.3	48
2/16 Kiosk B	2	0.6	22
OSHA permissible exposure limit / Short-term Exposure Limits		50	--
American Conference of Industrial Hygienists threshold limit value		25	--
NIOSH Recommended Exposure Limit		35	200

Noise Emission Exposure Levels

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, snowcoaches, and other equipment. During the winter season 2004/2005, after BAT limits and commercial guiding were in place, occupational exposure to noise was evaluated with the conclusion that noise emission exposure levels were below OSHA permissible limits and other recommended maximum exposure levels (Spear and Stephenson 2005). This study found that employee noise exposures averaged 60.6 dBA for the winter 2004/2005 and 65.2 for the winter 2005/2006, or 3.5 percent and 5.5 percent of the allowable noise exposure, respectively. Peak 8-hour time-weighted averages for those two winters were 75 and 80 dBA, or 12.5 percent and 26.0 percent of the allowable exposure, respectively (Jensen and Meyer 2006). Clearly, although employees are exposed to some noise, those exposures are well within applicable standards.

Operators and passengers in OSVs can also be exposed to elevated noise levels. A variety of snowcoaches have been tested for average interior noise levels (see chapter 3). Five snowcoaches were tested for interior noise levels in March 2012 (results above in table 13). On February 20, 2006, noise levels were measured on a 2006 Arctic Cat T660 4-stroke machine on packed (groomed snow) at the West Entrance to Yellowstone. Results are presented below in table 15. These noise levels were measured at the operator's ear and for snowmobiles, do not account for wind, wearing a helmet, or other similar factors. In actuality, the actual level of noise the snowmobile operator is exposed to is likely significantly less given the rider wears a helmet and other coverings and may wear ear plugs. Noise exposure while riding on or in OSVs can be controlled with standard ear plugs, which are provided by snowmobile and snowcoach operators to users entering the park. All commercially available NIOSH-rated foam plugs provide enough attenuation to protect employee hearing. An estimated exposure of 77 dBA for 8 hours when wearing earplugs falls within acceptable exposure limits set forth by OSHA, NIOSH, and American Conference of Industrial Hygienists.

TABLE 15: NOISE LEVEL MEASUREMENTS IN DBA MEASURED AT OPERATOR'S EAR

Speed (mph)	dBA 2006 Arctic Cat T660 packed snow	dBA 2004 Arctic Cat T660 unpacked snow
0 (Idle)	69	67
15	87	84
20		85
25	91	89
30		97
35	92	92
40		91
45	97	92

CONCLUSION

The best available data indicate that personnel exposure to exhaust emission contaminants and to elevated noise levels do not exceed established EPA, OSHA or NIOSH standards for either snowmobiles or snowcoaches. One of the few places where data are available to directly compare snowmobile and snowcoach transportation events for human health and safety is gate personnel exposure to CO. When snowmobiles and snowcoaches were separated into different lines at the West Entrance to measure for

CO, the exposure results indicated that while CO was slightly higher over the sampling period for the snowmobile lane, peak readings were higher in the snowcoach lane (Radtke 2009). Data show that employee and visitor exposure levels are at or below acceptable limits and that mitigation strategies such as ear plugs, kiosk ventilation systems, and other mitigation strategies are available to address these concerns. Based on the best available data for this subject, the NPS has concluded that snowmobile and snowcoach operations have comparable impacts in regards to health and human safety in that neither create unsafe or levels of impact that exceed established standards.

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APPENDIX B: BEST AVAILABLE TECHNOLOGY STANDARDS FOR SNOWCOACHES

Executive Summary

By no later than the 2017/2018 season, all snowcoaches must meet National Park Service (NPS) established best available technology (BAT) standards (described as sound and air emission requirements in the proposed rule), as applicable to the snowcoach type and fuel type. Snowcoach BAT requirements would apply to all new snowcoaches brought into service starting in the 2014-2015 winter season.

For air emissions:

- A diesel-fueled snowcoach with a gross vehicle weight rating (GVWR) less than 8,500 pounds must meet the functional equivalent of 2010 (or newer) U.S. Environmental Protection Agency (EPA) Tier 2 model year engine and emission control technology requirements.
- A diesel-fueled snowcoach with a GVWR greater than or equal to 8,500 pounds must meet the EPA model year 2010 "engine configuration certified" diesel air emission requirements. Alternately, a snowcoach in this category may be certified under the functional equivalent of 2010 (or newer) EPA Tier 2 model year engine and emission control technology requirements if the snowcoach: (1) has a GVWR between 8,500 and 10,000 pounds; and (2) would achieve better emission results with a configuration that meets the Tier 2 requirements.
- A gasoline-fueled snowcoach greater than or equal to 10,000 GVWR must meet the functional equivalent of 2008 (or newer) EPA Tier 2 model year engine and emission control technology requirements.
- A gasoline-fueled snowcoach less than 10,000 GVWR must meet the functional equivalent of 2007 (or newer) EPA Tier 2 model year engine and emission control technology requirements.
- All emission-related exhaust components (as listed in 40 CFR 86.004-25(b)(3)(iii) through (v)) must function properly. These emission-related components must be replaced with the original equipment manufacturer (OEM) component, if possible. If OEM parts are not available, aftermarket parts may be used if they are certified not to adversely affect emission and sound characteristics. Catalysts that have exceeded their useful life must be replaced unless the commercial tour operator can demonstrate that the catalyst is functioning properly. Operating a snowcoach that has its original pollution control equipment modified or disabled would be prohibited.

For noise emissions:

- A snowcoach may not exceed a sound level of 75 dB(A) (A-weighted decibel) when measured by operating the snowcoach at cruising speed in accordance with the SAE J1161 test procedures.

The NPS would test and approve all snowcoaches for operation in Yellowstone National Park and maintain a list of approved snowcoaches that meet the BAT air and sound emissions requirements. Once approved, a snowcoach may operate in the park through the winter season that begins no more than 10 years following its engine manufacture date. To continue to operate in the park during future winter seasons, a snowcoach must be retrofitted with a new engine and emissions control equipment, and be recertified for air and sound emissions. For example, a snowcoach with a model year 2010 engine could

operate through the 2020-2021 winter season and would cease to be allowed to operate in the park as of March 15, 2021, if it is not retrofitted with a new engine and re-tested. Individual snowcoaches may be subject to periodic and random inspections to determine compliance with BAT requirements.

Background on Tier 2 Standards

The Tier 2 Rule (65 FR 6697, February 10, 2000) instituted a comprehensive regulatory program designed to significantly reduce the emissions from new passenger cars and light trucks, including pickup trucks, vans, minivans, and sport-utility vehicles. These reductions provide for cleaner air and greater public health protection, primarily by reducing ozone and particulate matter pollution. The program treats vehicles and fuels as a system, combining requirements for much cleaner vehicles with requirements for much lower levels of sulfur in gasoline. The program phases in a single set of tailpipe emission standards that apply to all passenger cars, light trucks, and larger passenger vehicles operated on any fuel. In 2004, EPA began phasing in Tier 2 emissions standards for light-duty vehicles, light-duty trucks, and medium-duty passenger vehicles, and in 2008 for heavy duty spark and compression ignition vehicles (the vehicle classes most converted snowcoaches meet). Implementation of these standards was completed in 2010 (65 FR 6697, February 10, 2000). Tier 2 engines and emission control equipment include vehicle computers, full complement of sensors including engine control module (ECM) computers, be onboard diagnostics system (OBD) equipped, and have exhaust after-treatment equipment that is standard OEM equipment included with on-road vehicles or engines.

BAT Air Emission Standards

Snowcoach BAT requirements would apply to all new snowcoaches brought into service starting in the 2014-2015 winter season. By no later than the 2017/2018 winter season, every snowcoach would be required to have Tier 2 compliant engines and exhaust emission controls in order to be authorized for use in Yellowstone National Park. The BAT emissions standard specification would differ depending on whether the vehicle was gasoline or diesel powered and the GVWR of the vehicle.

- All emission-related exhaust components originally installed by the manufacturer must be in place and functioning properly. These emission-related components must be replaced with the OEM component, if possible. If OEM parts are not available, aftermarket parts may be used if they are certified not to adversely affect emission and sound characteristics.
- Modifying or disabling original pollution control equipment is prohibited except for maintenance purposes.
- All snowcoaches operating in Yellowstone National Park would be subject to unannounced periodic inspections by the NPS to ensure that snowcoaches are meeting the NPS BAT requirements. These unannounced inspections may involve the visual inspection of the Malfunction Indicator Light otherwise known as the “Check Engine” light. If the “Check Engine” light is illuminated, the operator /owner of the snowcoach would need to have the vehicle scanned by a trained technician to determine the issue identified by the Diagnostic Trouble Code. Inspections may also include noise output as measured via the SAE J1161 test. Necessary repairs and/or equipment replacement would need to be performed within 10 business days of the inspection by the NPS and documented to the NPS[1].

[1] Additional time may be granted on a case-by-case basis, at the discretion of the NPS, depending on replacement parts availability and/or corrective work scheduling.

For all gasoline powered snowcoaches less than 10,000 GVWR

The BAT emission technology standard for gasoline powered snowcoaches less than 10,000 lbs GVWR would be the functional equivalent of meeting 2007 (or newer) EPA Tier 2 Model Year engine and emission control technology requirements and having all associated emissions control equipment incorporated into the engine and drive train for the vehicle class as an on-road wheeled vehicle (size and weight). This would include items such as ECM computers, OBD, sensors, and exhaust after-treatment equipment that is standard OEM equipment included with on-road vehicles or engines. A snowcoach may operate in the park through the winter season that begins no more than 10 years following its engine manufacture date. To continue to operate in the park during future winter seasons, a snowcoach must be retrofitted with a new engine and exhaust emissions control equipment, and be recertified for air and sound emissions. For example, a snowcoach less than 10,000 lbs GVRW with a model year 2010 engine could operate through the 2020-2021 winter season and would cease to be allowed to operate in the park as of March 15, 2021, if it is not retrofitted with a new engine and re-tested.

If a used gasoline powered vehicle[2] is being converted into a snowcoach, the NPS would require the operator to confirm that the vehicle meets the functional equivalent of 2007 (or newer) EPA Tier 2 Model Year engine and emission control technology requirements and has all associated emissions control equipment incorporated into the engine and drive train for the vehicle class as an on-road wheeled vehicle (size and weight). This would include items such as ECM computers, OBD, sensors, and exhaust after-treatment equipment that is standard OEM equipment included with on-road vehicles or engines. A snowcoach may operate in the park through the winter season that begins no more than 10 years following its engine manufacture date. To continue to operate in the park during future winter seasons, a snowcoach must be retrofitted with a new engine and exhaust emissions control equipment, and be recertified for air and sound emissions. For example, a snowcoach with a model year 2010 engine could operate through the 2020-2021 winter season and would cease to be allowed to operate in the park as of March 15, 2021, if it is not retrofitted with a new engine and re-tested. A replacement engine older than 10 years old would not be acceptable.

If it is the operator's intention to repower a gasoline vehicle or convert a diesel vehicle to gasoline, the NPS would require the operator to confirm that the vehicle meets the functional equivalent of 2007 (or newer) EPA Tier 2 Model Year engine and emission control technology requirements and has all associated emissions control equipment incorporated into the engine and drive train for the vehicle class as an on-road wheeled vehicle (size and weight). This would include items such as ECM computers, OBD, sensors, and exhaust after-treatment equipment that is standard OEM equipment included with on-road vehicles or engines. The replacement engine could be no older than 10 years past the manufacturing date. A replacement engine more than 10 years past the manufacturing date would not be acceptable for use in Yellowstone National Park. For example, a snowcoach with a model year 2010 engine could operate through the 2020-2021 winter season and would cease to be allowed to operate in the park as of March 15, 2021, if it is not retrofitted with a new engine and exhaust emission control equipment and re-tested. A snowcoach with a model year 2007 engine could operate through the 2017-2018 winter season and would cease to be allowed to operate in the park as of March 15, 2018, if it is not retrofitted with a new engine and re-tested.

[2] "Used" vehicle in this case is defined as any chassis/frame/body of an on-road vehicle older than Model Year 2017.

For all gasoline powered snowcoaches greater than 10,000 GVWR (heavy duty applications)

The BAT emission technology standard for gasoline powered snowcoaches greater than 10,000 lbs GVWR would be the functional equivalent of meeting 2008 (or newer) EPA Tier 2 Model Year engine and emission control technology requirements and having all associated emissions control equipment incorporated into the engine and drive train for the vehicle class as an on-road wheeled vehicle (size and weight). This would include items such as ECM computers, OBD, sensors, and exhaust after-treatment equipment that is standard OEM equipment included with on-road vehicles or engines. A snowcoach may operate in the park through the winter season that begins no more than 10 years following its engine manufacture date. To continue to operate in the park during future winter seasons, a snowcoach must be retrofitted with a new engine and exhaust emissions control equipment, and be recertified for air and sound emissions. For example, a snowcoach greater than 10,000 lbs GVWR with a model year 2010 engine could operate through the 2020-2021 winter season and would cease to be allowed to operate in the park as of March 15, 2021, if it is not retrofitted with a new engine and exhaust emission control equipment and re-tested.

If a used gasoline powered vehicle[3] greater than 10,000 lbs GVWR is being converted into a snowcoach, the NPS would require the operator to confirm that the vehicle meets the functional equivalent of 2008 (or newer) EPA Tier 2 Model Year engine and emission control technology requirements and has all associated emissions control equipment incorporated into the engine and drive train for the vehicle class as an on-road wheeled vehicle (size and weight). This would include items such as ECM computers, OBD, sensors, and exhaust after-treatment equipment that is standard OEM equipment included with on-road vehicles or engines. A snowcoach may operate in the park through the winter season that begins no more than 10 years following its engine manufacture date. To continue to operate in the park during future winter seasons, a snowcoach must be retrofitted with a new engine and exhaust emissions control equipment, and be recertified for air and sound emissions. For example, a snowcoach greater than 10,000 lbs GVWR with a model year 2010 engine could operate through the 2020-2021 winter season and would cease to be allowed to operate in the park as of March 15, 2021, if it is not retrofitted with a new engine and exhaust emission control equipment and re-tested.

If it is the operator's intention to repower a gasoline vehicle or convert a diesel vehicle to gasoline greater than 10,000 lbs GVWR, the NPS would require the operator to confirm that the vehicle meets the functional equivalent of 2008 (or newer) EPA Tier 2 Model Year engine and emission control technology requirements and has all associated emissions control equipment incorporated into the engine and drive train for the vehicle class as an on-road wheeled vehicle (size and weight). This would include items such as ECM computers, OBD, sensors, and exhaust after-treatment equipment that is standard OEM equipment included with on-road vehicles or engines. The replacement engine could be no older than 10 years past the manufacturing date. A replacement engine more than 10 years past the manufacturing date would not be acceptable for use in Yellowstone National Park. For example, a snowcoach greater than 10,000 lbs GVWR with a model year 2010 engine could operate through the 2020-2021 winter season and would cease to be allowed to operate in the park as of March 15, 2021, if it is not retrofitted with a new engine and exhaust emission control equipment and re-tested.

[3] "Used" vehicle in this case is defined as any chassis/frame/body of an on-road vehicle older than Model Year 2017.

For all diesel powered snowcoaches

The BAT emission standards would be the functional equivalent of meeting 2010 (or newer) EPA Tier 2 Model Year engine and emission control technology requirements and having related emissions control equipment incorporated into the engine and drive train for the vehicle class as an on-road wheeled vehicle (size and weight). This would include items such as ECM computers, OBD, sensors, and exhaust after-treatment equipment that is standard OEM equipment included with on-road diesel powered vehicles. Diesel-powered vehicles must be equipped with applicable operational ceramic particulate filters and afterburners. A diesel snowcoach may operate in the park through the winter season that begins no more than 10 years following its engine manufacture date. To continue to operate in the park during future winter seasons, a snowcoach must be retrofitted with a new engine and exhaust emissions control equipment, and be recertified for air and sound emissions. For example, a snowcoach with a model year 2010 diesel engine could operate through the 2020-2021 winter season and would cease to be allowed to operate in the park as of March 15, 2021, if it is not retrofitted with a new engine and exhaust emission control equipment and re-tested.

If a used diesel powered vehicle[4] is being converted into a snowcoach, the NPS would require the operator to confirm that the vehicle meets the functional equivalent of 2010 (or newer) EPA Tier 2 Model Year engine and emission control technology requirements and has all associated emissions control equipment incorporated into the engine and drive train for the vehicle class as an on-road wheeled vehicle (size and weight). This would include items such as ECM computers, OBD, sensors, and exhaust after-treatment equipment that is standard OEM equipment included with on-road vehicles or engines such as operational ceramic particulate filters and afterburners. The engine could be no older than 10 years past the manufacturing date. A replacement engine older than 10 years old would not be acceptable. For example, a snowcoach with a model year 2010 engine could operate through the 2020-2021 winter season and would cease to be allowed to operate in the park as of March 15, 2021, if it is not retrofitted with a new engine and exhaust emission control equipment and re-tested.

If it is the operator's intention to repower a diesel vehicle or convert a gasoline vehicle to diesel, the NPS would require the operator to confirm that the vehicle meets the functional equivalent of 2010 (or newer) EPA Tier 2 Model Year engine and emission control technology requirements and has all associated emissions control equipment incorporated into the engine and drive train for the vehicle class as an on-road wheeled vehicle (size and weight). This would include items such as ECM computers, OBD, sensors, and exhaust after treatment equipment that is standard OEM equipment included with on-road vehicles or engines such as operational ceramic particulate filters and afterburners. The replacement engine could be no older than 10 years past the manufacturing date. A replacement engine more than 10 years past the manufacturing date would not be acceptable for use in Yellowstone National Park. For example, a snowcoach with a model year 2010 engine could operate through the 2020-2021 winter season and would cease to be allowed to operate in the park as of March 15, 2021, if it is not retrofitted with a new engine and exhaust emission control equipment and re-tested.

The NPS requires diesel vehicles with a GVWR of 8,500 pounds or more meet, at a minimum, the EPA 2010 "engine configuration certified" diesel air emission standards. However, if the diesel vehicle has a GVWR between 8,500 and 10,000 pounds, there may be a configuration that meets the technology standards for an EPA Light Duty Tier 2 on-road vehicle which would achieve the best results from an emissions perspective. This particular type of BAT configuration requires review and approval by the NPS.

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[4] "Used" vehicle in this case is defined as a chassis/frame/body of an on-road vehicle older than Model Year 2017.

If the EPA promulgates more restrictive emission technology requirements for any class of vehicle that may be considered for conversion to oversnow use, the NPS would evaluate these new emission technology requirements and may update the NPS BAT provisions through the concession contract process.

BAT Noise Emission Standards

- Snowcoach BAT requirements would apply to all new snowcoaches brought into service starting in the 2014-2015 winter season. By no later than the 2017/2018 season, all snowcoaches must meet a noise emissions requirement of no greater than 75 dBA (performance specification) when measured at typical cruising speed following the SAE J1161 test procedures (typically approximately 22–25 mph). The test procedures for measuring noise output would follow those used by Volpe 2010 (Exterior Sound Level Measurements of Snowcoaches at Yellowstone National Park, U.S. Department of Transportation, Research and Innovative Technology Administration, John A. Volpe National Transportation Systems Center, April 2010).

Through contract and permit, the NPS would encourage snowcoach guides and operators to equip their snowcoaches with devices to further minimize noise emissions.

Administrative Exceptions

An exception to these requirements would be for limited numbers of snowcoaches that are used for specific administrative functions, such as in emergency and towing situations. These snowcoaches would not be required to meet snowcoach BAT requirements.

APPENDIX C: NON-COMMERCIALLY GUIDED SNOWMOBILE ACCESS PROGRAM

Executive Summary

- A non-commercially guided snowmobile access program was selected as an element of the preferred alternative in the Winter Use Plan / Supplemental Environmental Impact Statement (plan/SEIS). The non-commercially guided snowmobile access program allows up to four non-commercially guided snowmobile transportation events – with up to 5 snowmobiles per event – to enter the park daily, one transportation event per entrance.
- Access to Yellowstone National Park would continue to remain 100 percent guided. The park would continue to prohibit unguided snowmobile access.
- Each non-commercial guide may lead no more than two trips per winter season, and must be at least 18 years of age by the first day of the trip. Non-commercial guides would be required to possess a non-commercial snowmobile access permit which would be awarded annually through an online lottery system and have successfully completed the Yellowstone Snowmobile Education Certification training course.
- Each non-commercial snowmobile operator in a non-commercially guided snowmobile transportation event would be required to have successfully completed the to-be-developed Yellowstone Snowmobile Education Certification training course and be in possession of a valid state-issued motor vehicle driver's license before the first day of the trip.
- Trip members without a state-issued driver's license or those who had not successfully completed the Yellowstone Snowmobile Education Certification training course would not be permitted to operate a snowmobile in the park.
- The non-commercially guided snowmobile access program would begin on the first day of the 2014/2015 winter season.
- The decision to continue or terminate the non-commercially guided snowmobile access program or to make significant changes to it would be based upon stakeholder input into predetermined metrics with fixed standards (triggers) to ensure continued protection of park resources and visitor experiences. These standards would be made available to the public prior to implementation of the non-commercially guided snowmobile access program.

Definitions

Commercial Guide—A person who operates as a snowmobile or snowcoach guide for a fee or compensation and is authorized to operate in the park under a concession contract or a commercial use authorization.

Oversnow vehicle or OSV—A snowmobile, snowcoach, or other motorized vehicle that is intended for travel primarily on snow and has been authorized by the superintendent to operate in the park. An OSV that does not meet the definition of a snowcoach must comply with all requirements applicable to snowmobiles.

Snowmobile—A self-propelled vehicle intended for travel solely on snow, with a curb weight of not more than 1,000 pounds (450 kg), driven by a track or tracks in contact with the snow, and which may be

steered by a ski or skis in contact with the snow. All-terrain vehicles and utility-type vehicles are not snowmobiles, even if they have been modified for use on snow with track and ski systems.

Non-commercially Guided Snowmobile Access Program—An access program that permits duly authorized parties to enter Yellowstone National Park without the requirements of a commercial snowmobile guide. All non-commercial snowmobile operators would be required to have successfully completed a Yellowstone-specific education certification process and one member of the party (the non-commercial snowmobile guide) would need to be in possession of a non-commercially guided snowmobile access permit. The non-commercially guided snowmobile access program may be adjusted or terminated based on impacts to park resources and visitor experiences.

Non-commercially Guided Snowmobile Trip—A trip that is led by a non-commercial guide and is not for profit; to the extent possible costs are evenly shared among all participants and no trip member may pay less than other participants. No trip member may be paid to participate on the trip. Trip preparation, costs, and conduct of the trip must be shared by all members of the group, including all logistics, food, fuel, equipment, transportation, vehicle shuttle, and other costs. Non-commercially guided snowmobile trips must be self-guided and may not hire commercial guides. Non-commercially guided snowmobile trips may not be used by any person or organization in any way to obtain a profit and doing so would result in the revocation of the permit and may jeopardize future non-commercially guided access to Yellowstone National Park by the non-commercial snowmobile guide and other trip members.

Non-commercial Snowmobile Access Permit—A permit that allows access to Yellowstone National Park for a single group of up to five snowmobiles for a specific date range. These permits would be awarded through an annual lottery system.

Non-commercial Snowmobile Operator—A person who has successfully completed the Yellowstone Snowmobile Education Certification Program (explained below) and is certified as having the requisite knowledge and skills to operate a snowmobile in Yellowstone National Park. All non-commercial snowmobile operators must be in possession of a valid state-issued motor vehicle driver's license before entering the park.

Non-commercial Snowmobile Guide—In addition to stipulations outlined above under non-commercial snowmobile operator, a non-commercial snowmobile guide must obtain and be in possession of a non-commercial snowmobile access permit as awarded and obtained through the lottery system. Non-commercial snowmobile guides are directly responsible for the actions of their group. Each non-commercial guide may lead no more than two trips per winter season, and must be at least 18 years of age by the first day of the trip. Non-commercial guides must have working knowledge of snowmobile safety, general first aid, snowmobile repair, and navigational technique. It is preferable that non-commercial guides, or another member of the trip, be familiar with Yellowstone National Park. Non-commercial snowmobile guides may not advertise for profit and may not accept a fee or any type of compensation for organizing or leading a trip. Collecting a fee (monetary compensation), payable to an individual, group, or organization for conducting, leading, or guiding a non-commercially guided snowmobile trip is not allowed. Non-commercial guides will be able to help their group travel safely through the park, and will be familiar with daily weather conditions and hand signals to warn group members about wildlife and other road hazards, indicate turns, and indicate when to turn the snowmobile on or off. They will have knowledge of basic first aid, and are equipped with similar supplies. They will employ a single file "follow-the leader" approach and communicate frequently with group members.

Unguided Snowmobile Access—A visitor or group of visitors who enter the park by snowmobile without obtaining certification through the Yellowstone Snowmobile Education Certification Program,

who do not possess the necessary entrance permits, or who are not accompanied by a commercial or non-commercial guide.

Yellowstone Snowmobile Education Certification Program—A to-be-developed online snowmobile education program that all non-commercial snowmobile operators must complete before entering the park via snowmobile. Individuals who successfully complete the Yellowstone Snowmobile Certification Program (details below) would receive a certificate of completion, valid for the duration of the season.

Non-commercially Guided Snowmobile Access Program

The non-commercially guided snowmobile access program would be overseen and administered by the Superintendent's Office, Yellowstone National Park. Yellowstone National Park commits to working with interested parties and stakeholders to develop the non-commercially guided snowmobile access program and supporting Yellowstone Snowmobile Education Certification Program.

All individuals who wish to operate a snowmobile in Yellowstone National Park as part of a non-commercially guided snowmobile transportation event will be required to have successfully completed the Yellowstone Snowmobile Education Certification Program prior to the trip, be in possession of the certificate of completion on the day of the trip, and possess a valid state-issued motor vehicle driver's license. Individuals who successfully complete the program would receive a certificate of completion allowing them to operate a non-commercially guided snowmobile as part of a non-commercially guided snowmobile trip. The certificate of completion would be valid for the duration of the winter season, and for one year immediately following completion of the course.

Non-commercially guided snowmobile entrance permits would be allocated via an online lottery system. Visitors would be able to apply for specific entry dates in advance of the winter season. Lottery system requirements are as follows:

A. The non-commercial snowmobile guide must register for the non-commercial lottery at a to-be-determined website and meet all of the requirements of a non-commercial guide listed above. Should a non-commercial guide fail to meet these requirements, any trip won through the lottery would be cancelled. The applicant may list an alternate non-commercial guide, but to qualify as a potential replacement for the original non-commercial guide, the alternate non-commercial guide must be listed on the lottery application and be prepared to complete all duties required of a non-commercial guide.

B. Non-commercial trips are not transferable except to an alternate non-commercial guide listed on the lottery application that resulted in the trip.

C. Individuals can have only one profile in the online lottery system. Once a profile is established, an individual can apply for multiple entrance dates.

D. By the first day of the trip, non-commercial guides and alternate non-commercial guides must be 18 years or older and be in possession of a valid state-issued motor vehicle driver's license and certificate of completion for the Yellowstone Snowmobile Education Certification Program.

E. By the first day of the trip, all non-commercial snowmobile operators must be in possession of a valid state-issued motor vehicle driver's license and certificate of completion for the Yellowstone Snowmobile Education Certification Program.

F. The annual lottery would open on approximately July 1 for the for the following winter season. Lottery results are only valid for the following season and are not transferable between seasons.

G. Successful lottery winners would be sent an electronic trip preparation packet.

Visitors may bring their own snowmobile or rent from an authorized provider, but all snowmobiles must meet the best available technology (BAT) standard in place at the time of their trip. Specific BAT requirements are described below under program rules and regulations.

All non-commercial snowmobilers would be required to check in with a National Park Service (NPS) ranger at the entrance station prior to entering the park in order to receive their entrance permit and on-site orientation. An NPS ranger would provide an orientation session reinforcing the components of the education program detailed above and brief party members on current park road and weather conditions. The NPS ranger would ensure:

- Non-commercial guides have not led more than one previous non-commercially guided trip into the park that winter season.
- All group members who intend to operate a snowmobile as part of the non-commercially guided event possess the necessary documentation (certificate of completion of the Yellowstone Snowmobile Education Certification Program, entrance permit, valid state-issued motor vehicle driver's license, and snowmobile registration and insurance).
- An itinerary is on file with emergency contact information, and that the non-commercial guide's snowmobile has markings making it easily distinguishable from commercial snowmobiles.

Rangers would ensure that snowmobiles are BAT compliant, and the non-commercial guides possess the necessary safety equipment, including but not limited to a radio, tow rope, map, and first aid kit. In the event that a rented snowmobile must be abandoned within the park, the owner is responsible for retrieval within 24 hours. If a private snowmobile is abandoned within the park, the non-commercially guided group is responsible for removal of the snowmobile within 24 hours.

Yellowstone's Commitment to Working with Stakeholders

Yellowstone National Park commits to working with all interested parties and stakeholders on the development of the Non-commercially Guided Snowmobile Access Program and Yellowstone Snowmobile Education Certification Program within the parameters prescribed in this appendix.

Yellowstone National Park envisions the Yellowstone Snowmobile Education Certification Program would be based on an existing snowmobile education program, such as International Snowmobilers Manufacturing Association SafeRider! Program (www.snowmobilers.org), but would be tailored with information specific to Yellowstone National Park. Participants would be charged a per person course fee. The Yellowstone Snowmobile Education Certification Program would emphasize that operating a snowmobile in Yellowstone National Park is a privilege, and that compliance with park rules and regulations and responsible and safe ridership are the responsibility of the snowmobile operator. Other components of the program would likely include rules and regulations of the park, park values and environmental education, required documentation (documentation of course completion, entrance permit, valid state-issued motor vehicle driver's license, and snowmobile registration and insurance), courtesy and ethics when encountering wildlife and other visitors, safety and emergency protocol, accident causes and mitigation techniques, road conditions, snowmobile operations, and mechanical repair. Education components would be reinforced during the onsite orientation session on the day of the trip, and hands-on snowmobile operating training would be provided to all trip participants.

Non-commercially Guided Snowmobile Access Program Rules and Regulations

A. All park rules and regulations are in effect for non-commercial trips.

B. All snowmobiles must be registered and insured and must meet BAT requirements in place at the time of the trip.

C. All non-commercial snowmobile operators must possess and carry a valid state-issued driver's license.

D. All non-commercial snowmobile operators must be in possession of a valid state-issued driver's license and must have successfully completed the Yellowstone Snowmobile Education Certification Program and be in possession of a Yellowstone Snowmobile Education Certificate Card.

E. All group members must be present for the on-site orientation on the morning of the trip. Trips are required to check-in with NPS staff by a predetermined time the morning of the trip.

F. Non-commercial guides must be at least 18 years of age by the first day of their trip.

G. Each non-commercial guide can lead up to two trips per winter season. In the event that an alternate non-commercial guide replaces a non-commercial guide, all non-commercial guide requirements would be transferred to the alternate non-commercial guide.

H. Non-commercial Snowmobile Access Permits are nontransferable except as provided for alternate non-commercial guides as explained above. Non-commercial guides or their alternates must be present for the duration of their scheduled trip.

I. Non-commercial guides would be allowed to start their trips as planned, pass their trips to the alternate non-commercial guide, or cancel a given trip. Deferment and/or swapping of entrance gate or dates is not allowed. It is the non-commercial guide's responsibility to notify Yellowstone National Park if unable to use his or her scheduled date(s). The non-commercial guide must have their successful lottery paperwork in their possession the morning of the trip.

J. Fees and deposits are due at the time specified below and are non-refundable.

K. Non-commercial guides may allow for changes in their group on the day of a trip provided that all snowmobile operators have successful completed the Yellowstone Snowmobile Education Certification Program and are in possession of their certificate of completion, possess a valid state-issued driver's license, and are listed on the trip participant sheet turned into the NPS ranger at the gate.

Estimated Non-commercially Guided Snowmobile Trip Expenditures

Component	Cost	Payment Due
Lottery Application Fee	Anticipated to be ~$10.00/season	At time of lottery application
Lottery Selection Fee	Anticipated to be ~$10.00/group/trip	At time of lottery award (permit awarded)
Yellowstone Snowmobile Education Certificate Program	Anticipated to be ~$10.00/operator	At time of course initiation
Gate Entrance Fee	Consistent with standard park entrance fee structure	At the entrance gate

Non-commercially Guided Snowmobile Access Program Trip Requirements

A. Non-commercial Guide Responsibilities—Non-commercial guides must comply with all portions of the permit application procedure and are directly responsible for the actions of his/her party. Failure to adhere to any of these trip requirements or program rules and regulations, either by a non-commercial guide or a member of his or her party, may result in revocation of the permit and/or future eligibility as a non-commercial guide, citation of the non-commercial guide and/or members of the group, and possible administrative decision that may affect future access to Yellowstone National Park in the winter by non-commercially guided snowmobiles.

B. Accessible Documentation—An NPS ranger may, on occasion, travel with non-commercial groups in order to ensure compliance with permit conditions. Rangers may contact a given party and request information such as a copy of a non-commercial guide's permit and passenger list.

C. Trip Size—Individual non-commercial trips shall carry no more than 10 persons on a maximum of five snowmobiles. It is not permissible to split up the trip at any point other than in an emergency.

D. Check In—Each group must check in at the assigned entrance station by a specified time.

E. Maximum Stay—To be determined during development of the program with interested stakeholders.

F. Accidents—Accidents must be reported to the contract holder and involving groups operating private snowmobiles must be reported directly to the NPS.

G. Pets—No cats, dogs, or other pets are permitted on a non-commercially guided snowmobile trips.

H. Resource Protection—Natural or historical features such as rocks, old mining artifacts, fossils, flowers, or Indian artifacts may not be removed or disturbed (36 CFR 2.1).

I. Non-commercial guides and all members of their group must adhere to all park rules and regulations.

Hypothetical Scenario for Individuals Wishing to Enter Yellowstone National Park in winter via Non-commercially Guided Snowmobile (without a commercial snowmobile guide)

1. Individuals create a profile on to-be-determined website and apply for a specific gate and entry date range. Once the annual lottery is open, it would be continuously open through the last day of the winter season (typically March 15). Post-lottery, the website would electronically notify all applicants of their selection and send trip information to NPS. Non-commercial guides are responsible for confirming their trip with park personnel responsible for oversight of the program. If desirable, individuals can specify an alternative non-commercial guide.
2. When selected for their chosen gate and dates, all snowmobile operators in the group must successfully complete the Yellowstone Snowmobile Education Certification Program prior to the first day of the trip.
3. Upon successful completion of the Yellowstone Snowmobile Education Certificate Program, the NPS would send group members certification of successful completion and an electronic pre-trip orientation package. The NPS would work with lottery winners to ensure that all necessary paperwork is in place prior to the day of the trip.

4. On the day of the trip, the non-commercial guide would ensure that all snowmobiles in their trip are BAT compliant and that all snowmobile operators are in possession of a valid state-issued driver's license and a Yellowstone Snowmobile Education Certification Card.
5. At the park entrance gate, an NPS ranger would check that snowmobiles are BAT compliant and that all members possess the necessary safety equipment and required documentation. The NPS ranger would conduct an on-site orientation session for all members of the group to reinforce components of the Yellowstone Snowmobile Education Program and familiarize all members of the group with operating a snowmobile.
6. Non-commercial guides /alternate non-commercial guides and their group, in possession of all required documentation and safety materials, may enter the park.

APPENDIX D: WINTER USE COLLABORATIVE ADAPTIVE MANAGEMENT AND MONITORING FRAMEWORK

This appendix provides additional detail to the discussion in chapter 2 regarding adaptive management. It describes the final Winter Use Plan / Supplemental Environmental Impact Statement (plan/SEIS) collaborative adaptive management framework and how new information collected over time may result in changes to future winter use management. This framework will be applied to the selected alternative. For this discussion, the adaptive management framework assumes the selected alternative will be alternative 4, the preferred alternative identified in the plan/SEIS.

The long-term adaptive management strategy described in this appendix will provide a structured process, involving the public and interested stakeholders, to continually evaluate the effectiveness of the winter use plan and seek to provide information to inform uncertainties and improve management over time. Engagement of the public in the development of the winter use adaptive management plan is necessary for the ultimate success of the program.

The National Park Service (NPS) has identified three main objectives for long-term adaptive management:

1. To ensure that the impacts of oversnow vehicles (OSVs) use remain within the range predicted under the preferred alternative in this plan/SEIS.
2. To gather additional data regarding the comparability of impacts from a group of snowmobiles versus a snowcoach.
3. To reduce impacts on park resources after implementation of the selected alternative, by gathering additional data regarding the overall impacts of winter use and using those data to guide future management decisions.

As described briefly in chapter 2, adaptive management is a management tool. It allows decision-makers to acknowledge the uncertainties surrounding the management of natural systems and helps natural resource managers respond to resource or system conditions over time through the collection and evaluation of additional information. The knowledge that uncertainties exist provides managers the ability to consider them in their planning and allows for the latitude to modify actions to progress towards desired outcomes. Adaptive management has the potential to improve a manager's understanding of ecological systems to better achieve management objectives.

The focus of this program is on learning with the ultimate goal of the effort to continuously improve management. In order for adaptive management to be successful, stakeholders need to be engaged during the formulation of the initial problem and remain engaged throughout implementation (Williams et al. 2009). The collaborative adaptive management and monitoring framework described in this appendix includes an initial outreach in the summer of 2013, during which the NPS will work with stakeholders in developing a long-term, sustainable adaptive management plan for winter use management in Yellowstone National Park.

INITIAL YELLOWSTONE WINTER USE ADAPTIVE MANAGEMENT MONITORING PROCESS

The NPS recognizes that despite eight seasons of managed use there are still uncertainties surrounding how resources will respond to OSV use management and the effects to the visitor experience and

continual room to improve management in a manner that considers visitor experience and seeks to reduce environmental impacts. Table 1 below identifies some of the affected resources, indicators, and monitoring methods that may be used to collect baseline, or pre-project, data during the first two seasons of implementation (the transition year between the use levels allowed for the past three seasons and implementation of the new transportation event management framework, and the first year of implementation of transportation event management). Before this initial approach is implemented, the park will convene meetings with stakeholders to begin development of a long-term stakeholder-driven adaptive management plan for winter use in Yellowstone National Park. The approach for developing the long-term plan is described below.

Table 1 outlines an example monitoring framework that may be implemented during the 2013/2014 and 2014/2015 seasons. Several affected resources are identified, as well as potential indicators that would be used to assess changes in those resources. Information collected during these seasons, in combination with data collected over the previous four seasons which allowed use at the 2009-2013 Interim Regulation level will allow a baseline to be established and can be used to help refine monitoring methods for the long-term plan through understanding of natural variability.

TABLE 1: EXAMPLES OF ADAPTIVE MANAGEMENT MONITORING AFFECTED RESOURCE, INDICATOR, AND MONITORING METHOD IDENTIFICATION

Affected Resource	Indicator	Preliminary Monitoring Methods
Air Quality at the West Entrance and Old Faithful	Levels of: CO, PM_{10}, and NO_2	Fixed site monitoring for CO, PM_{10}, and NO_2
Soundscape directly adjacent to park roads	Audibility: decibel levels (dBA) in terms of magnitude and duration (constant sound level or L_{eq}) sound is audible over an 8-hour period.	Could include audibility logging, digital recordings, and sound pressure level measurement
Visitor Experience	Satisfaction	Visitor survey (pending OMB approval)
Wildlife on or near roads	Wildlife behavioral responses to OSV use	Observational studies
Health and Safety of OSV travelers	Number and severity of reported incidents	Incident reports regarding OSV use

FUTURE LONG-TERM ADAPTIVE MANAGEMENT STRATEGY

A focused, stakeholder-involved, collaborative approach will help to refine and set long-term adaptive management objectives to guide future winter use actions. As part of this process, stakeholders and the public will be engaged to ensure the park fully understands key issues and concerns and to work collaboratively on developing a suite of appropriate metrics to monitor impacts and reduce key uncertainties. Although there is often a desire to monitor many resource indicators, the adaptive management plan will focus on key uncertainties that if reduced, would allow for improved winter use management. The NPS is committed to implementing this adaptive management strategy, and plans to hire a position, stationed at the park, to oversee development and initial implementation of the long-term adaptive management strategy.

Based on the results of the initial collaborative workshops, a monitoring plan will be developed to evaluate the conditions of identified resources and associated metrics. The results would be analyzed on an annual basis. Based on the results, the NPS may adjust winter use management in order to better protect park resources and improve visitor experiences. Monitoring results may also suggest that other metrics may need to be evaluated, or alterations to the way resources are monitored should be made. If such situations arise, the NPS will seek additional stakeholder input.

The NPS proposes to convene an adaptive management working group during the summer of 2013, present a draft adaptive management plan in the fall of 2013 with pilot projects to develop/refine sampling protocols, and implement a preliminary final adaptive management plan in the winter of 2014/2015. All interested parties will be encouraged to join the collaborative adaptive management meetings. Upon completion of the long-term adaptive management plan, the park will hold regularly scheduled stakeholder meetings to discuss data and findings, and obtain feedback from stakeholders on recommendations. The NPS will also develop a website to serve as an information portal for the winter use adaptive management and monitoring program.

Future Management Actions

Results of monitoring may influence future changes in management. As park resources respond to OSV use levels and associated impacts, the NPS may find it advisable or necessary to reduce OSV use levels or the manner in which OSVs are managed (such as locations, timing, guiding requirements, non-commercial guiding, temporal spacing, etc.). These potential decisions will be based on the monitoring data and the progress of meeting specific adaptive management decision-making triggers that will be refined with stakeholder input. While the park may take any of the actions listed below in response to the monitoring data collected, the park could not, under any scenario, authorize more than 110 transportation events (the maximum number of events evaluated under the preferred alternative in the EIS) through adaptive management, unless additional National Environmental Policy Act (NEPA) compliance is completed and changes to the winter use regulation for the park are made. Potential future actions could include

- Requiring lower-emission (noise or air) technologies for OSVs;
- Reducing sum numbers of daily OSV events permitted;
- Reducing average of maximum number of OSVs per transportation event;
- Adjusting the ration of snowcoach and snowmobile transportation events (however, no more than 50 transportation events would be allocated to snowmobiles under any scenario as described under the preferred alternative);
- Establishing timed-entry requirements or staging at the entrance gates for OSVs;
- Adjusting speed limits;
- Adjusting OSV speed limits in travel corridors or developed areas;
- Adjusting OSV entry protocols at entrance stations;
- Phasing out the use of specific technologies or models, which could include limits on the sizes/widths of snow coaches;
- Increasing recreational and educational opportunities for visitors;
- Increasing or decreasing event allowances for non-commercial guiding or discontinuing the non-commercially guided snowmobile access program entirely;
- Closing certain OSV areas, routes, or entrances; and
- Modifying the time periods during which OSVs are allowed to be used on certain segments of roads.

As noted above, the NPS has identified three main objectives for long-term adaptive management. For two of those objectives—continuing to assess the comparability of impacts from a group of snowmobiles

versus a snowcoach and continuing to improve the condition of park resources—the NPS would have discretion as to when changes to management are undertaken. However, for the first objective—ensuring impacts are within the range predicted in under the preferred alternative in the EIS—a change to management would be mandatory; actions would be taken if monitoring indicates an impact has exceeded the intensity level (minor, moderate, major) predicted under the preferred alternative in the EIS. For example, if the EIS predicts that OSV use would have a minor effect for a given resource, as defined by the intensity definitions, and monitoring data indicates that the effects are actually crossing into what the intensity definitions define as a moderate effect, the park would act as soon as practicable to adjust use so that the impacts are reduced to minor. The NPS notes that for the preferred alternative, all impacts have been assessed at the minor level, except for impacts to wildlife, which are expected to be moderate, and air quality, where NO_2 emissions are expected to be moderate. No major adverse impacts are predicted under the preferred alternative. The mandatory portion of the adaptive management framework would ensure that over the long-term, no major adverse impacts to park resources would be allowed from OSV use.

Furthermore, for impacts to soundscapes and air quality, where there are quantitative modeling data, the NPS would strive to keep actual levels at or near the specific levels predicted under the preferred alternative in the EIS. For example, for air quality, the intensity definitions define a moderate impact as a pollutant reaching between 51 and 79 percent of the National Ambient Air Quality Standards (NAAQS). If a given pollutant is predicted under the preferred alternative in the EIS to reach 52 percent of the NAAQS, and monitoring indicates it is actually reaching a higher level but not exceeding 79 percent, NPS could take action at that point to reduce the level of that pollutant to the level predicted under the preferred alternative in the EIS.

The management actions listed above have been described and their potential impacts have been analyzed in this plan/SEIS and previous NEPA documents that have been incorporated by reference. Therefore, only a streamlined environmental review may be necessary if the park determines it necessary to adjust its management in the future. Management changes that would conflict with the associated Record of Decision (ROD) for this plan/SEIS may necessitate the need for a new NEPA review and potentially, changes to the associated rule.

NEPA Review

Once it is determined that a potential future management action is necessary or desirable to better achieve adaptive management objectives, an initial environmental screening process will be conducted to determine what, if any, additional environmental compliance may be required. Through this screening process, the NPS will document whether adaptive management adjustments, both individually and cumulatively, are (1) within the range of management actions described for the selected alternative, and (2) fully analyzed in the environmental effects section of this NEPA analysis or those incorporated by reference. The following questions will be used to evaluate if the winter use plan/SEIS and documents incorporated by reference have adequately analyzed impacts for proposed adjustments to winter use management:

- Is the change to the selected action in the ROD a feature of, or essentially similar to, an action or alternative analyzed in the existing NEPA documents? Is the action within the same analysis area, or if the project location is different, are the geographic and resource conditions sufficiently similar to those analyzed in the existing NEPA documents? If there are differences, are they substantial?
- Is the range of alternatives analyzed in the existing NEPA documents appropriate with respect to the new proposed actions, given current environmental concerns, interests, and resource values?

- Is the existing analysis valid in light of any new information or circumstances? Can it be concluded that new information and new circumstances would not be significant as they relate to environmental concerns?
- Are the direct, indirect, and cumulative effects that would result from implementation of the new proposed actions similar (both quantitatively and qualitatively) to those analyzed in the existing NEPA document?
- Does the proposed action alter the conclusions of the no impairment analysis accompanying the Record of Decision?

Some management changes could be implemented quickly, as they would be within the scope of the selected alternative and their impacts will have been adequately assessed. However, other actions may require additional environmental review and/or rulemaking prior to implementation.

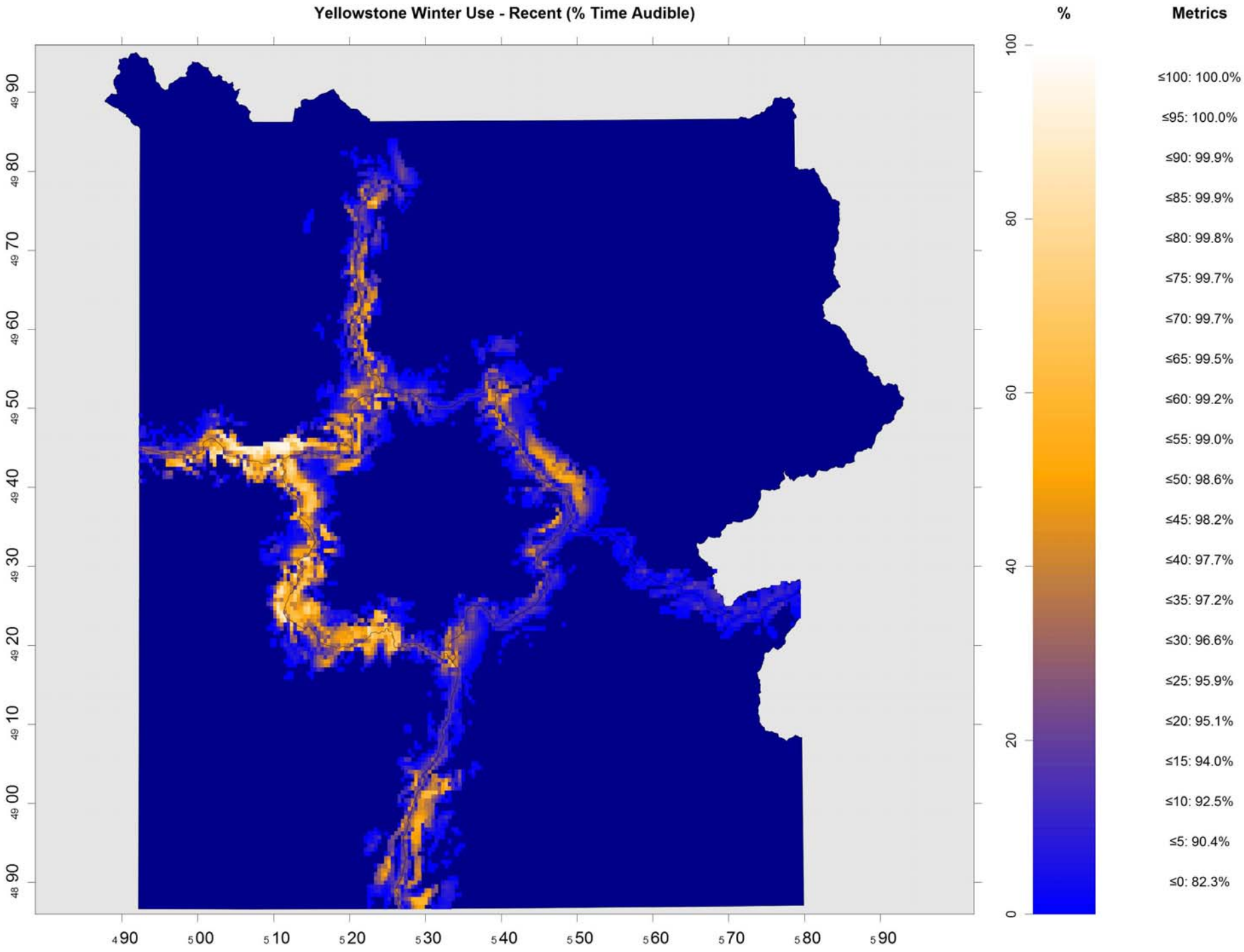
In addition to the stakeholder involvement as part of the adaptive management framework, the appropriate level of public and stakeholder involvement and notification of any proposed changes would occur based on the level of environmental analysis required.

APPENDIX E: SOUNDSCAPES MODELING MAPS

List of Contents

- Percent Time Audible (TAUD) maps
- Audible L_{eq} maps
- Peak 4 maps
- All metrics (composite of TAUD, audible L_{eq} and peak 4) maps
- 8-hour L_{eq}—mapping of 8-hour L_{eq} using the travel corridor and backcountry intensity definition categories

SEIS Alternative	Fleet Assumption	Soundscapes Modeling Run Name
Existing Average Conditions (2009-2011)	Current Fleet	Recent
Alternative 1: No Snowmobile/Snowcoach Use	Administrative Use, Current Fleet	Alt1
Alternative 2: Continue Snowmobile/Snowcoach Use at 2012/2013 Winter Season Interim Regulation Limits	Current Fleet	Alt2r1
	BAT Snowcoaches	Alt2r2
Alternative 3: Transition to Best Available Technology (BAT) Snowcoaches Only	BAT Snowcoaches, No Snowmobiles	Alt3
Alternative 4a: Manage OSV Use by Transportation Events (480 snowmobiles/60 snowcoaches)	Current Fleet	Alt4Ar1
	BAT Snowcoaches and Snowmobiles (new smb BAT 67 dBA and BAT sc 75 dBA)	Alt4Ar2
Alternative 4b: Manage OSV Use by Transportation Events (0 snowmobiles/110 snowcoaches)	Current Fleet	Alt4Br1
	BAT Snowcoaches and Snowmobiles (new smb BAT 67dBA and BAT sc 75dBA)	Alt4Br2
Alternative 4c: Manage OSV Use by Transportation Events (480 snowmobiles, 120 snowcoaches)	Enhanced BAT for Snowcoaches (71 dBA) and New BAT for Snowmobiles (67 dBA)	Alt4Cr1
	Enhanced BAT for Snowcoaches (71 dBA) and Snowmobiles Voluntarily Quieter than BAT (65 dBA)	Alt4Cr2
Alternative 4d: Manage OSV Use by Transportation Events (0 snowmobiles/220 snowcoaches)	Enhanced BAT for Snowcoaches (71 dBA) and New BAT for Snowmobiles (67 dBA)	Alt4Dr1
	Enhanced BAT for Snowcoaches (71 dBA) and Snowmobiles Voluntarily Quieter than BAT (65 dBA)	Alt4Dr2


Yellowstone Winter Use - Recent (% Time Audible)
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≤90: 99.9%
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≤75: 99.7%
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≤65: 99.5%
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≤25: 95.9%
≤20: 95.1%
≤15: 94.0%
≤10: 92.5%
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≤0: 82.3%
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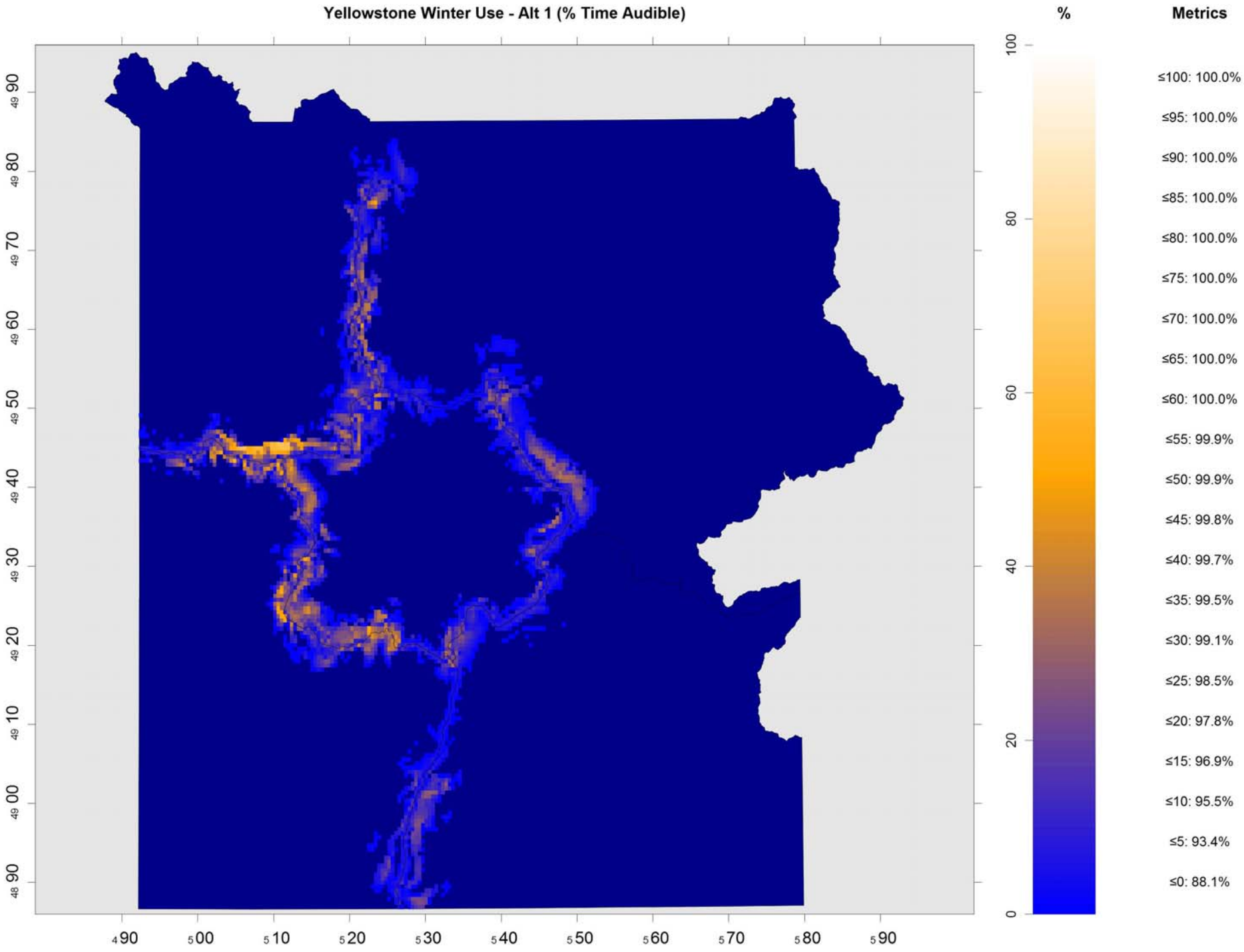
Yellowstone Winter Use - Alt 1 (% Time Audible)
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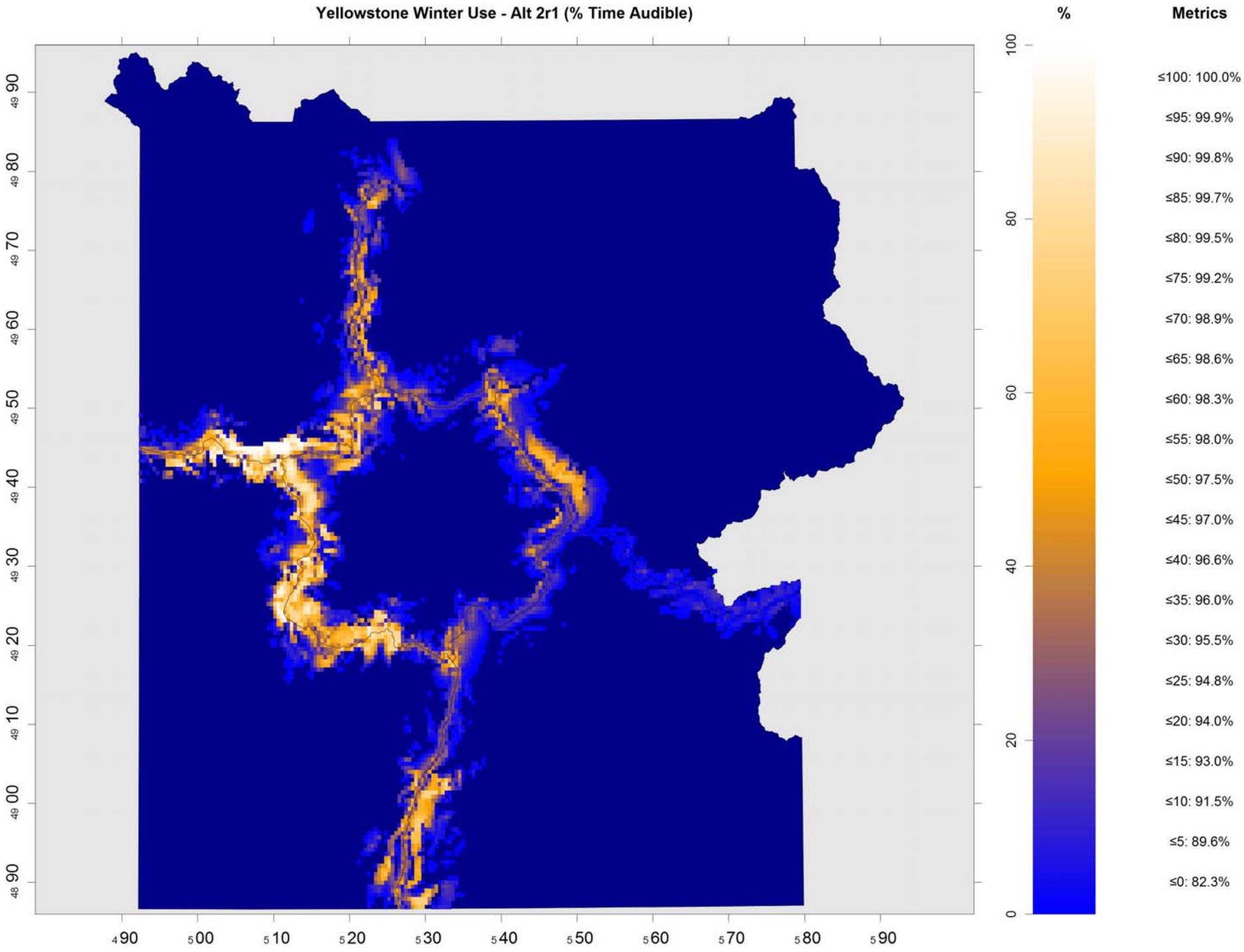
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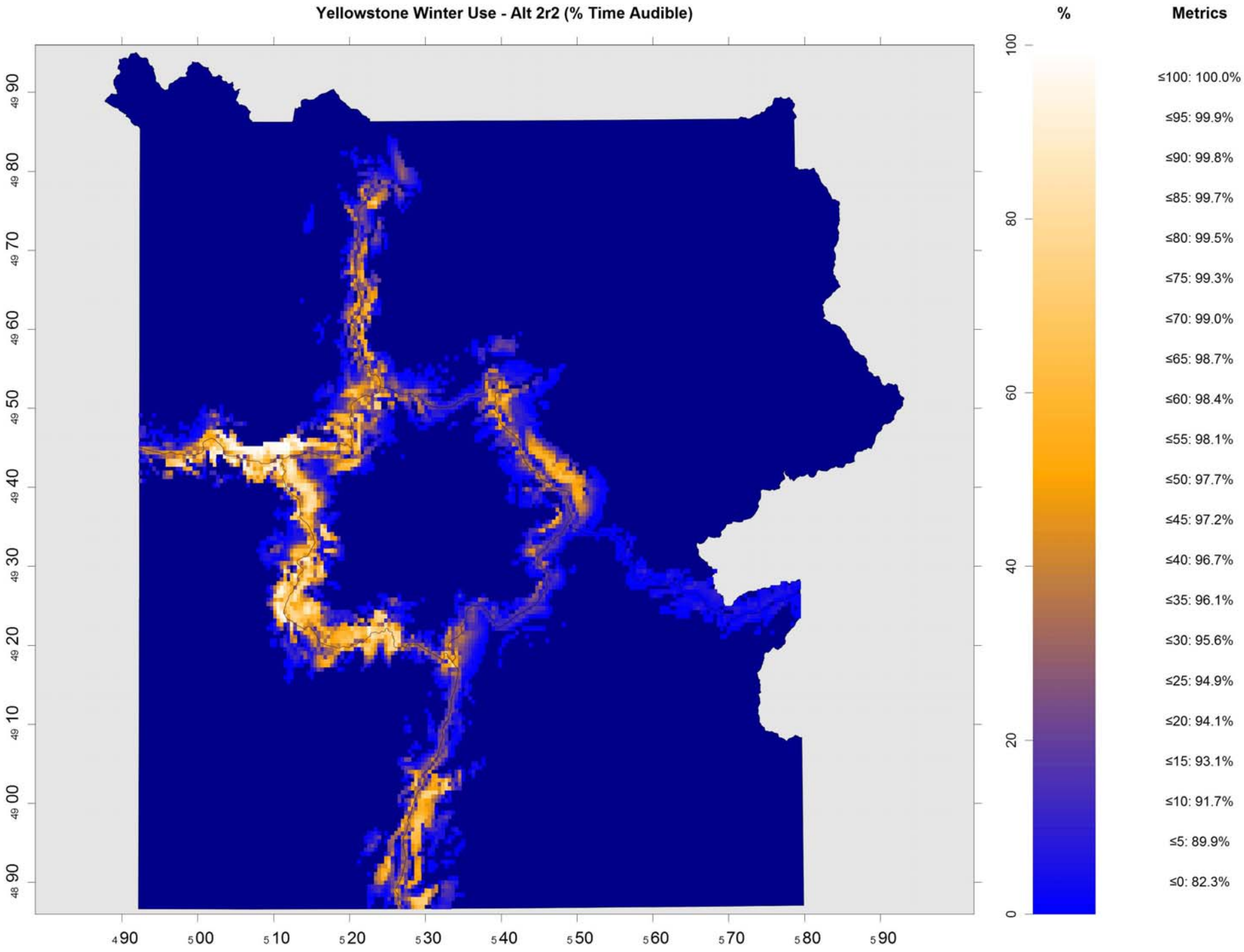
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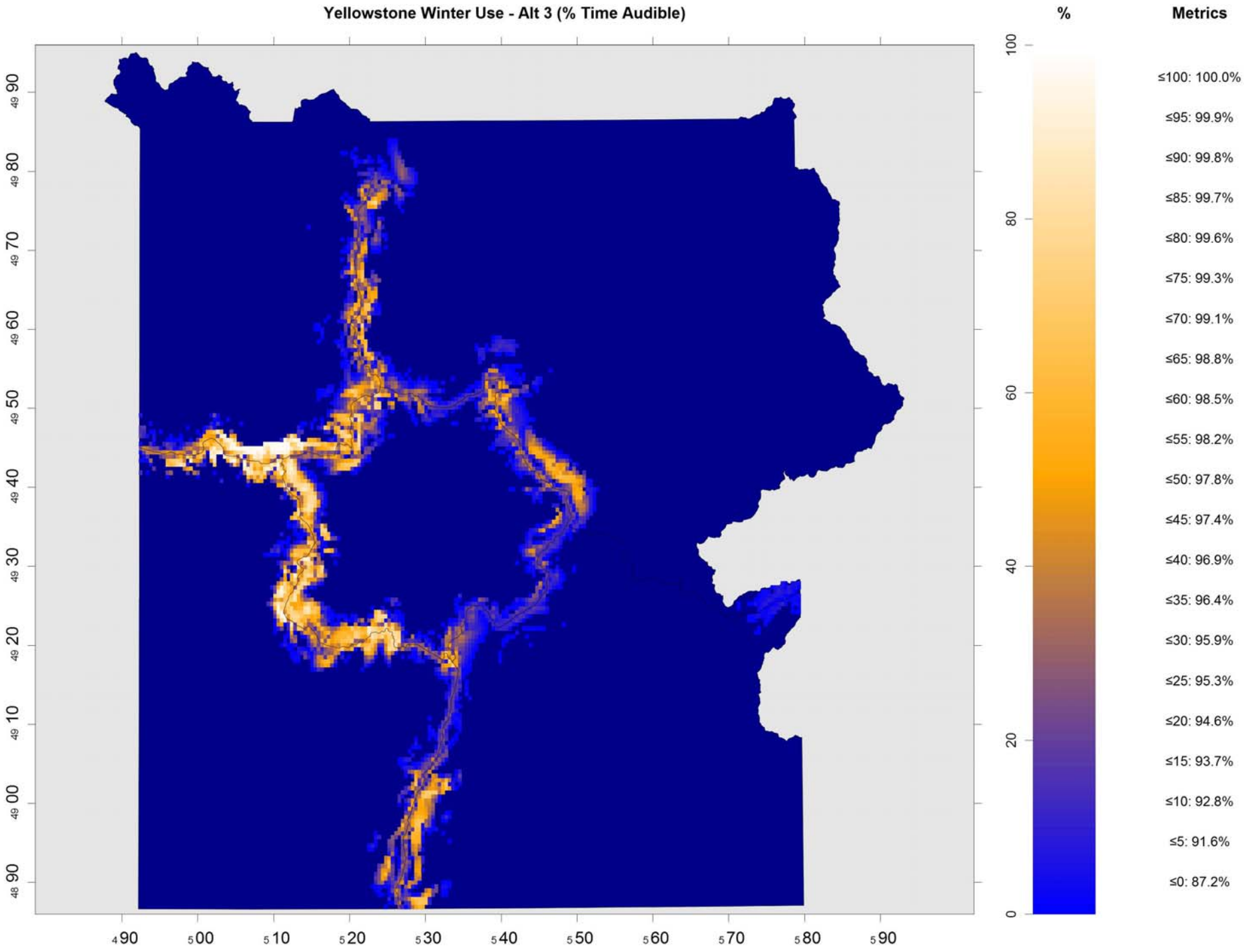
Yellowstone Winter Use - Alt 3 (% Time Audible)
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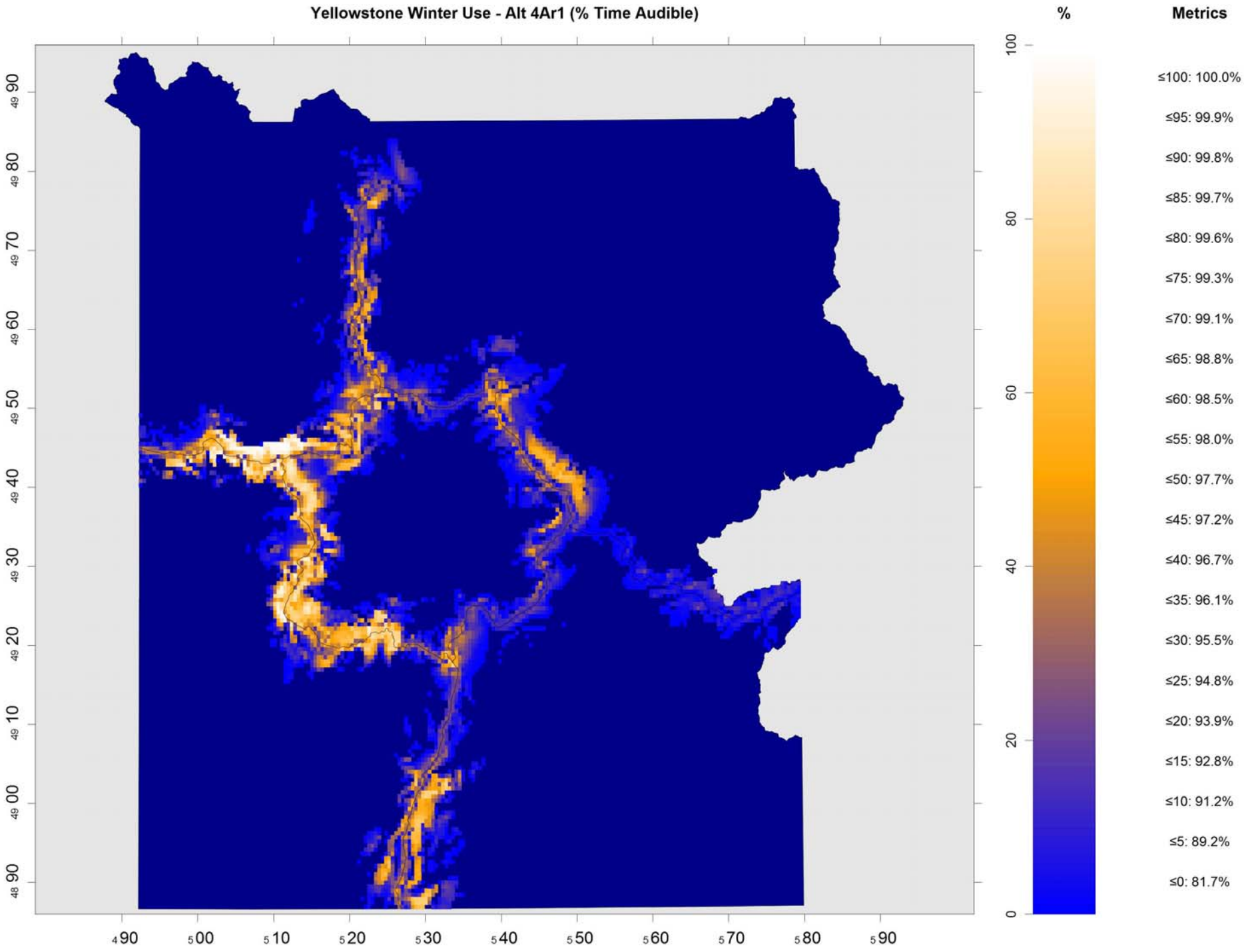
Yellowstone Winter Use - Alt 4Ar1 (% Time Audible)
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5 90
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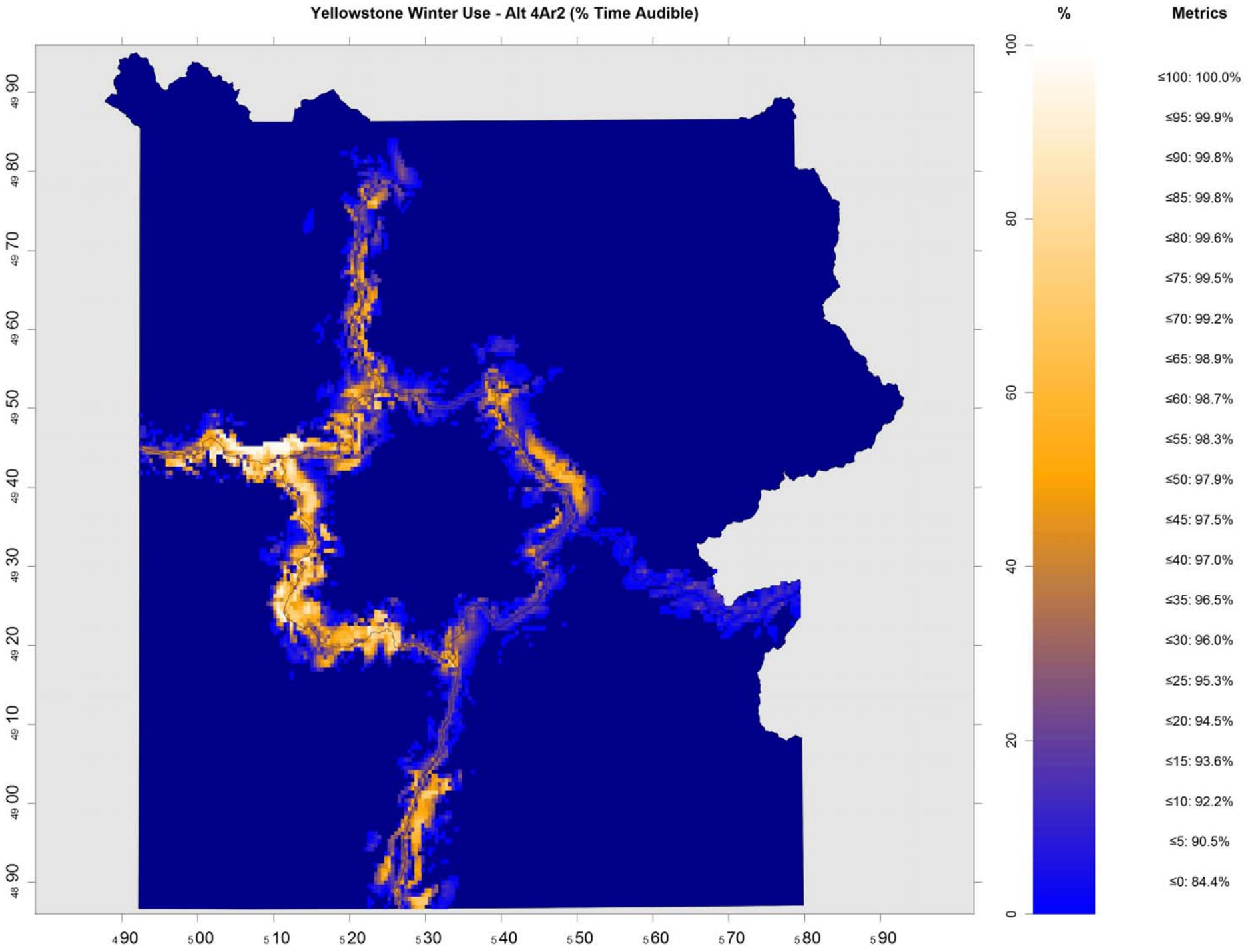
Yellowstone Winter Use - Alt 4Ar2 (% Time Audible)
%
Metrics
100
80
60
40
20
0
≤100: 100.0%
≤95: 99.9%
≤90: 99.8%
≤85: 99.8%
≤80: 99.6%
≤75: 99.5%
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≤40: 97.0%
≤35: 96.5%
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≤15: 93.6%
≤10: 92.2%
≤5: 90.5%
≤0: 84.4%
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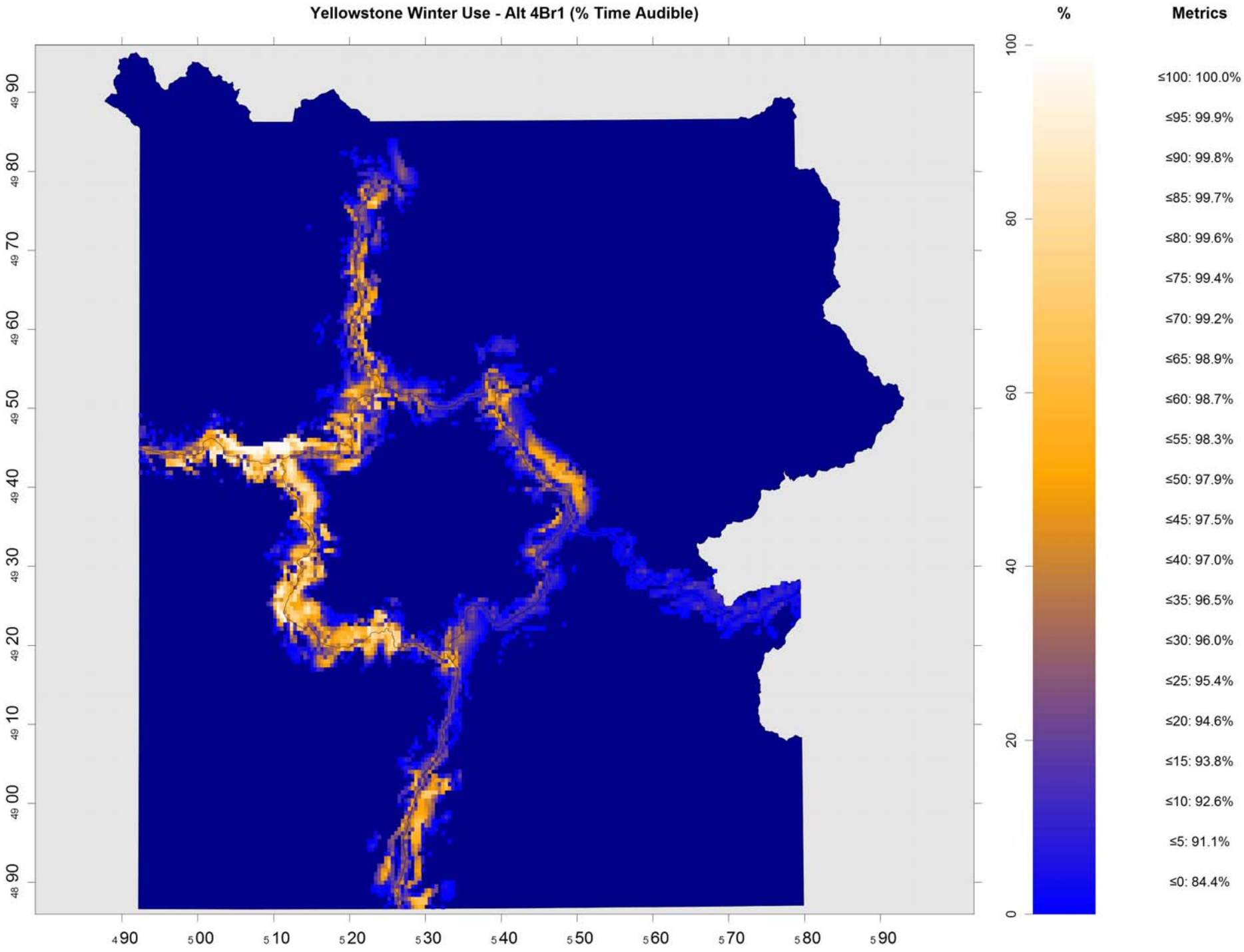
48 90


Yellowstone Winter Use - Alt 4Br1 (% Time Audible)
%
Metrics
100
80
60
40
20
0
≤100: 100.0%
≤95: 99.9%
≤90: 99.8%
≤85: 99.7%
≤80: 99.6%
≤75: 99.4%
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≤65: 98.9%
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≤45: 97.5%
≤40: 97.0%
≤35: 96.5%
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≤25: 95.4%
≤20: 94.6%
≤15: 93.8%
≤10: 92.6%
≤5: 91.1%
≤0: 84.4%
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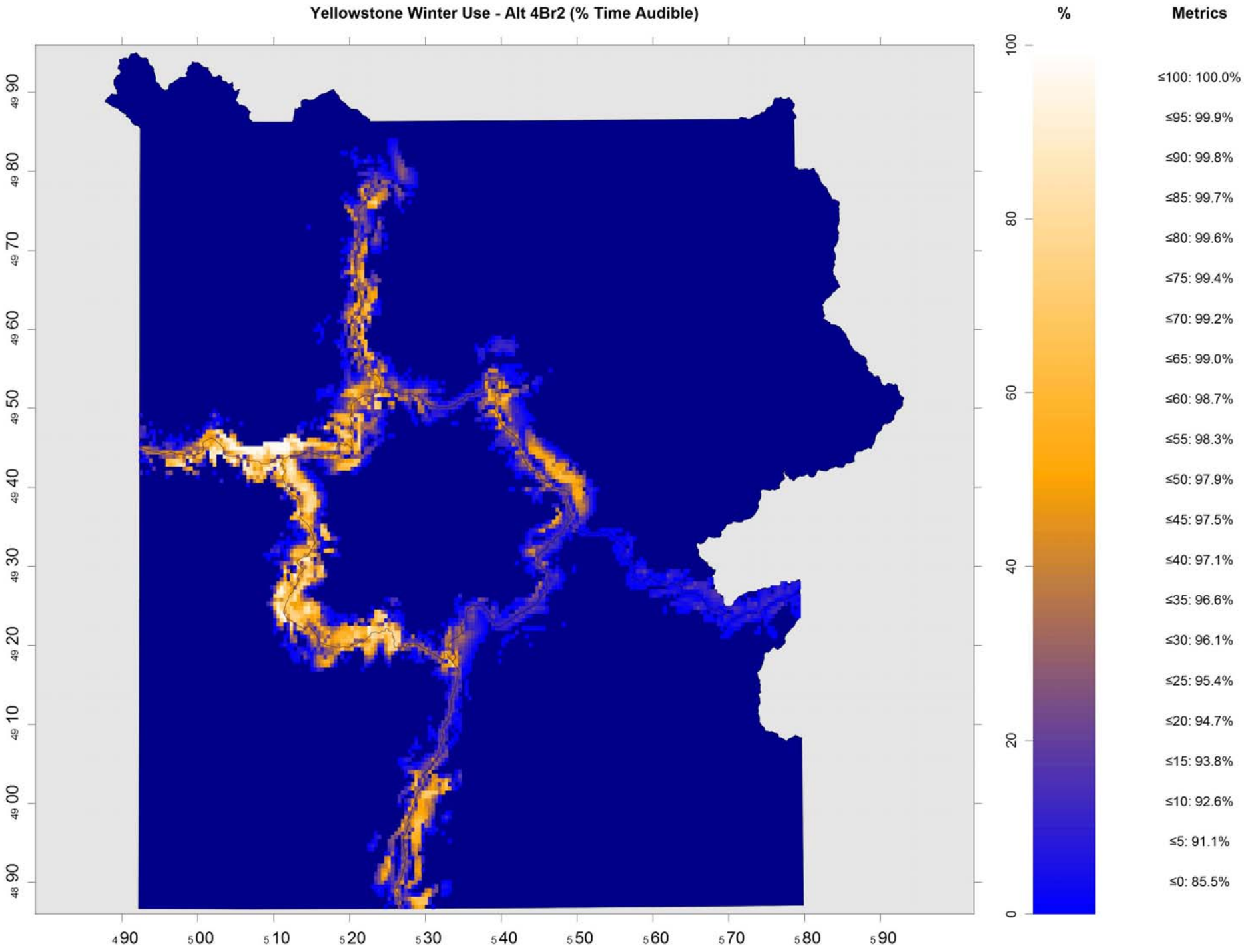
Yellowstone Winter Use - Alt 4Br2 (% Time Audible)
%
Metrics
100
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≤100: 100.0%
≤95: 99.9%
≤90: 99.8%
≤85: 99.7%
≤80: 99.6%
≤75: 99.4%
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≤0: 85.5%
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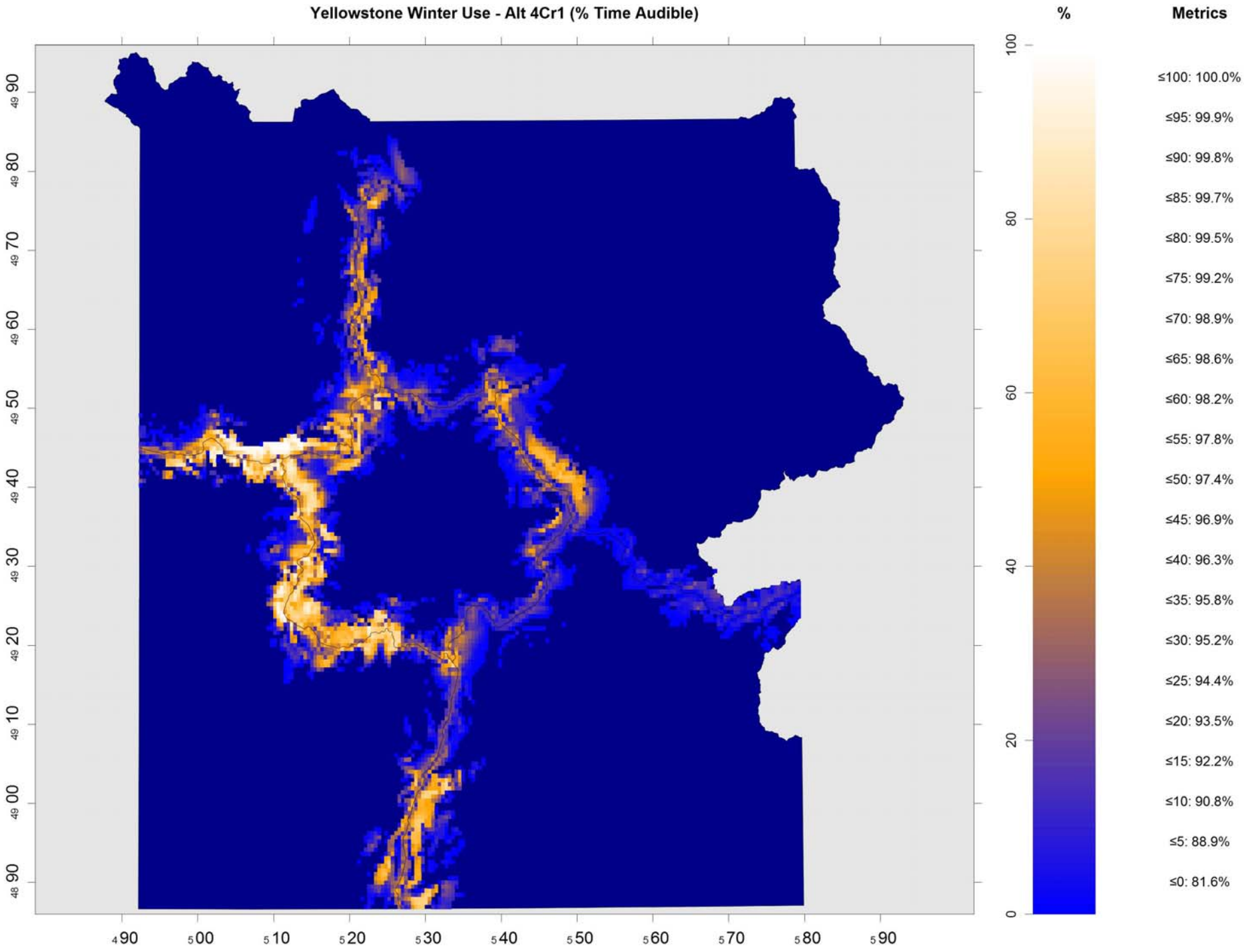
Yellowstone Winter Use - Alt 4Cr1 (% Time Audible)
%
Metrics
100
80
60
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≤100: 100.0%
≤95: 99.9%
≤90: 99.8%
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≤5: 88.9%
≤0: 81.6%
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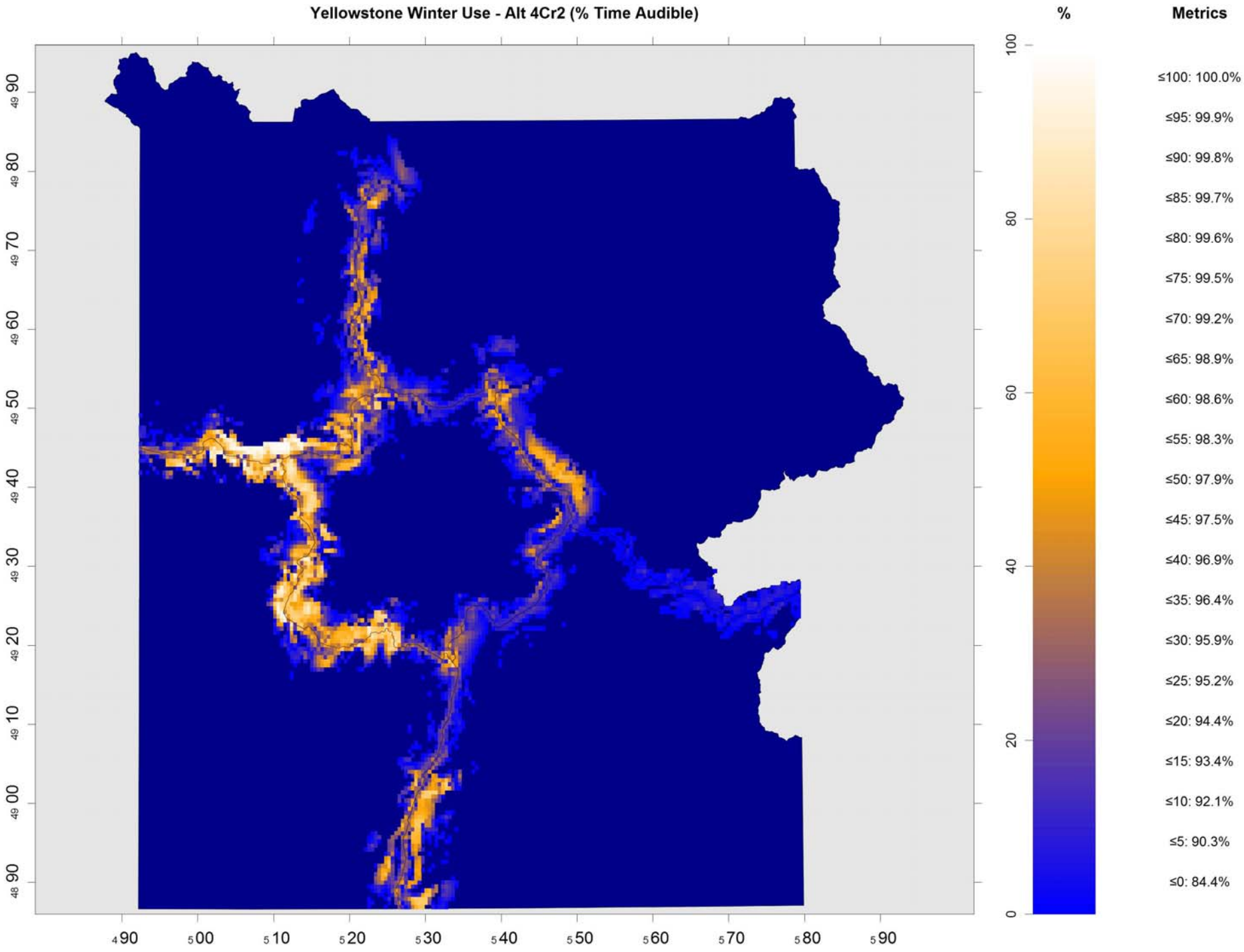
Yellowstone Winter Use - Alt 4Cr2 (% Time Audible)
%
Metrics
100
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≤100: 100.0%
≤95: 99.9%
≤90: 99.8%
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≤15: 93.4%
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≤5: 90.3%
≤0: 84.4%
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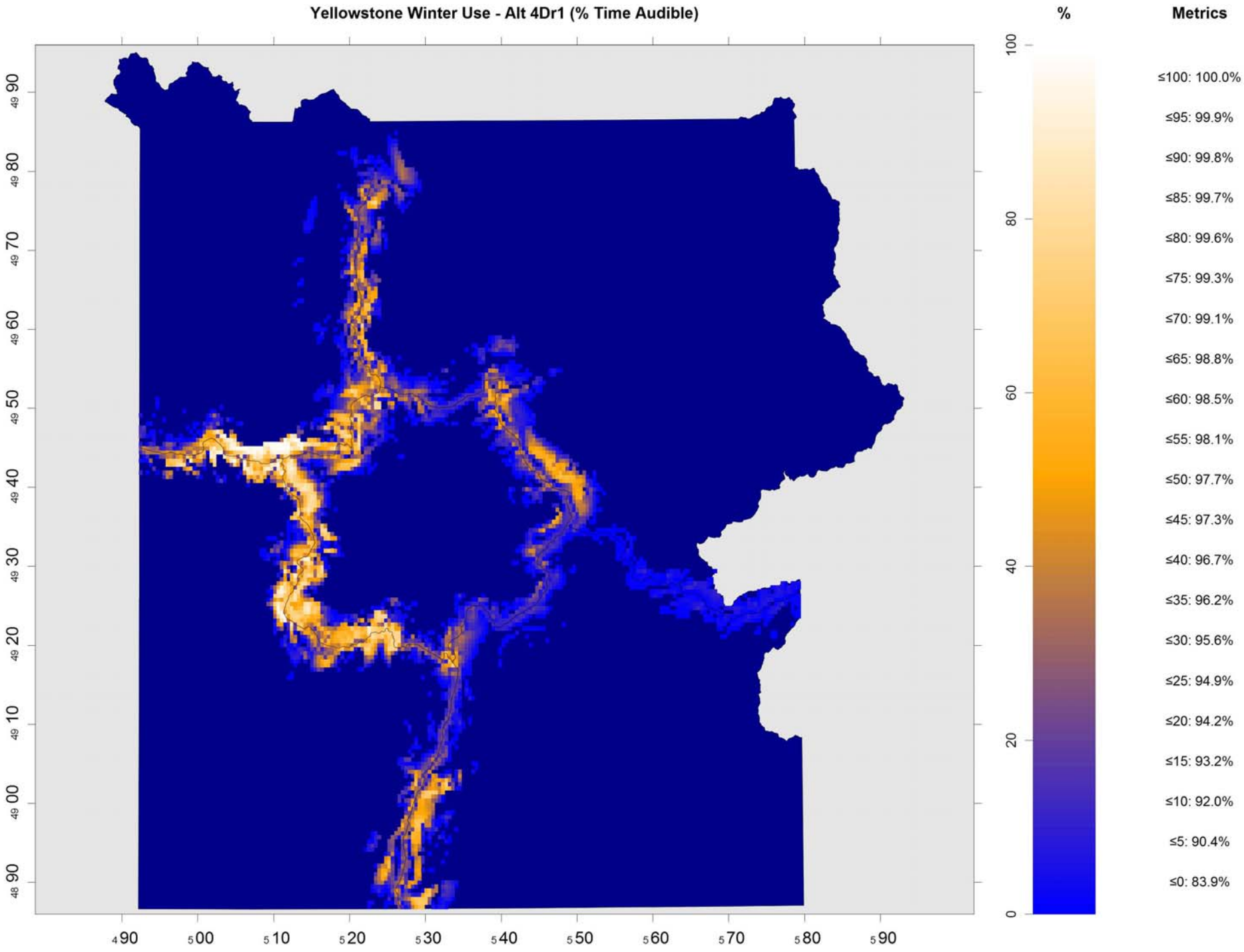
Yellowstone Winter Use - Alt 4Dr1 (% Time Audible)
%
Metrics
100
80
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≤100: 100.0%
≤95: 99.9%
≤90: 99.8%
≤85: 99.7%
≤80: 99.6%
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≤20: 94.2%
≤15: 93.2%
≤10: 92.0%
≤5: 90.4%
≤0: 83.9%
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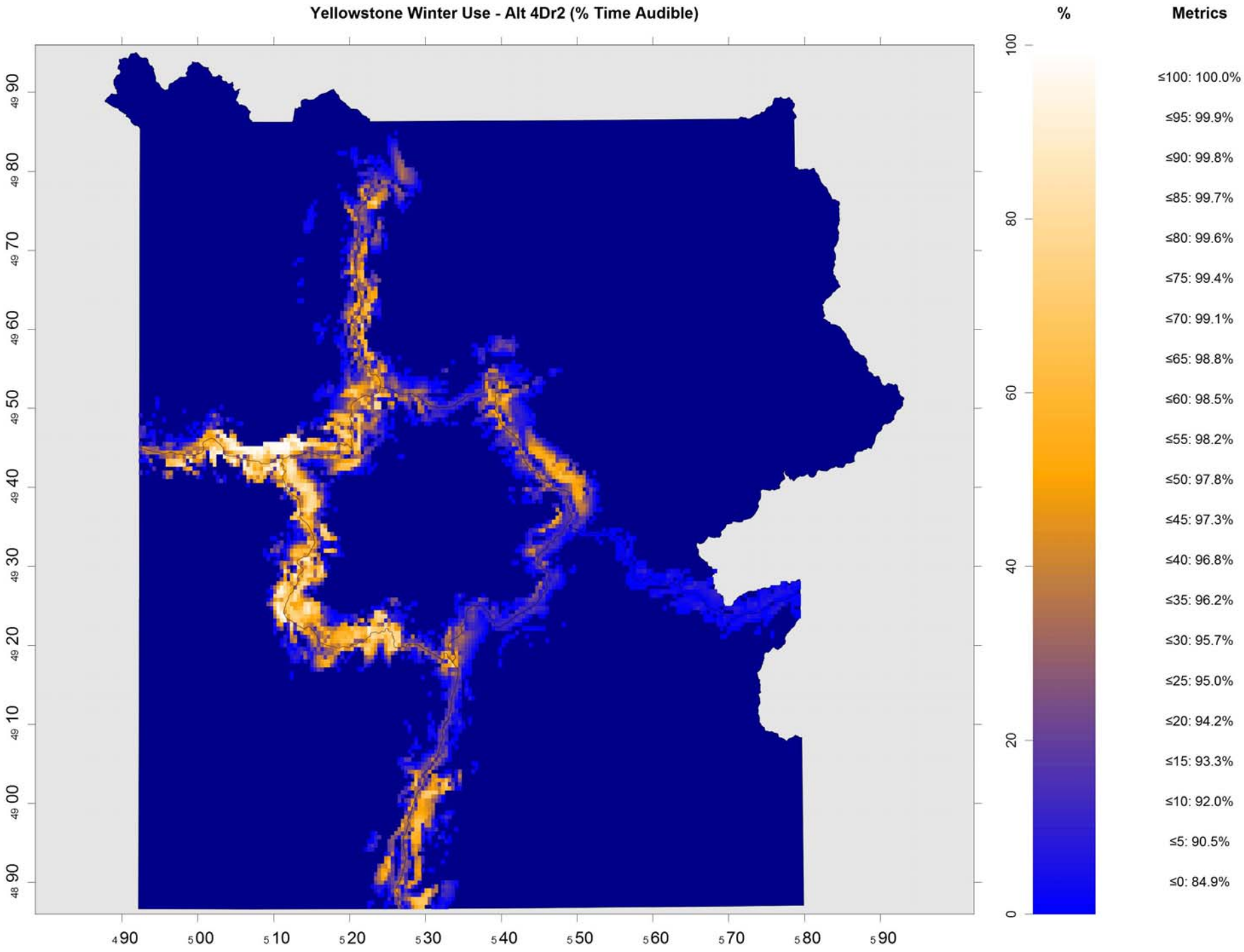
Yellowstone Winter Use - Alt 4Dr2 (% Time Audible)
%
Metrics
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≤100: 100.0%
≤95: 99.9%
≤90: 99.8%
≤85: 99.7%
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≤25: 95.0%
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≤10: 92.0%
≤5: 90.5%
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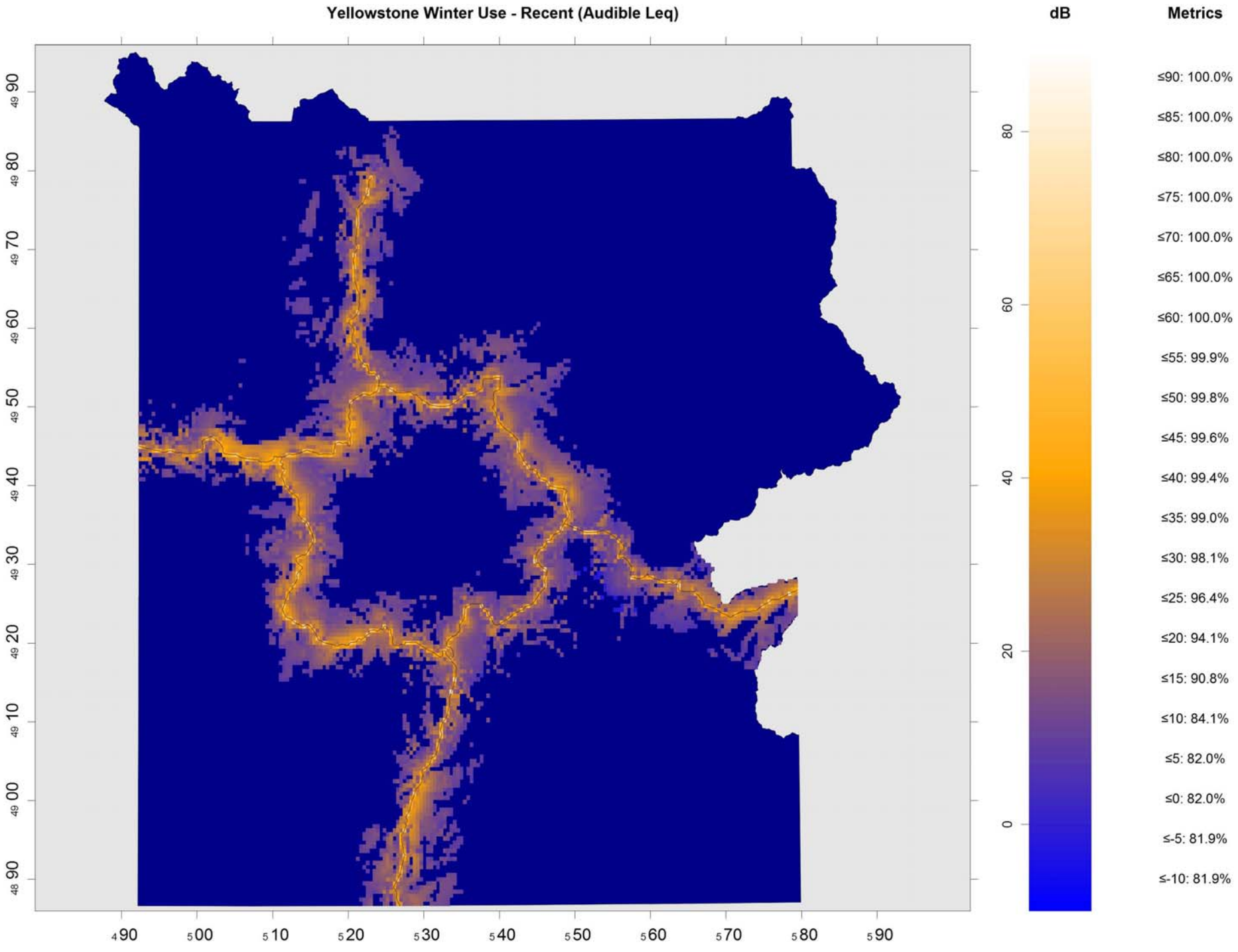
Yellowstone Winter Use - Recent (Audible Leq)
dB
Metrics
≤90: 100.0%
≤85: 100.0%
≤80: 100.0%
≤75: 100.0%
≤70: 100.0%
≤65: 100.0%
≤60: 100.0%
≤55: 99.9%
≤50: 99.8%
≤45: 99.6%
≤40: 99.4%
≤35: 99.0%
≤30: 98.1%
≤25: 96.4%
≤20: 94.1%
≤15: 90.8%
≤10: 84.1%
≤5: 82.0%
≤0: 82.0%
≤-5: 81.9%
≤-10: 81.9%
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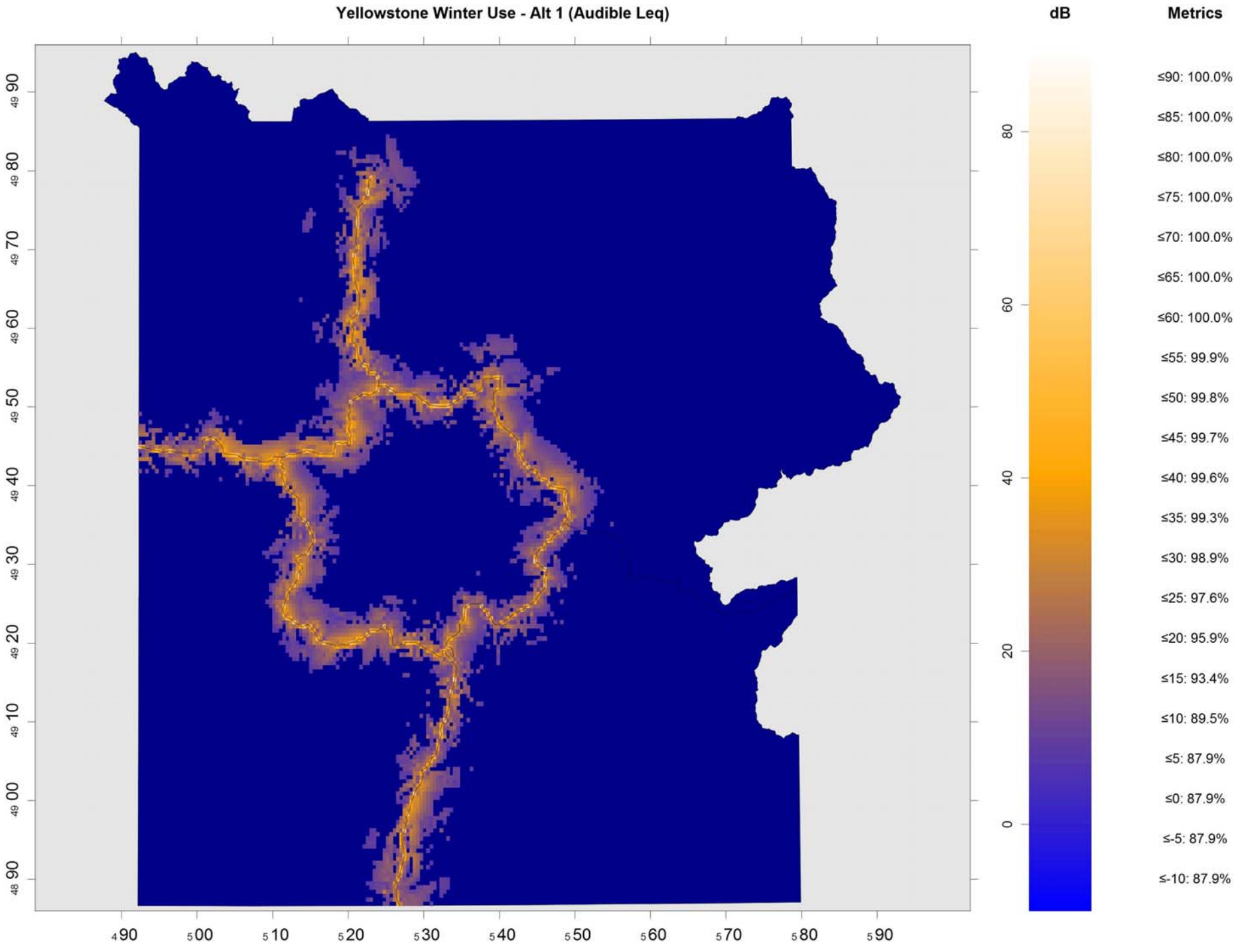
Yellowstone Winter Use - Alt 1 (Audible Leq)
dB
Metrics
≤90: 100.0%
≤85: 100.0%
≤80: 100.0%
≤75: 100.0%
≤70: 100.0%
≤65: 100.0%
≤60: 100.0%
≤55: 99.9%
≤50: 99.8%
≤45: 99.7%
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≤30: 98.9%
≤25: 97.6%
≤20: 95.9%
≤15: 93.4%
≤10: 89.5%
≤5: 87.9%
≤0: 87.9%
≤-5: 87.9%
≤-10: 87.9%
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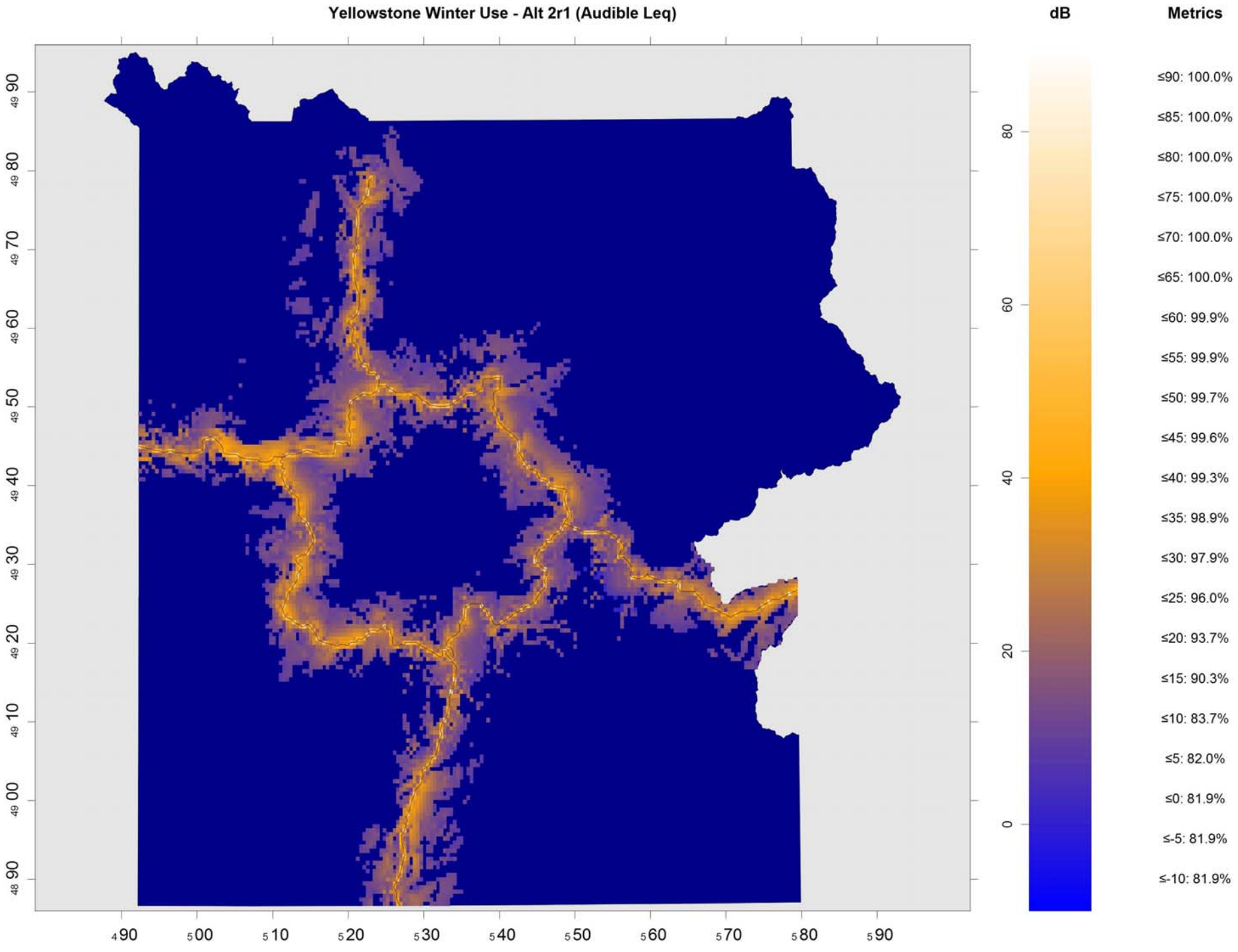
Yellowstone Winter Use - Alt 2r1 (Audible Leq)
dB
Metrics
≤90: 100.0%
≤85: 100.0%
≤80: 100.0%
≤75: 100.0%
≤70: 100.0%
≤65: 100.0%
≤60: 99.9%
≤55: 99.9%
≤50: 99.7%
≤45: 99.6%
≤40: 99.3%
≤35: 98.9%
≤30: 97.9%
≤25: 96.0%
≤20: 93.7%
≤15: 90.3%
≤10: 83.7%
≤5: 82.0%
≤0: 81.9%
≤-5: 81.9%
≤-10: 81.9%
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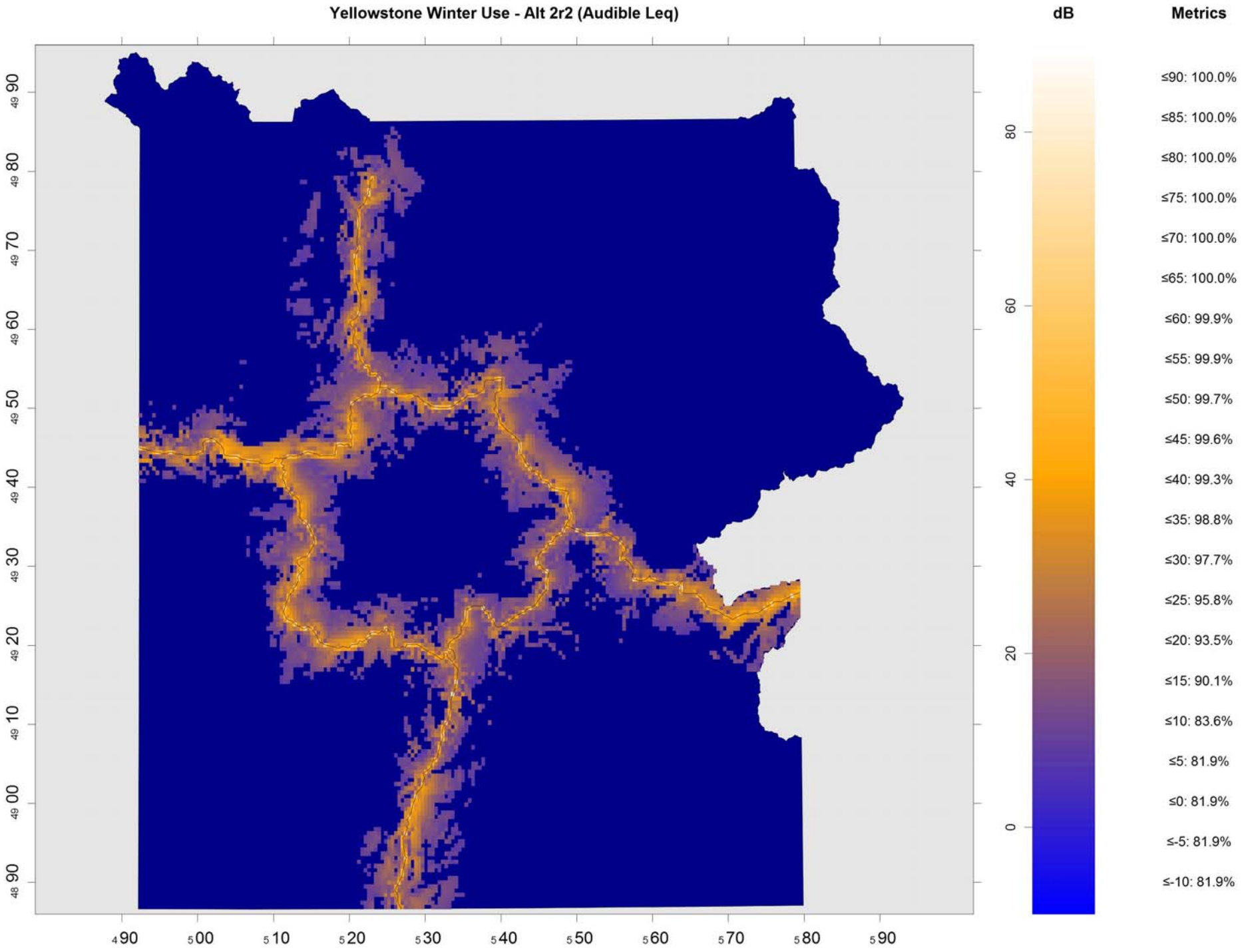
Yellowstone Winter Use - Alt 2r2 (Audible Leq)
dB
Metrics
≤90: 100.0%
≤85: 100.0%
≤80: 100.0%
≤75: 100.0%
≤70: 100.0%
≤65: 100.0%
≤60: 99.9%
≤55: 99.9%
≤50: 99.7%
≤45: 99.6%
≤40: 99.3%
≤35: 98.8%
≤30: 97.7%
≤25: 95.8%
≤20: 93.5%
≤15: 90.1%
≤10: 83.6%
≤5: 81.9%
≤0: 81.9%
≤-5: 81.9%
≤-10: 81.9%
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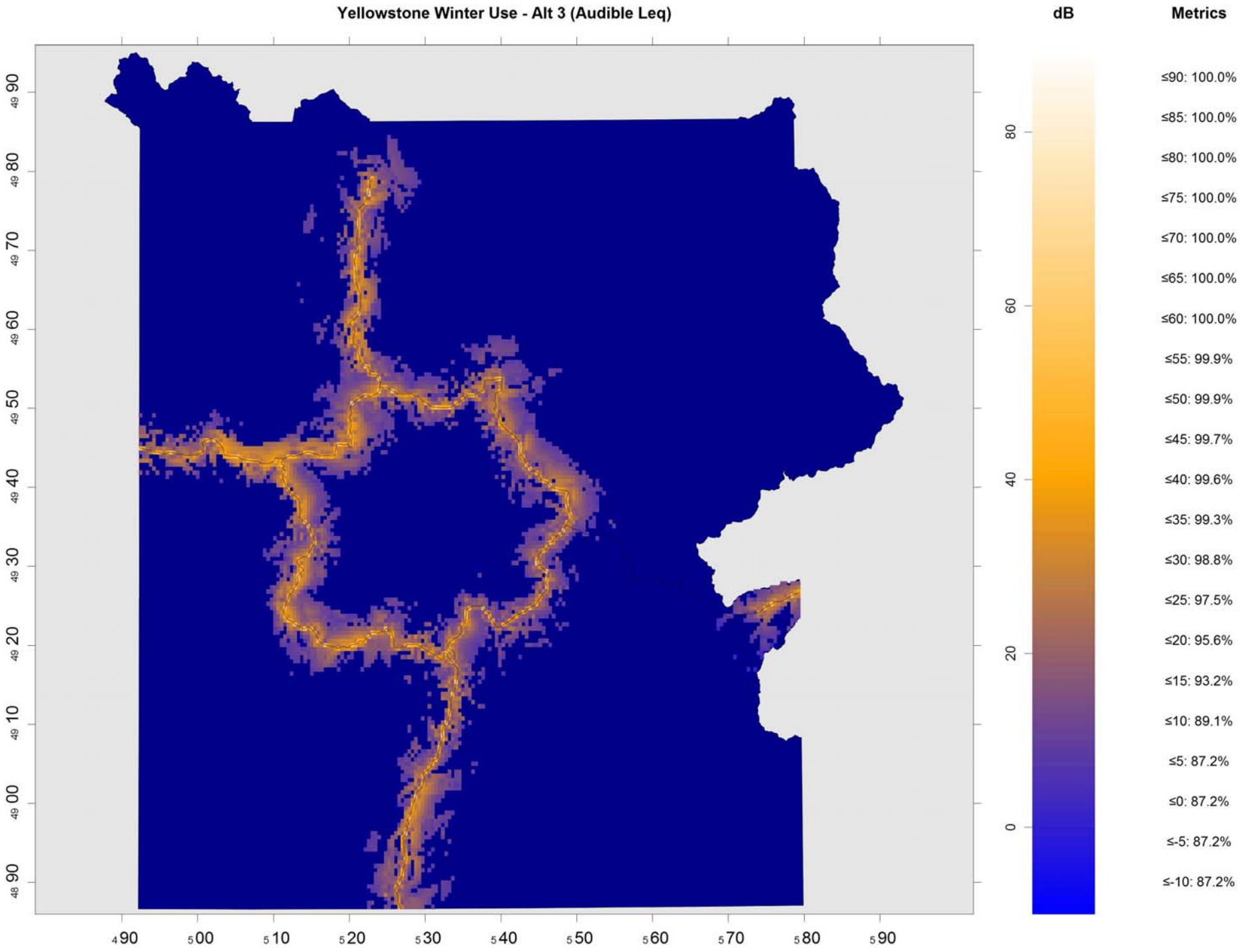
Yellowstone Winter Use - Alt 3 (Audible Leq)
dB
Metrics
≤90: 100.0%
≤85: 100.0%
≤80: 100.0%
≤75: 100.0%
≤70: 100.0%
≤65: 100.0%
≤60: 100.0%
≤55: 99.9%
≤50: 99.9%
≤45: 99.7%
≤40: 99.6%
≤35: 99.3%
≤30: 98.8%
≤25: 97.5%
≤20: 95.6%
≤15: 93.2%
≤10: 89.1%
≤5: 87.2%
≤0: 87.2%
≤-5: 87.2%
≤-10: 87.2%
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48 90
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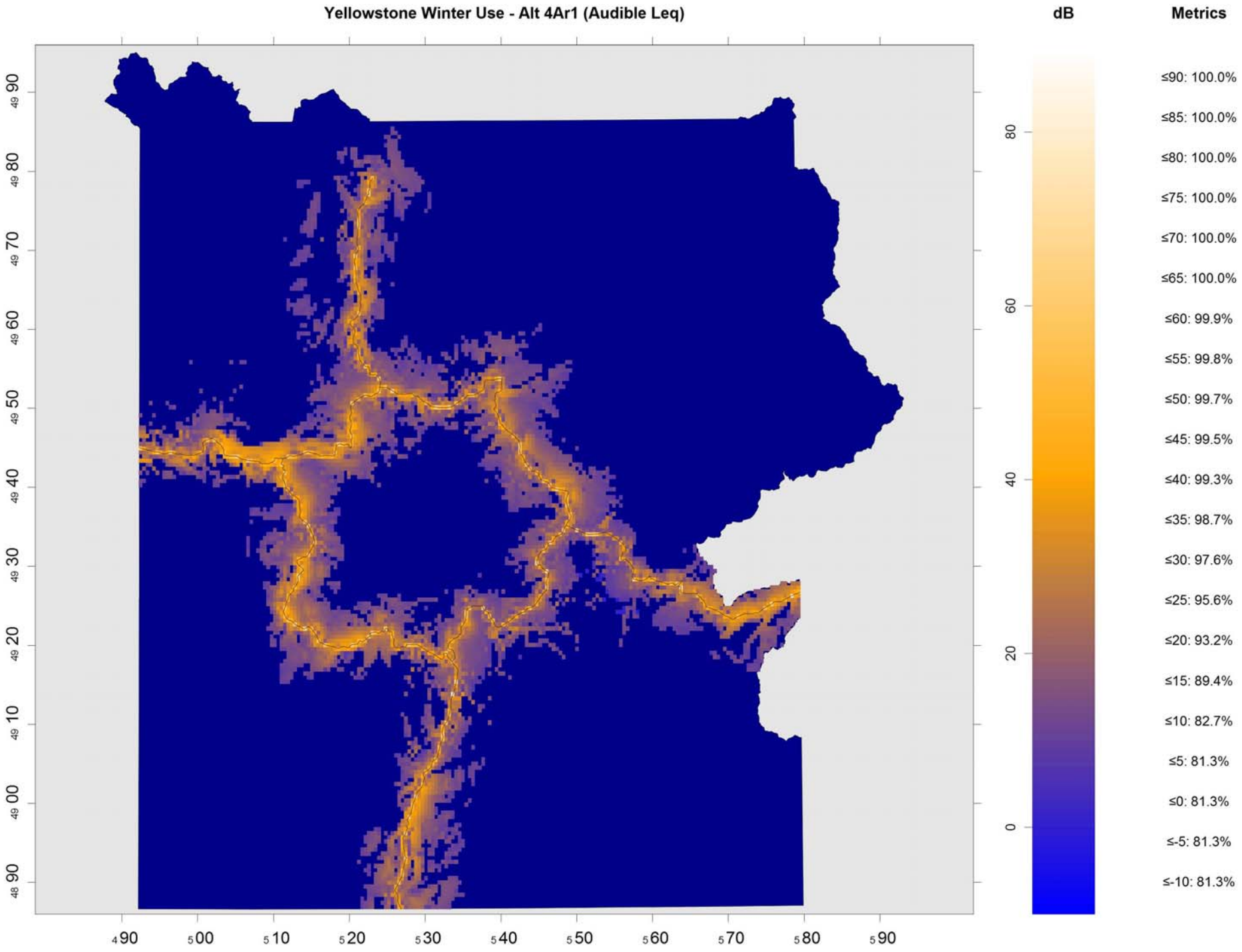
Yellowstone Winter Use - Alt 4Ar1 (Audible Leq)
dB
Metrics
≤90: 100.0%
≤85: 100.0%
≤80: 100.0%
≤75: 100.0%
≤70: 100.0%
≤65: 100.0%
≤60: 99.9%
≤55: 99.8%
≤50: 99.7%
≤45: 99.5%
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≤35: 98.7%
≤30: 97.6%
≤25: 95.6%
≤20: 93.2%
≤15: 89.4%
≤10: 82.7%
≤5: 81.3%
≤0: 81.3%
≤-5: 81.3%
≤-10: 81.3%
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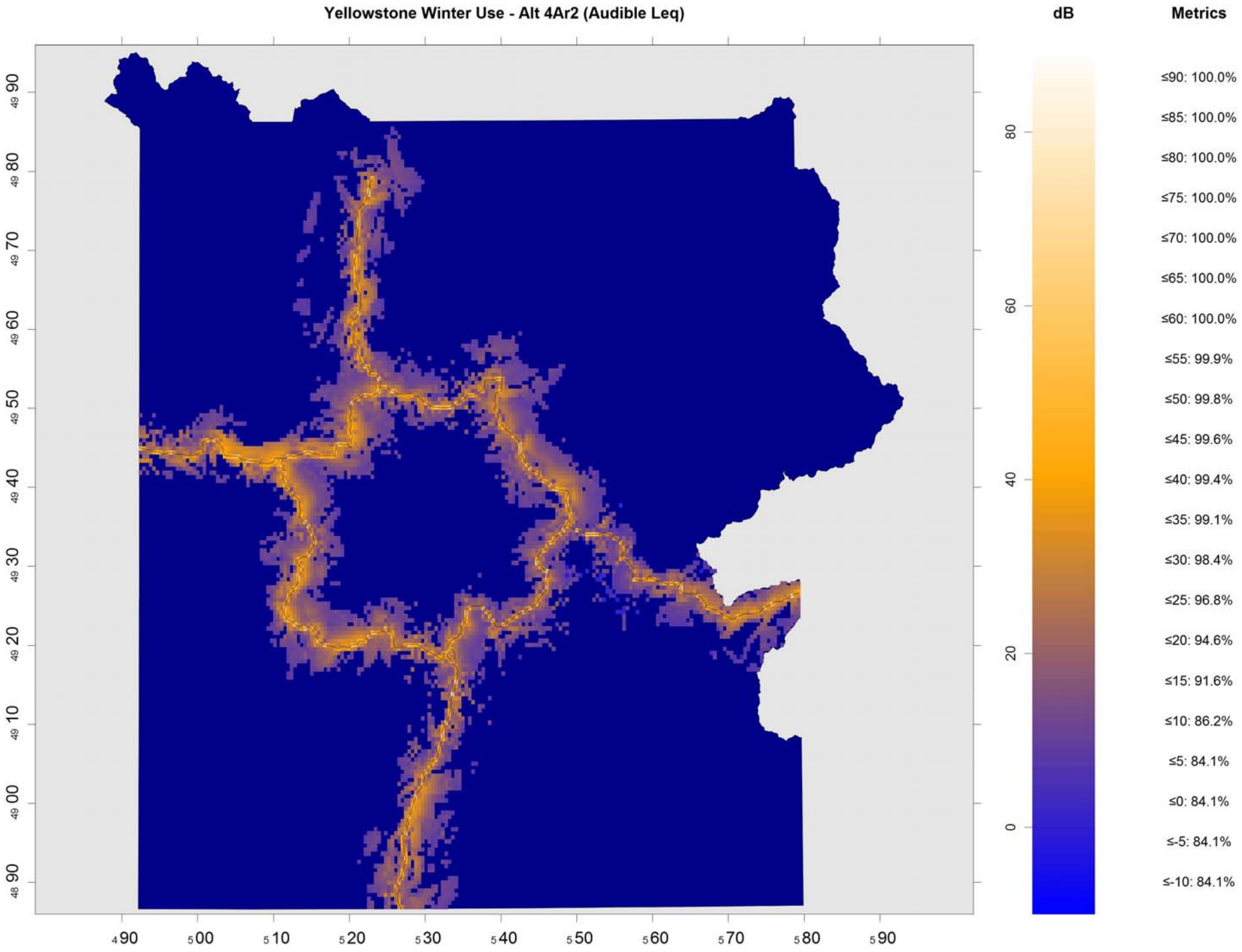
Yellowstone Winter Use - Alt 4Ar2 (Audible Leq)
dB
Metrics
≤90: 100.0%
≤85: 100.0%
≤80: 100.0%
≤75: 100.0%
≤70: 100.0%
≤65: 100.0%
≤60: 100.0%
≤55: 99.9%
≤50: 99.8%
≤45: 99.6%
≤40: 99.4%
≤35: 99.1%
≤30: 98.4%
≤25: 96.8%
≤20: 94.6%
≤15: 91.6%
≤10: 86.2%
≤5: 84.1%
≤0: 84.1%
≤-5: 84.1%
≤-10: 84.1%
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49 20
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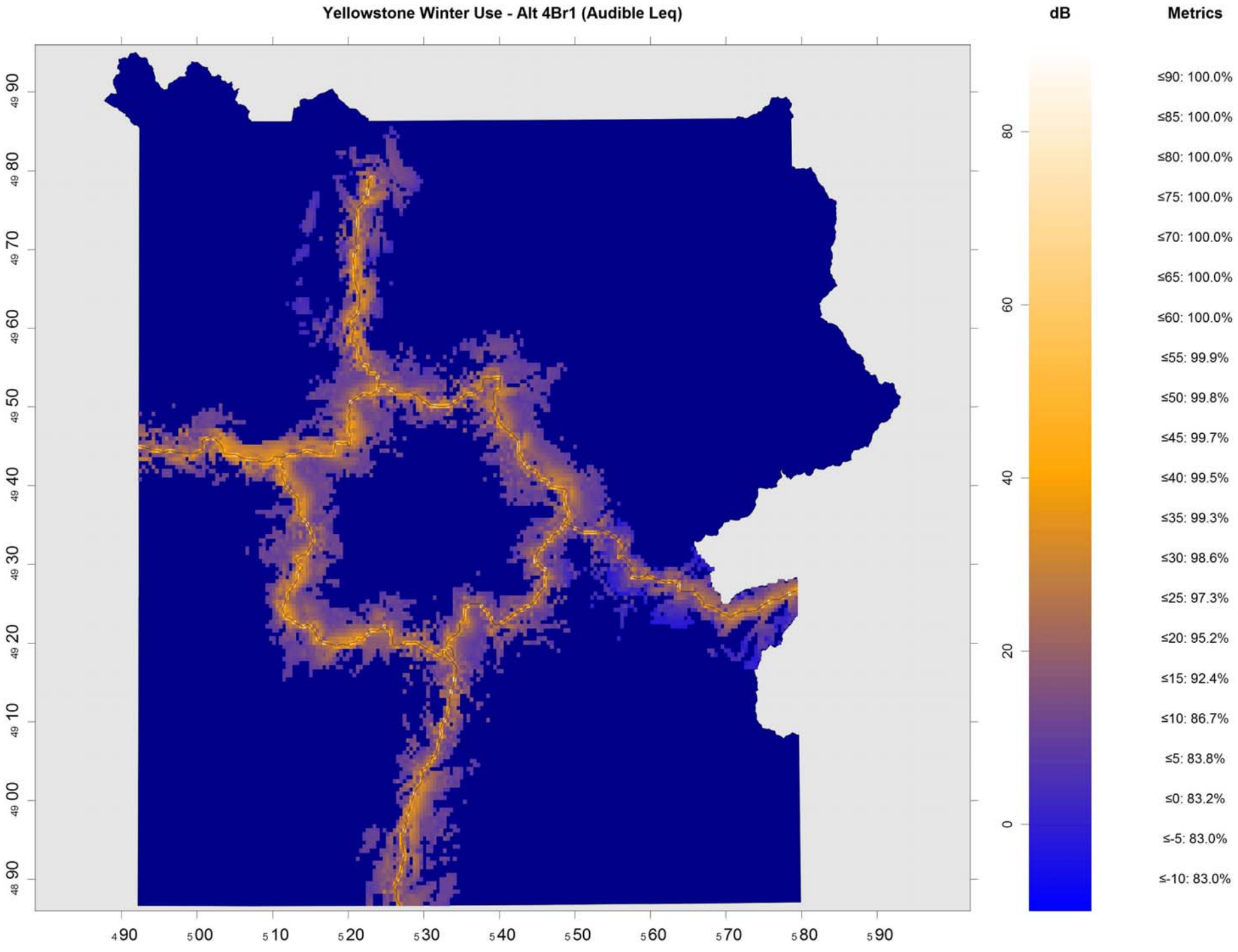
49 90


Yellowstone Winter Use - Alt 4Br1 (Audible Leq)
dB
Metrics
80
60
40
20
0
≤90: 100.0%
≤85: 100.0%
≤80: 100.0%
≤75: 100.0%
≤70: 100.0%
≤65: 100.0%
≤60: 100.0%
≤55: 99.9%
≤50: 99.8%
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≤40: 99.5%
≤35: 99.3%
≤30: 98.6%
≤25: 97.3%
≤20: 95.2%
≤15: 92.4%
≤10: 86.7%
≤5: 83.8%
≤0: 83.2%
≤-5: 83.0%
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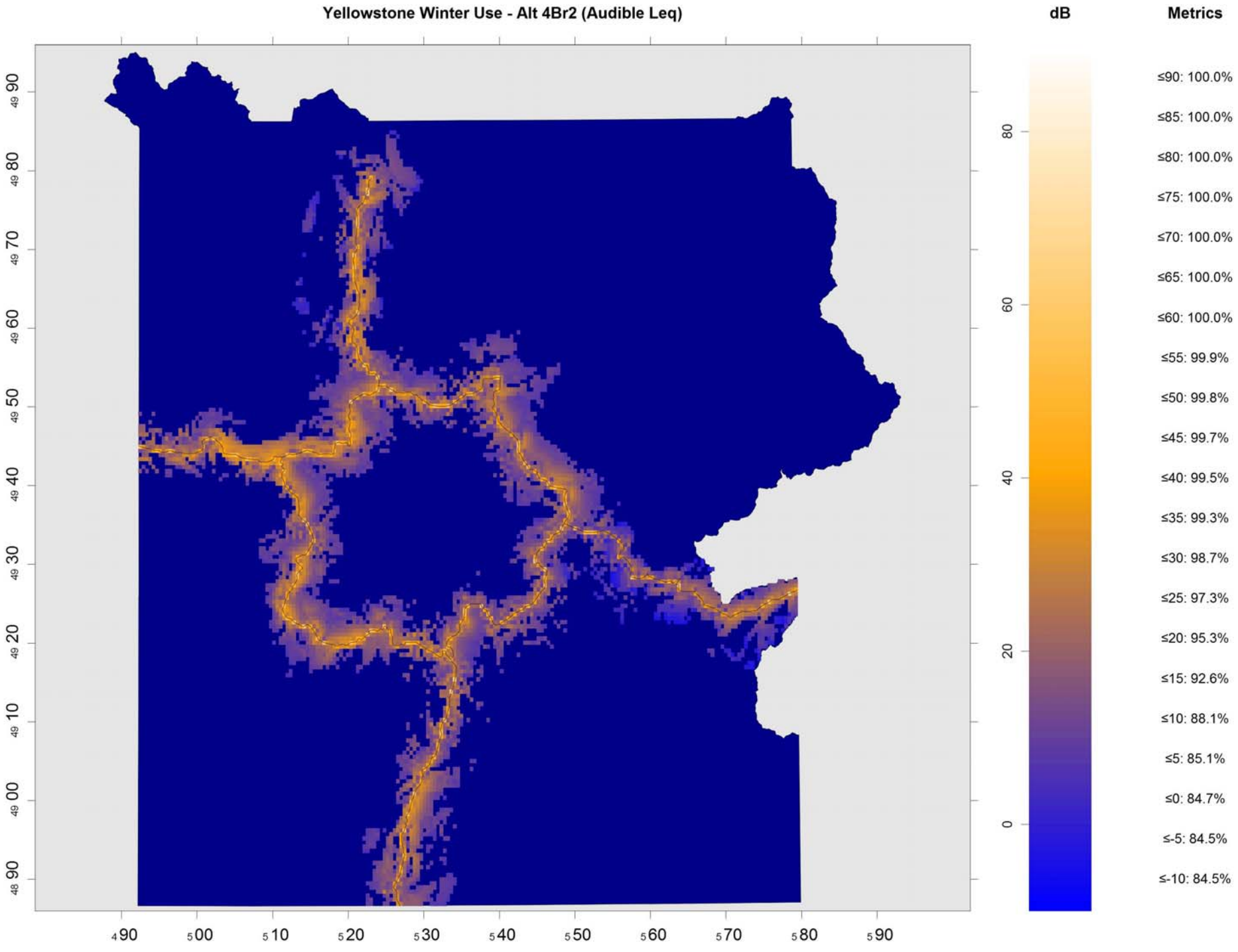
Yellowstone Winter Use - Alt 4Br2 (Audible Leq)
dB
Metrics
80
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≤90: 100.0%
≤85: 100.0%
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≤55: 99.9%
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≤35: 99.3%
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≤25: 97.3%
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≤15: 92.6%
≤10: 88.1%
≤5: 85.1%
≤0: 84.7%
≤-5: 84.5%
≤-10: 84.5%
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49 40
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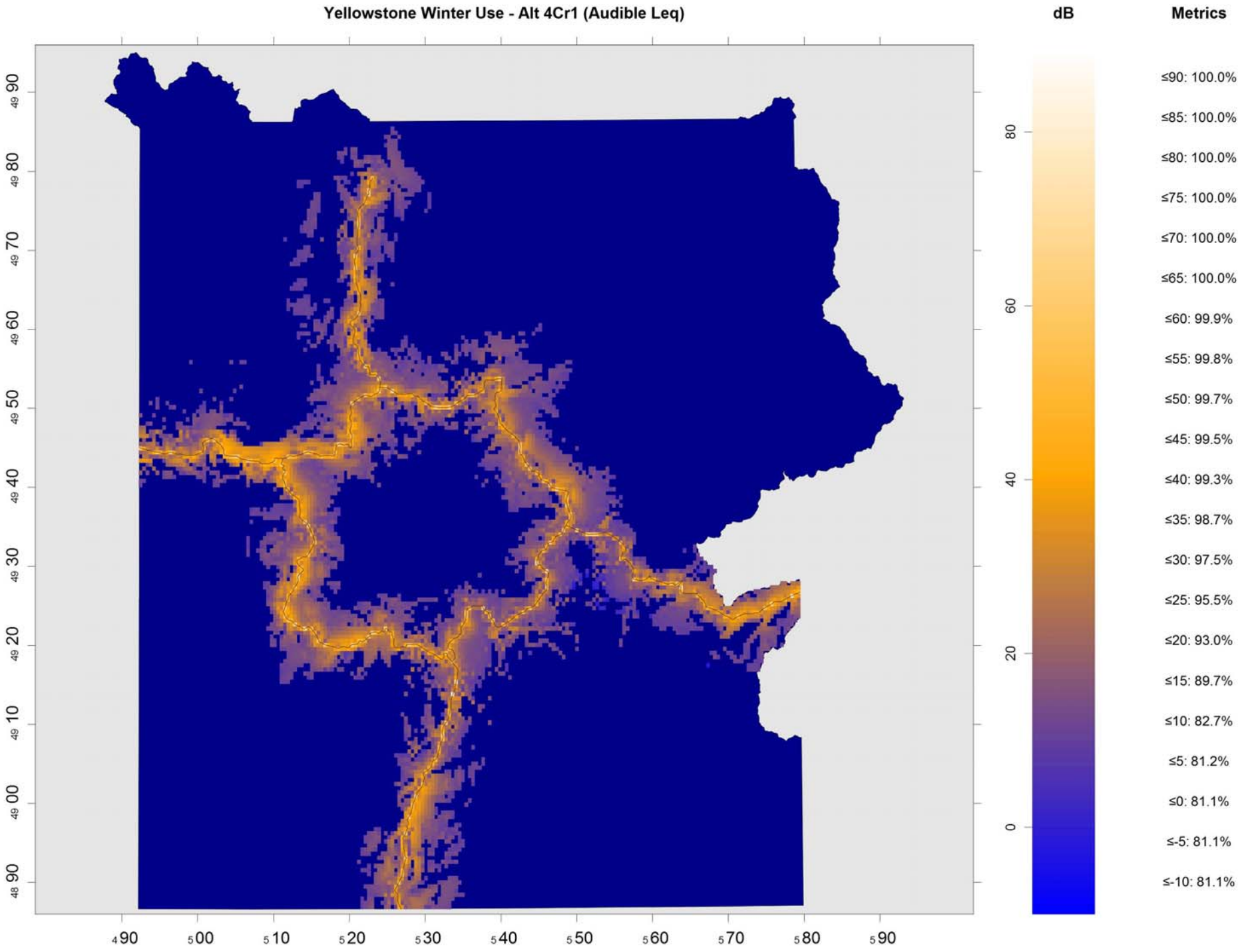
Yellowstone Winter Use - Alt 4Cr1 (Audible Leq)
dB
Metrics
80
60
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≤90: 100.0%
≤85: 100.0%
≤80: 100.0%
≤75: 100.0%
≤70: 100.0%
≤65: 100.0%
≤60: 99.9%
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≤25: 95.5%
≤20: 93.0%
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≤5: 81.2%
≤0: 81.1%
≤-5: 81.1%
≤-10: 81.1%
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5 80
5 90
49 90
49 80
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49 60
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49 40
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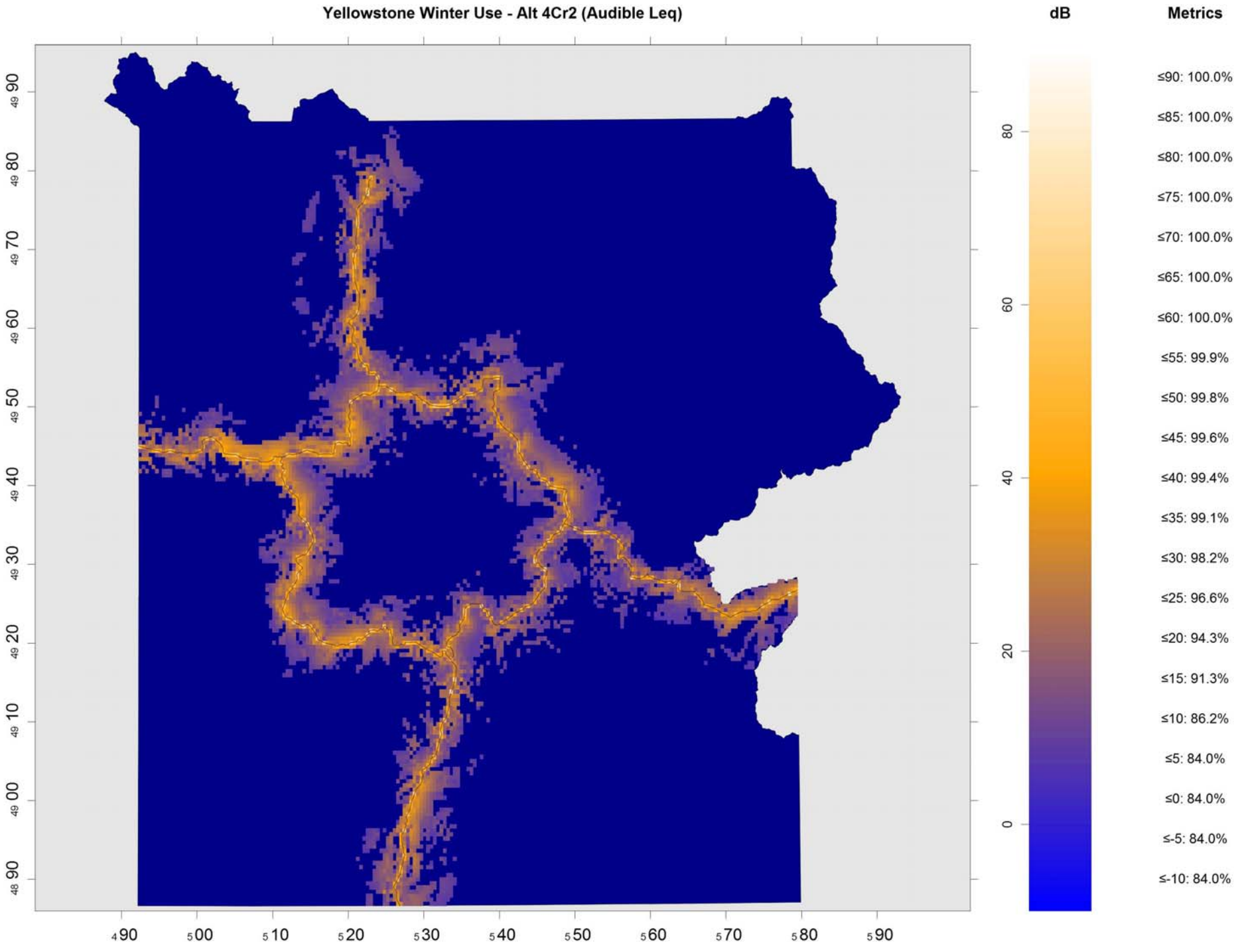
Yellowstone Winter Use - Alt 4Cr2 (Audible Leq)
dB
Metrics
≤90: 100.0%
≤85: 100.0%
≤80: 100.0%
≤75: 100.0%
≤70: 100.0%
≤65: 100.0%
≤60: 100.0%
≤55: 99.9%
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≤25: 96.6%
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≤15: 91.3%
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≤0: 84.0%
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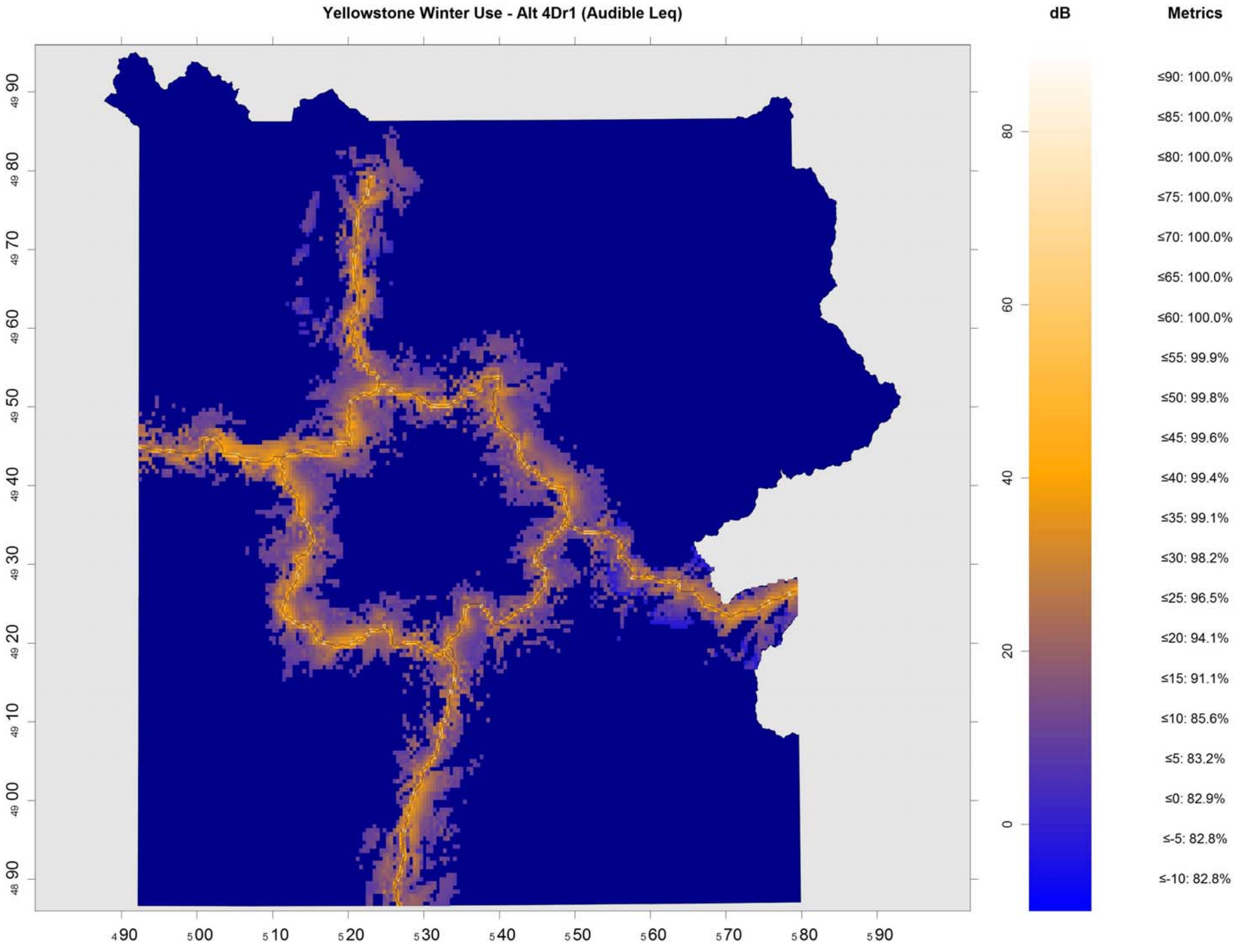
Yellowstone Winter Use - Alt 4Dr1 (Audible Leq)
dB
Metrics
80
60
40
20
0
≤90: 100.0%
≤85: 100.0%
≤80: 100.0%
≤75: 100.0%
≤70: 100.0%
≤65: 100.0%
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≤15: 91.1%
≤10: 85.6%
≤5: 83.2%
≤0: 82.9%
≤-5: 82.8%
≤-10: 82.8%
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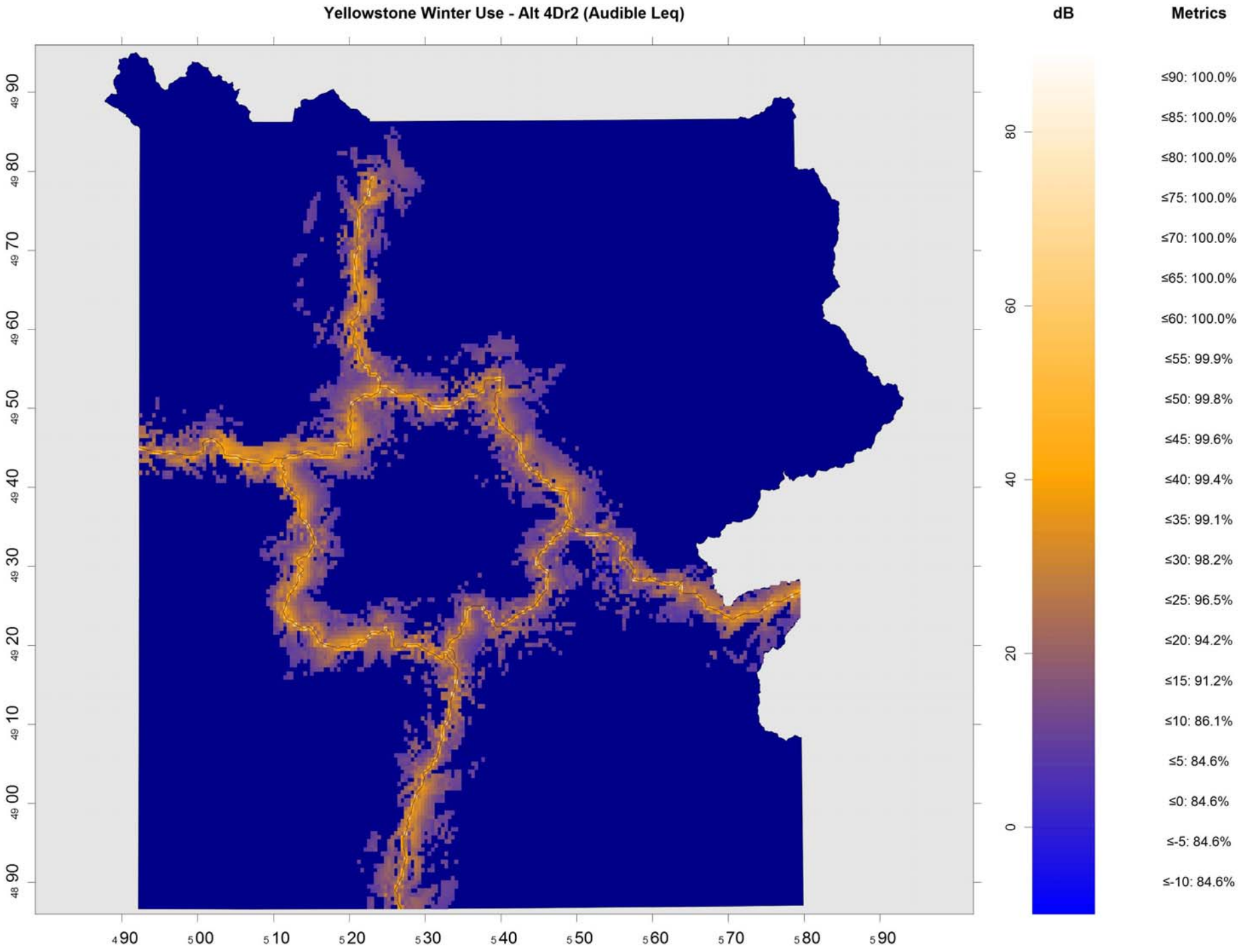
Yellowstone Winter Use - Alt 4Dr2 (Audible Leq)
dB
Metrics
≤90: 100.0%
≤85: 100.0%
≤80: 100.0%
≤75: 100.0%
≤70: 100.0%
≤65: 100.0%
≤60: 100.0%
≤55: 99.9%
≤50: 99.8%
≤45: 99.6%
≤40: 99.4%
≤35: 99.1%
≤30: 98.2%
≤25: 96.5%
≤20: 94.2%
≤15: 91.2%
≤10: 86.1%
≤5: 84.6%
≤0: 84.6%
≤-5: 84.6%
≤-10: 84.6%
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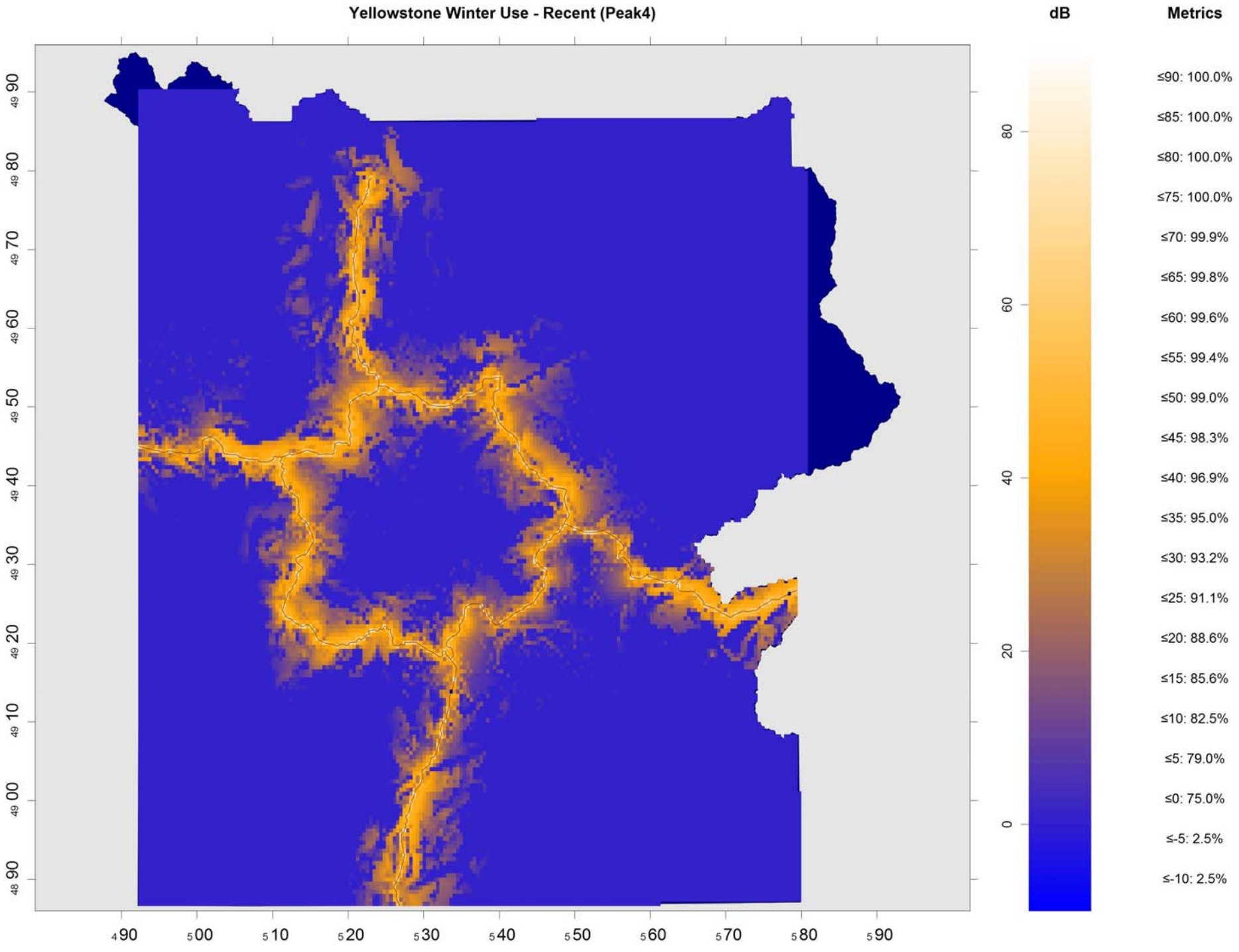
Yellowstone Winter Use - Recent (Peak4)
dB
Metrics
≤90: 100.0%
≤85: 100.0%
≤80: 100.0%
≤75: 100.0%
≤70: 99.9%
≤65: 99.8%
≤60: 99.6%
≤55: 99.4%
≤50: 99.0%
≤45: 98.3%
≤40: 96.9%
≤35: 95.0%
≤30: 93.2%
≤25: 91.1%
≤20: 88.6%
≤15: 85.6%
≤10: 82.5%
≤5: 79.0%
≤0: 75.0%
≤-5: 2.5%
≤-10: 2.5%
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5 90
48 90
49 00
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49 20
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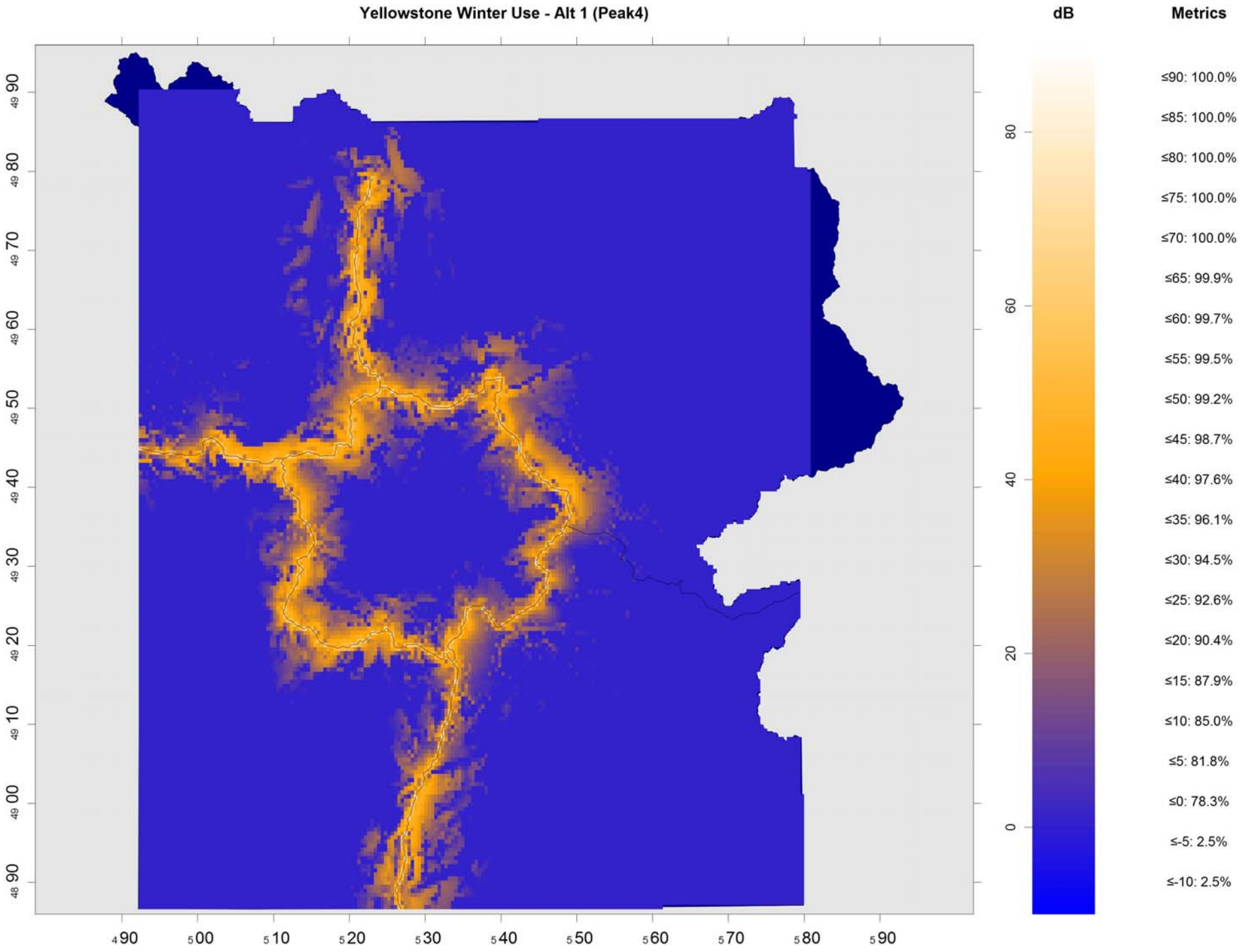
49 70
49 80
49 90


Yellowstone Winter Use - Alt 1 (Peak4)
dB
Metrics
≤90: 100.0%
≤85: 100.0%
≤80: 100.0%
≤75: 100.0%
≤70: 100.0%
≤65: 99.9%
≤60: 99.7%
≤55: 99.5%
≤50: 99.2%
≤45: 98.7%
≤40: 97.6%
≤35: 96.1%
≤30: 94.5%
≤25: 92.6%
≤20: 90.4%
≤15: 87.9%
≤10: 85.0%
≤5: 81.8%
≤0: 78.3%
≤-5: 2.5%
≤-10: 2.5%
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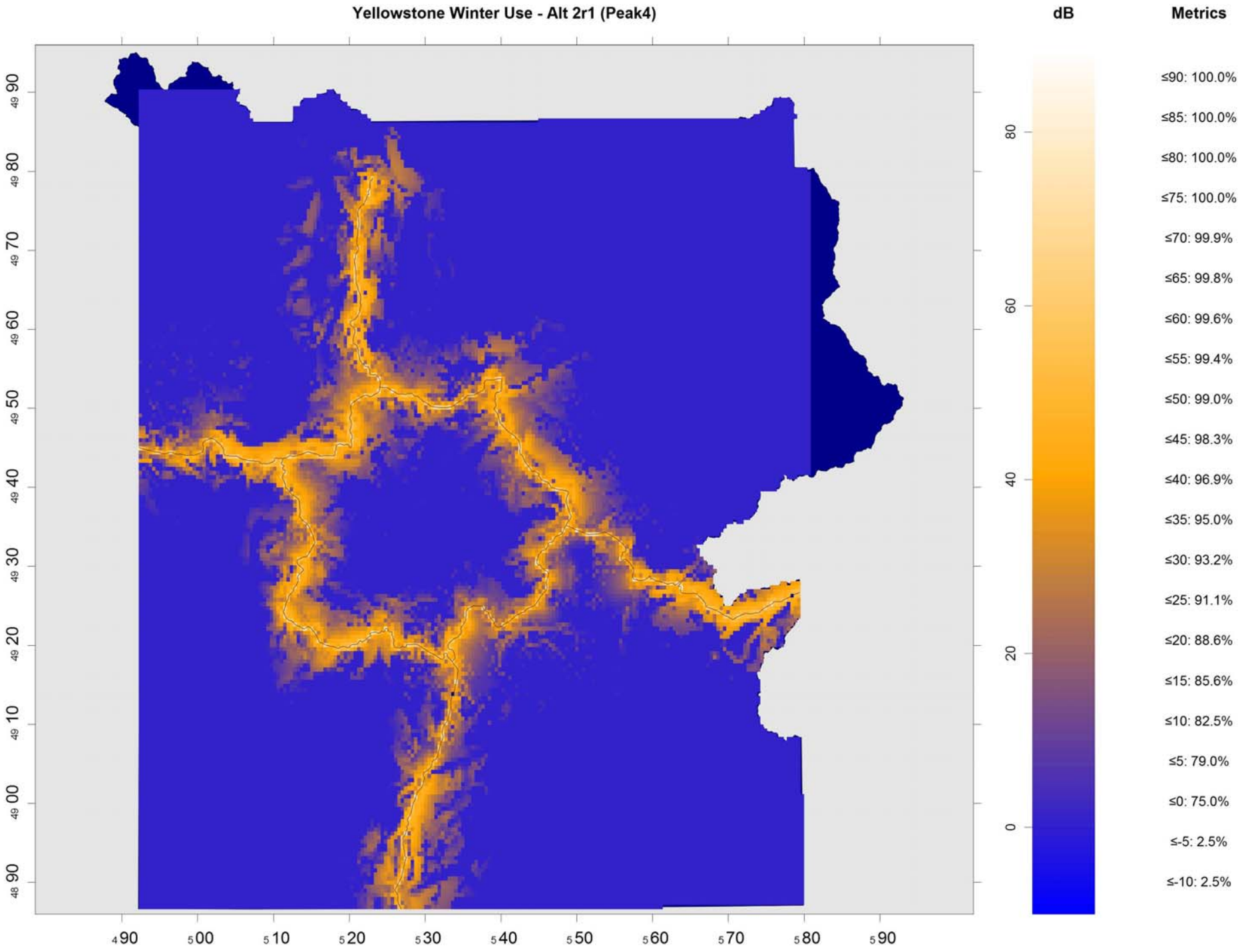
Yellowstone Winter Use - Alt 2r1 (Peak4)
dB
Metrics
≤90: 100.0%
≤85: 100.0%
≤80: 100.0%
≤75: 100.0%
≤70: 99.9%
≤65: 99.8%
≤60: 99.6%
≤55: 99.4%
≤50: 99.0%
≤45: 98.3%
≤40: 96.9%
≤35: 95.0%
≤30: 93.2%
≤25: 91.1%
≤20: 88.6%
≤15: 85.6%
≤10: 82.5%
≤5: 79.0%
≤0: 75.0%
≤-5: 2.5%
≤-10: 2.5%
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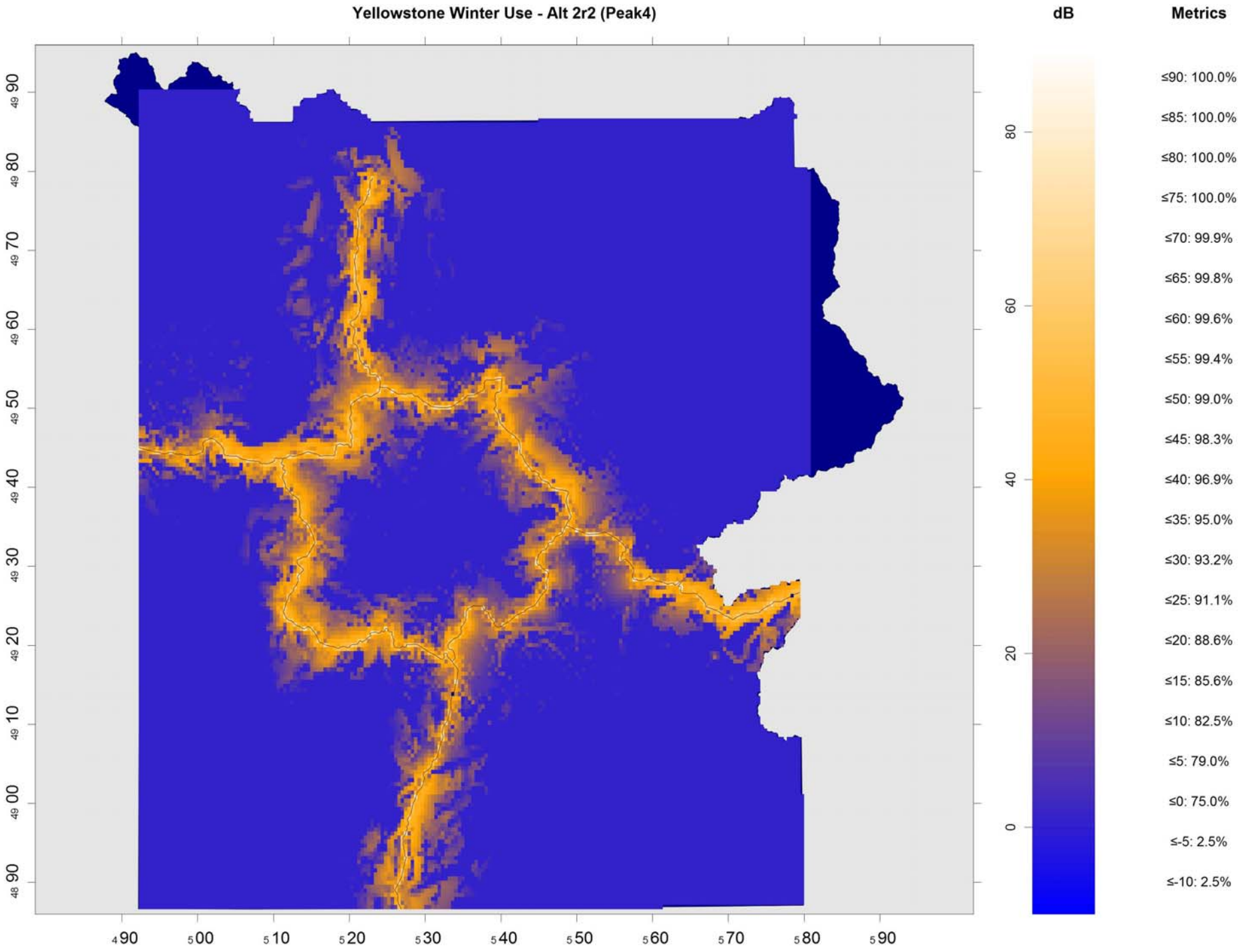
Yellowstone Winter Use - Alt 2r2 (Peak4)
dB
Metrics
≤90: 100.0%
≤85: 100.0%
≤80: 100.0%
≤75: 100.0%
≤70: 99.9%
≤65: 99.8%
≤60: 99.6%
≤55: 99.4%
≤50: 99.0%
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≤35: 95.0%
≤30: 93.2%
≤25: 91.1%
≤20: 88.6%
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≤10: 82.5%
≤5: 79.0%
≤0: 75.0%
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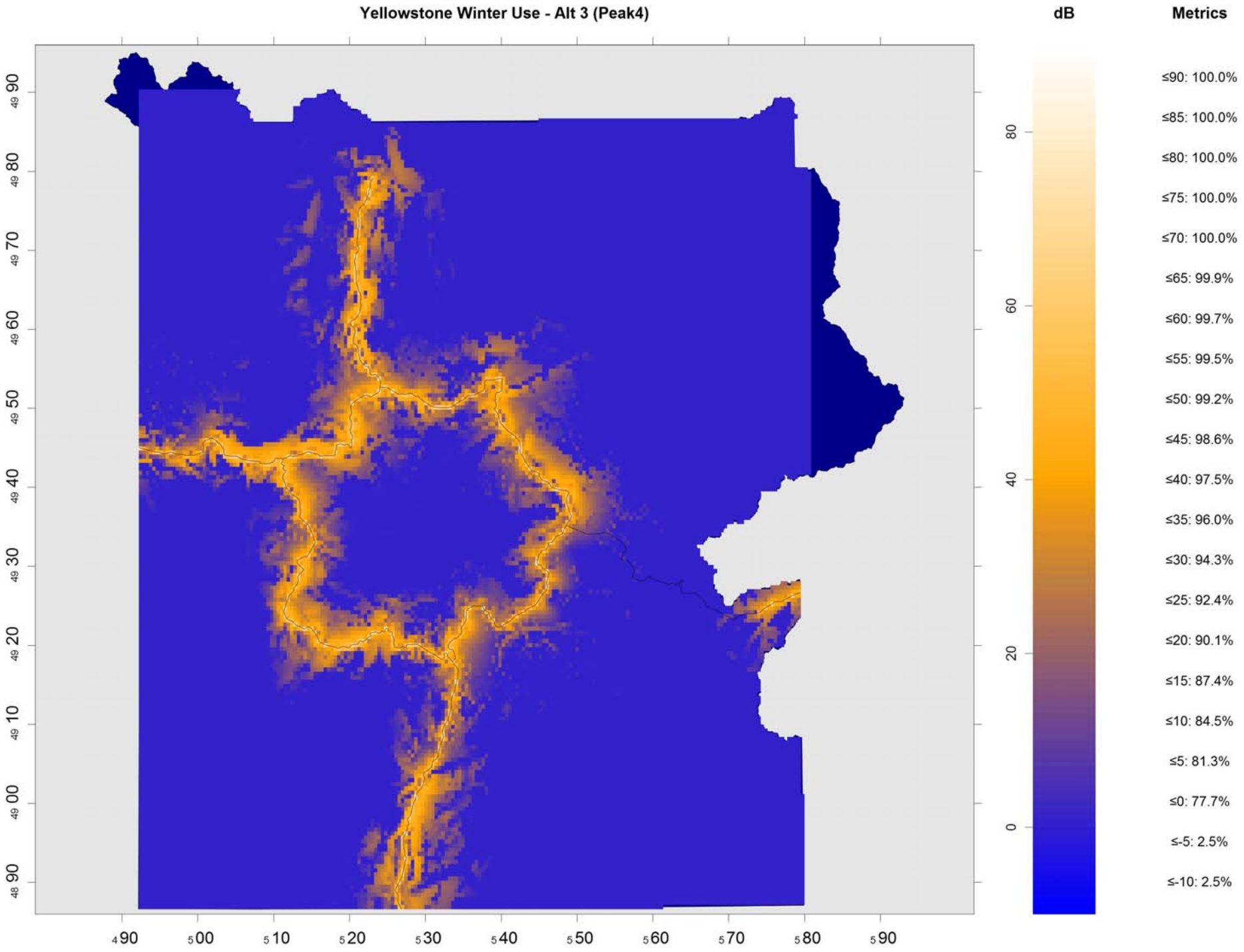
Yellowstone Winter Use - Alt 3 (Peak4)
dB
Metrics
≤90: 100.0%
≤85: 100.0%
≤80: 100.0%
≤75: 100.0%
≤70: 100.0%
≤65: 99.9%
≤60: 99.7%
≤55: 99.5%
≤50: 99.2%
≤45: 98.6%
≤40: 97.5%
≤35: 96.0%
≤30: 94.3%
≤25: 92.4%
≤20: 90.1%
≤15: 87.4%
≤10: 84.5%
≤5: 81.3%
≤0: 77.7%
≤-5: 2.5%
≤-10: 2.5%
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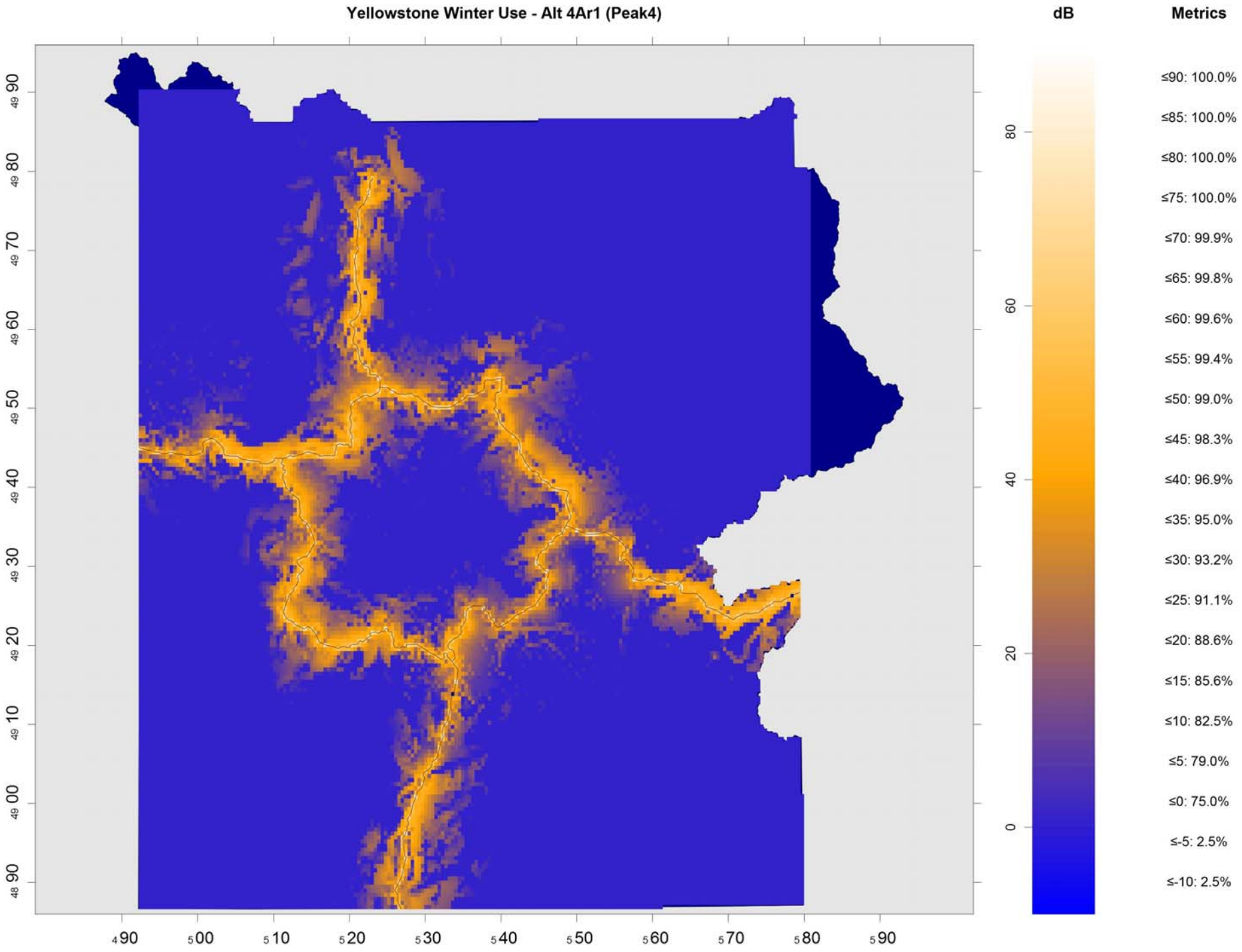
Yellowstone Winter Use - Alt 4Ar1 (Peak4)
dB
Metrics
≤90: 100.0%
≤85: 100.0%
≤80: 100.0%
≤75: 100.0%
≤70: 99.9%
≤65: 99.8%
≤60: 99.6%
≤55: 99.4%
≤50: 99.0%
≤45: 98.3%
≤40: 96.9%
≤35: 95.0%
≤30: 93.2%
≤25: 91.1%
≤20: 88.6%
≤15: 85.6%
≤10: 82.5%
≤5: 79.0%
≤0: 75.0%
≤-5: 2.5%
≤-10: 2.5%
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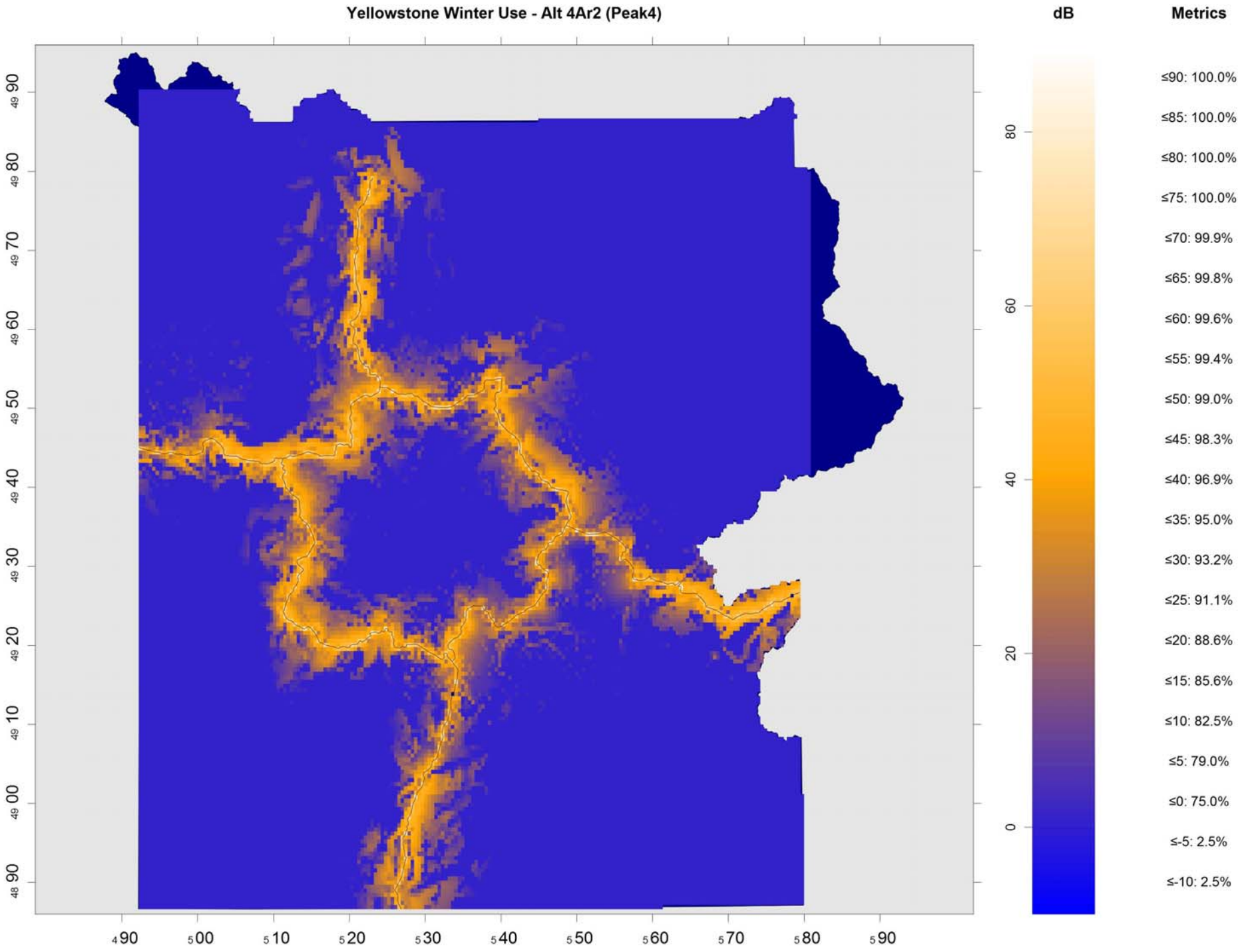
Yellowstone Winter Use - Alt 4Ar2 (Peak4)
dB
Metrics
≤90: 100.0%
≤85: 100.0%
≤80: 100.0%
≤75: 100.0%
≤70: 99.9%
≤65: 99.8%
≤60: 99.6%
≤55: 99.4%
≤50: 99.0%
≤45: 98.3%
≤40: 96.9%
≤35: 95.0%
≤30: 93.2%
≤25: 91.1%
≤20: 88.6%
≤15: 85.6%
≤10: 82.5%
≤5: 79.0%
≤0: 75.0%
≤-5: 2.5%
≤-10: 2.5%
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49 20
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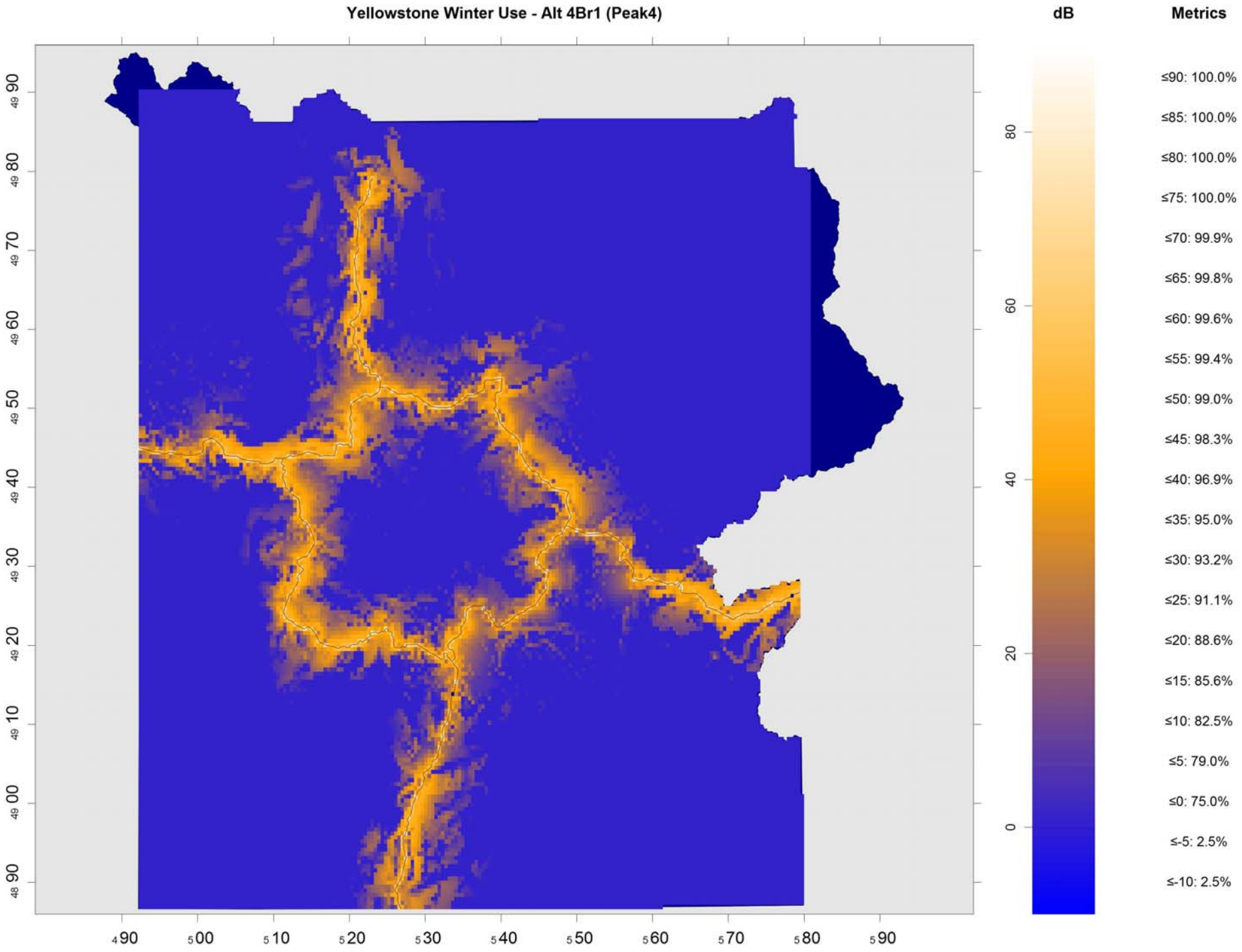
Yellowstone Winter Use - Alt 4Br1 (Peak4)
dB
Metrics
≤90: 100.0%
≤85: 100.0%
≤80: 100.0%
≤75: 100.0%
≤70: 99.9%
≤65: 99.8%
≤60: 99.6%
≤55: 99.4%
≤50: 99.0%
≤45: 98.3%
≤40: 96.9%
≤35: 95.0%
≤30: 93.2%
≤25: 91.1%
≤20: 88.6%
≤15: 85.6%
≤10: 82.5%
≤5: 79.0%
≤0: 75.0%
≤-5: 2.5%
≤-10: 2.5%
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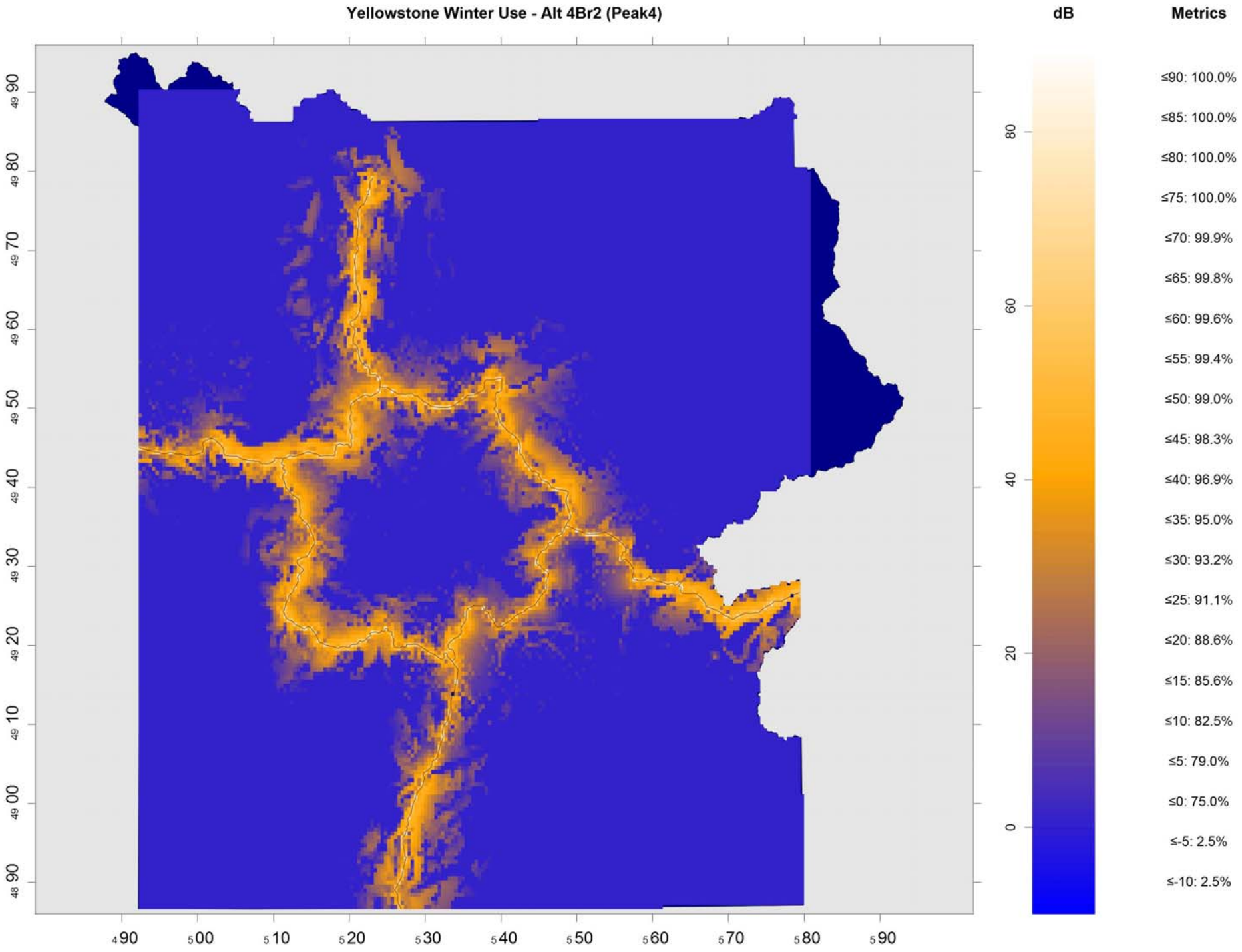
Yellowstone Winter Use - Alt 4Br2 (Peak4)
dB
Metrics
≤90: 100.0%
≤85: 100.0%
≤80: 100.0%
≤75: 100.0%
≤70: 99.9%
≤65: 99.8%
≤60: 99.6%
≤55: 99.4%
≤50: 99.0%
≤45: 98.3%
≤40: 96.9%
≤35: 95.0%
≤30: 93.2%
≤25: 91.1%
≤20: 88.6%
≤15: 85.6%
≤10: 82.5%
≤5: 79.0%
≤0: 75.0%
≤-5: 2.5%
≤-10: 2.5%
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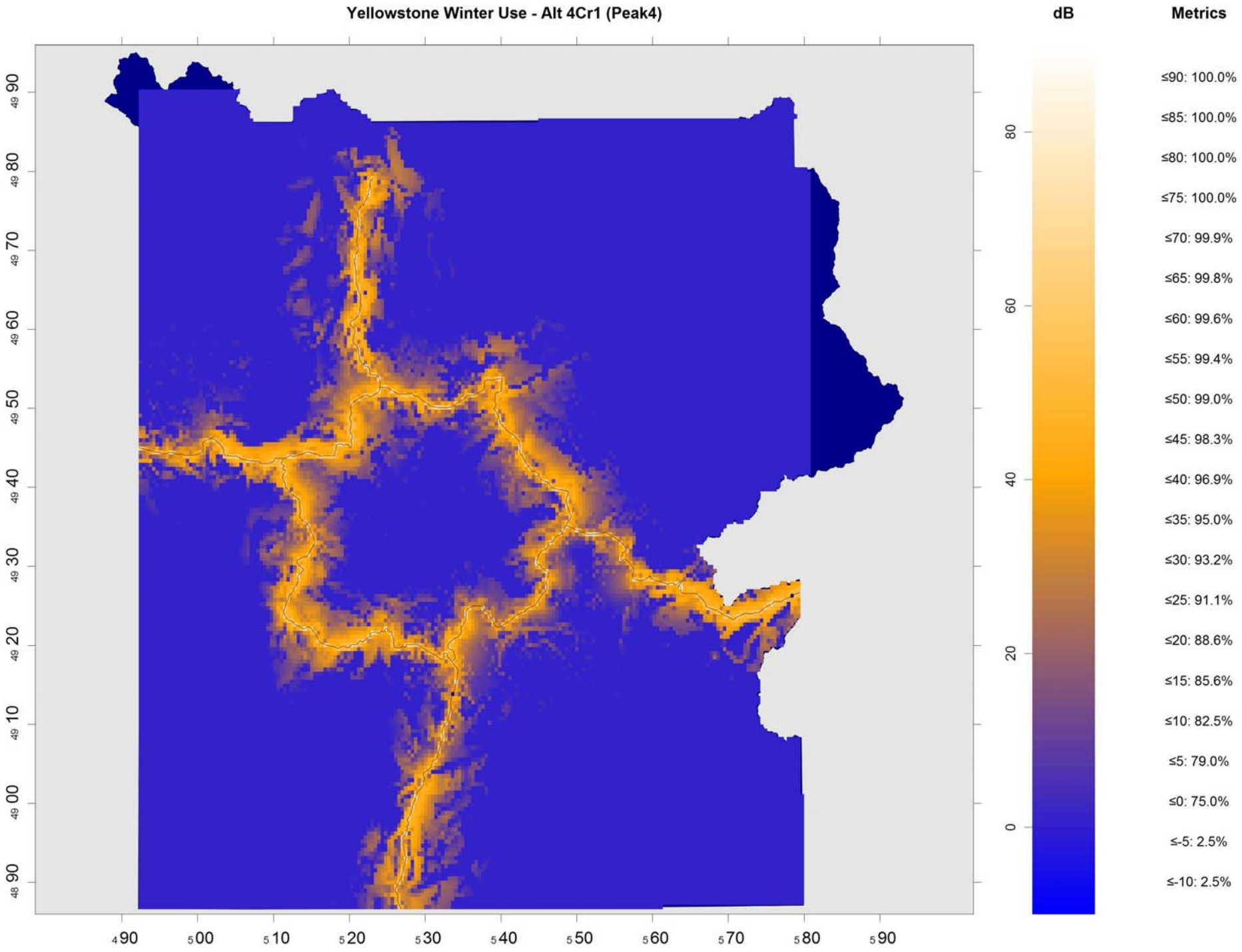
Yellowstone Winter Use - Alt 4Cr1 (Peak4)
dB
Metrics
≤90: 100.0%
≤85: 100.0%
≤80: 100.0%
≤75: 100.0%
≤70: 99.9%
≤65: 99.8%
≤60: 99.6%
≤55: 99.4%
≤50: 99.0%
≤45: 98.3%
≤40: 96.9%
≤35: 95.0%
≤30: 93.2%
≤25: 91.1%
≤20: 88.6%
≤15: 85.6%
≤10: 82.5%
≤5: 79.0%
≤0: 75.0%
≤-5: 2.5%
≤-10: 2.5%
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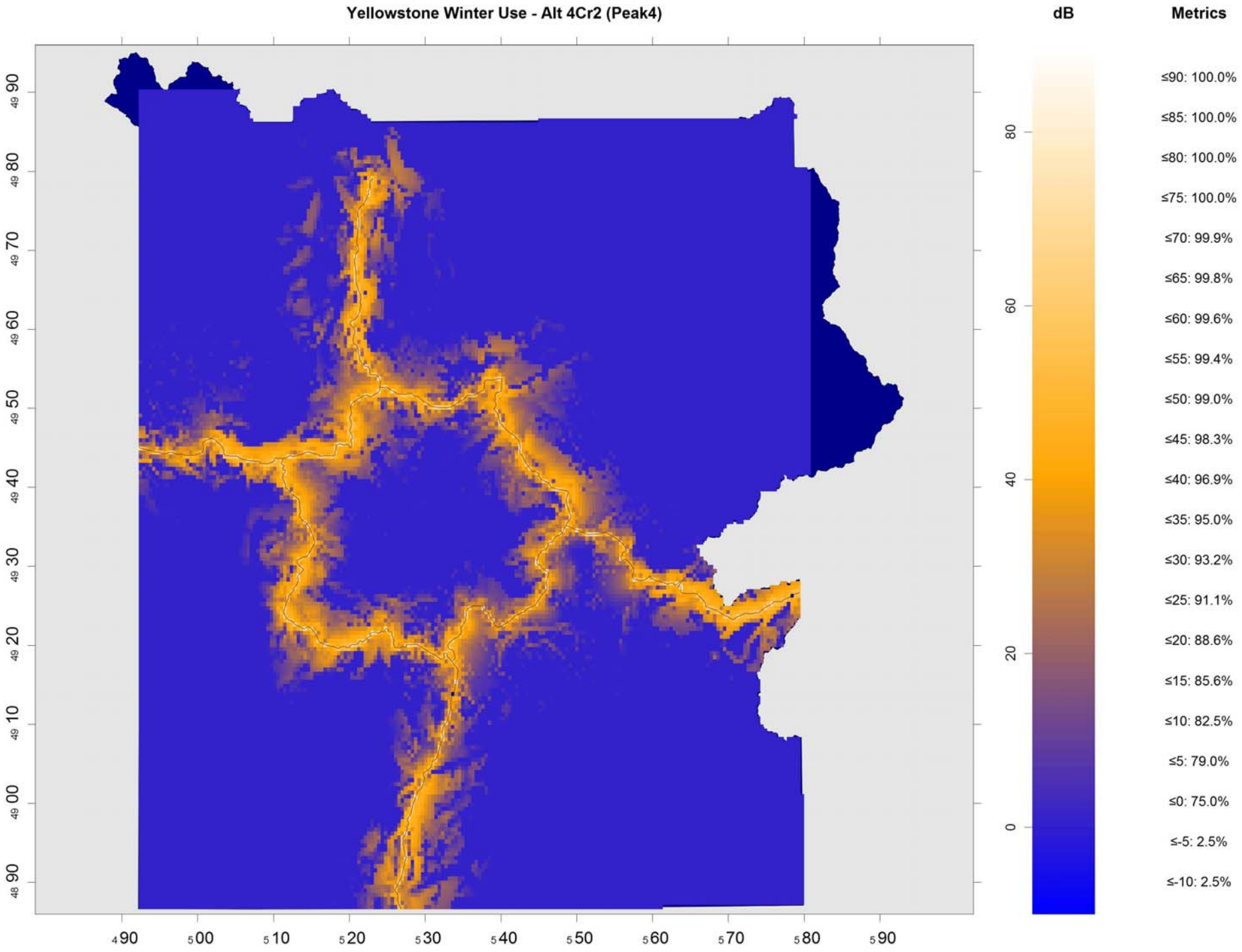
Yellowstone Winter Use - Alt 4Cr2 (Peak4)
dB
Metrics
≤90: 100.0%
≤85: 100.0%
≤80: 100.0%
≤75: 100.0%
≤70: 99.9%
≤65: 99.8%
≤60: 99.6%
≤55: 99.4%
≤50: 99.0%
≤45: 98.3%
≤40: 96.9%
≤35: 95.0%
≤30: 93.2%
≤25: 91.1%
≤20: 88.6%
≤15: 85.6%
≤10: 82.5%
≤5: 79.0%
≤0: 75.0%
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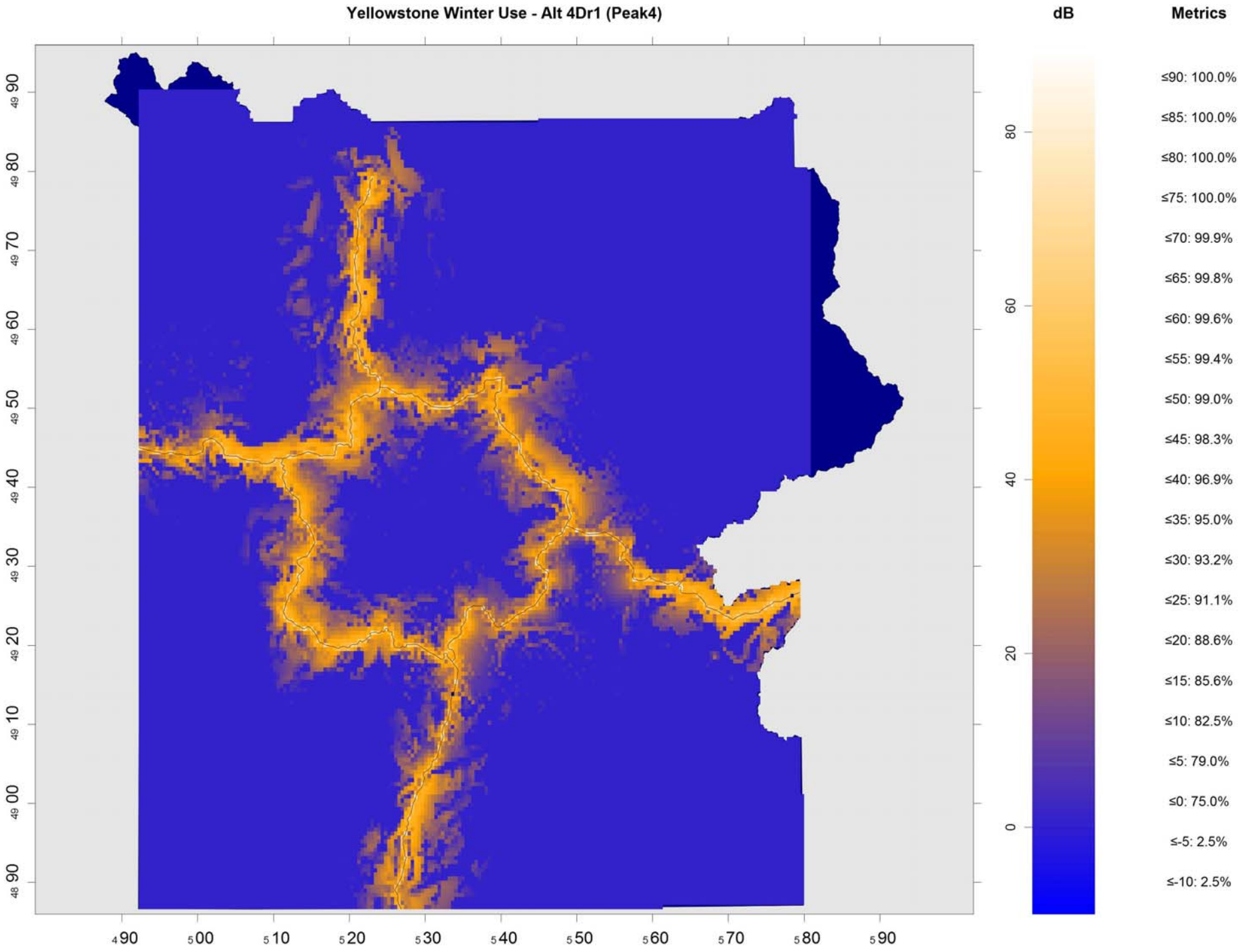
Yellowstone Winter Use - Alt 4Dr1 (Peak4)
dB
Metrics
≤90: 100.0%
≤85: 100.0%
≤80: 100.0%
≤75: 100.0%
≤70: 99.9%
≤65: 99.8%
≤60: 99.6%
≤55: 99.4%
≤50: 99.0%
≤45: 98.3%
≤40: 96.9%
≤35: 95.0%
≤30: 93.2%
≤25: 91.1%
≤20: 88.6%
≤15: 85.6%
≤10: 82.5%
≤5: 79.0%
≤0: 75.0%
≤-5: 2.5%
≤-10: 2.5%
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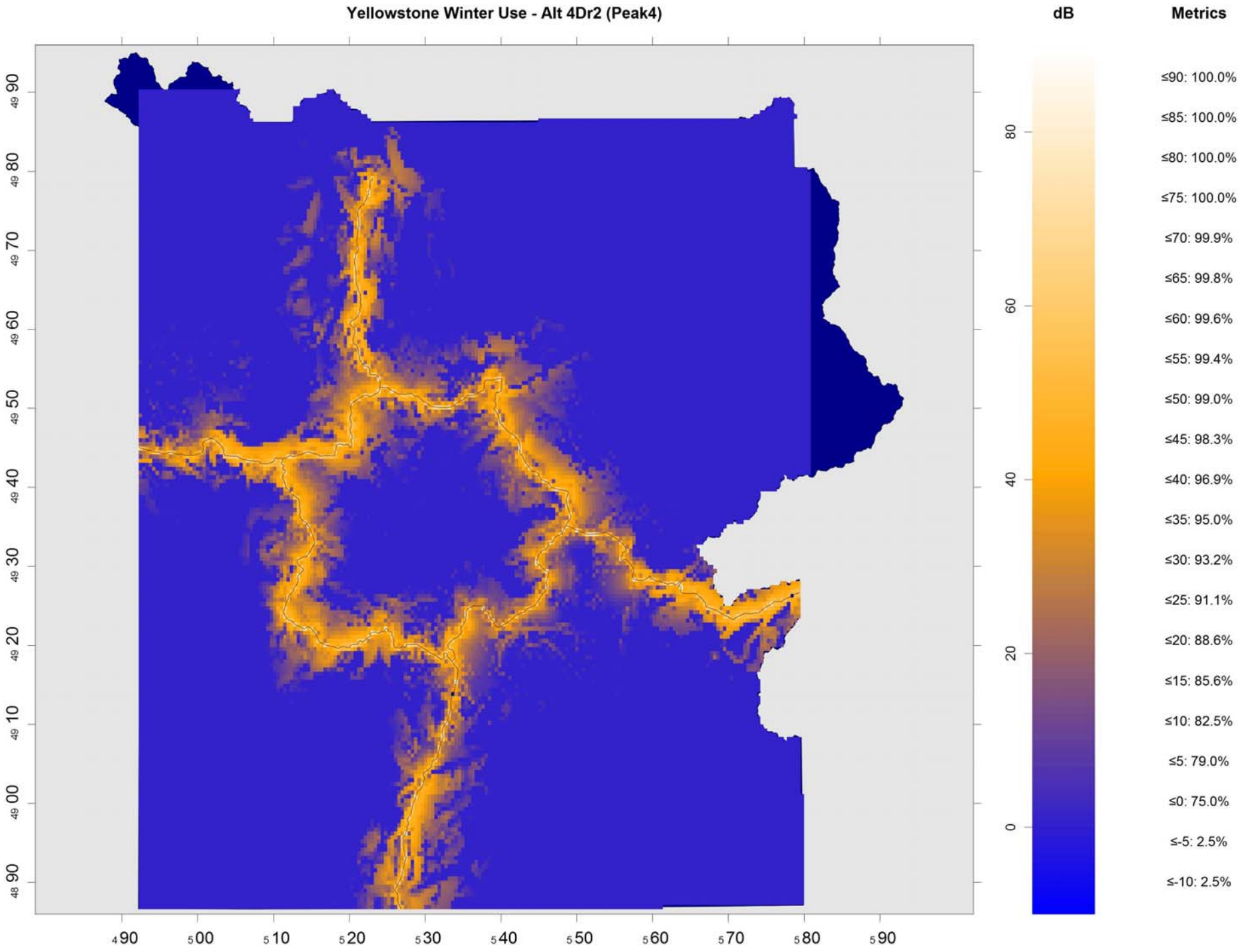
Yellowstone Winter Use - Alt 4Dr2 (Peak4)
dB
Metrics
≤90: 100.0%
≤85: 100.0%
≤80: 100.0%
≤75: 100.0%
≤70: 99.9%
≤65: 99.8%
≤60: 99.6%
≤55: 99.4%
≤50: 99.0%
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≤35: 95.0%
≤30: 93.2%
≤25: 91.1%
≤20: 88.6%
≤15: 85.6%
≤10: 82.5%
≤5: 79.0%
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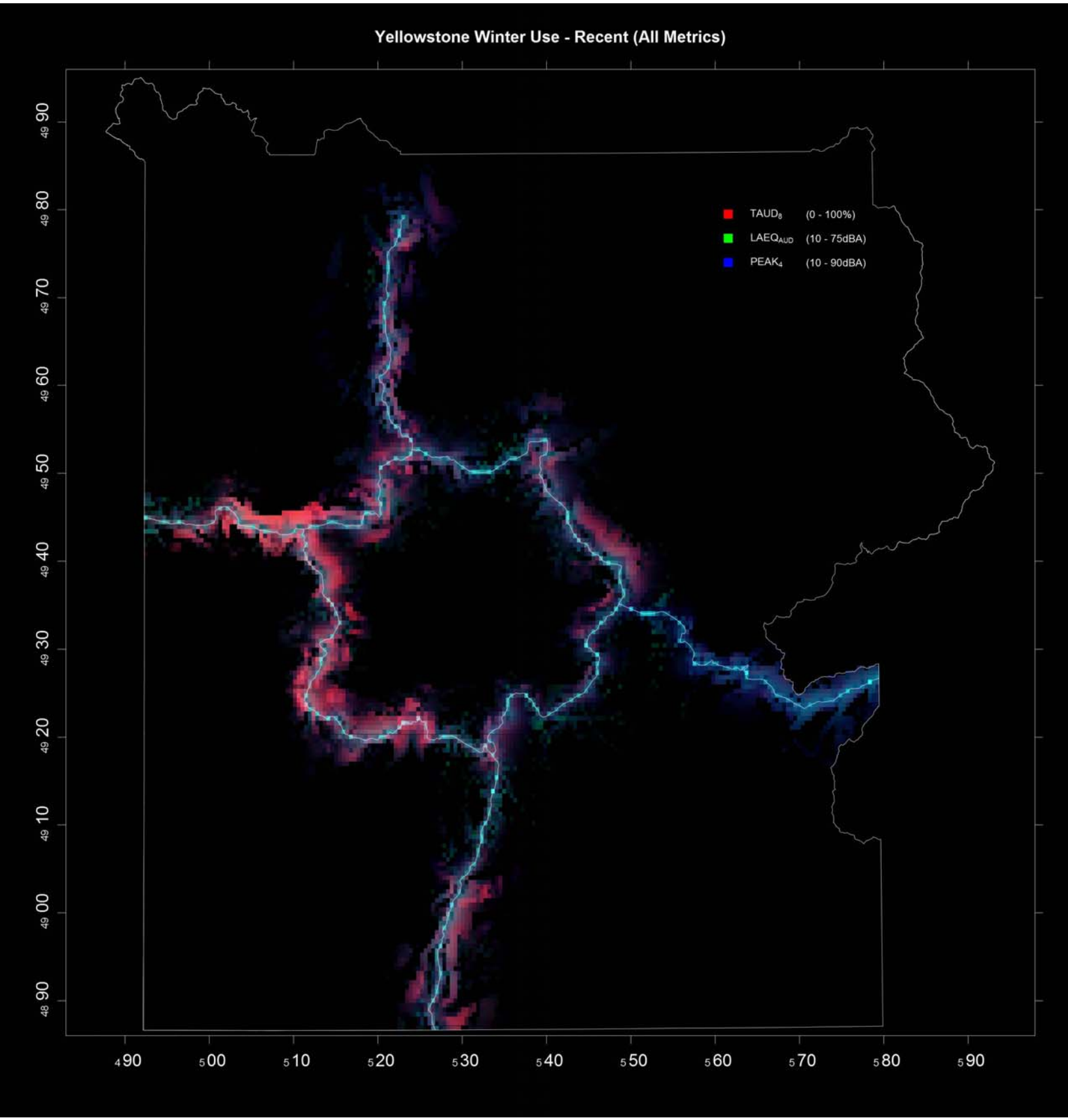
Yellowstone Winter Use - Recent (All Metrics)
TAUD8 (0 - 100%)
LAEQAUD (10 - 75dBA)
PEAK4 (10 - 90dBA)
4990
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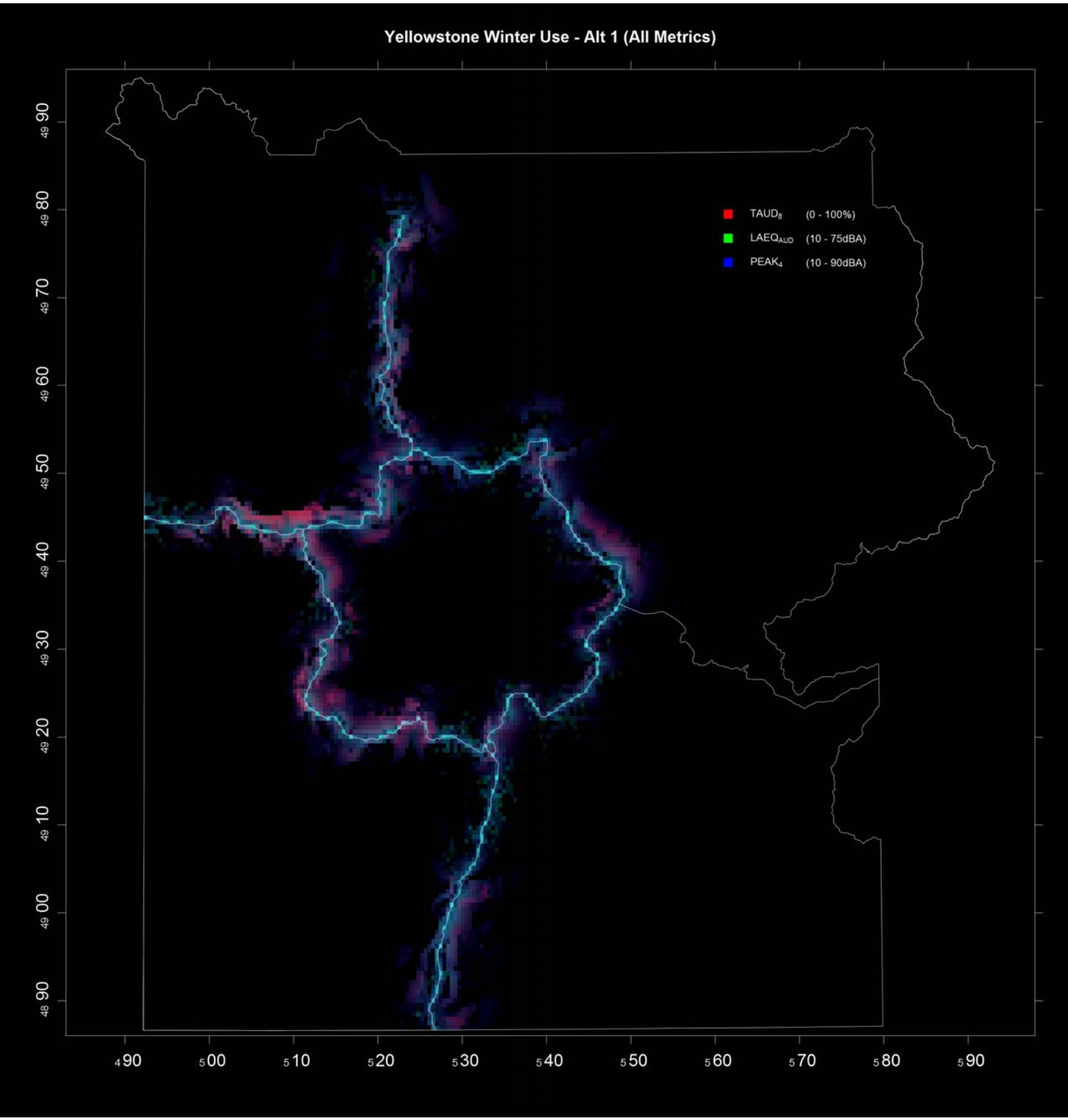
Yellowstone Winter Use - Alt 1 (All Metrics)
TAUD8 (0 - 100%)
LAEQAUD (10 - 75dBA)
PEAK4 (10 - 90dBA)
4990
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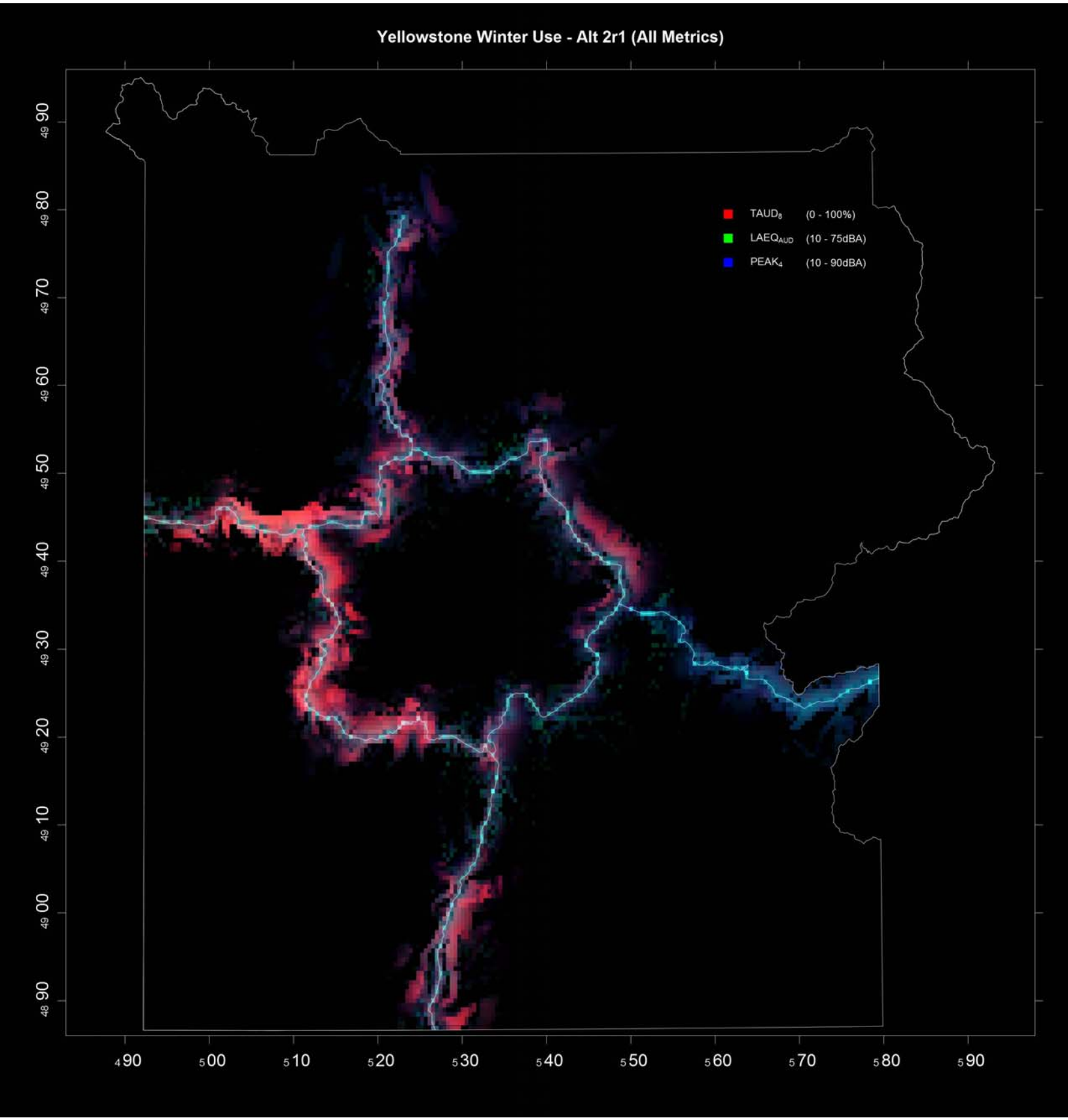
Yellowstone Winter Use - Alt 2r1 (All Metrics)
TAUD8 (0 - 100%)
LAEQAUD (10 - 75dBA)
PEAK4 (10 - 90dBA)
4990
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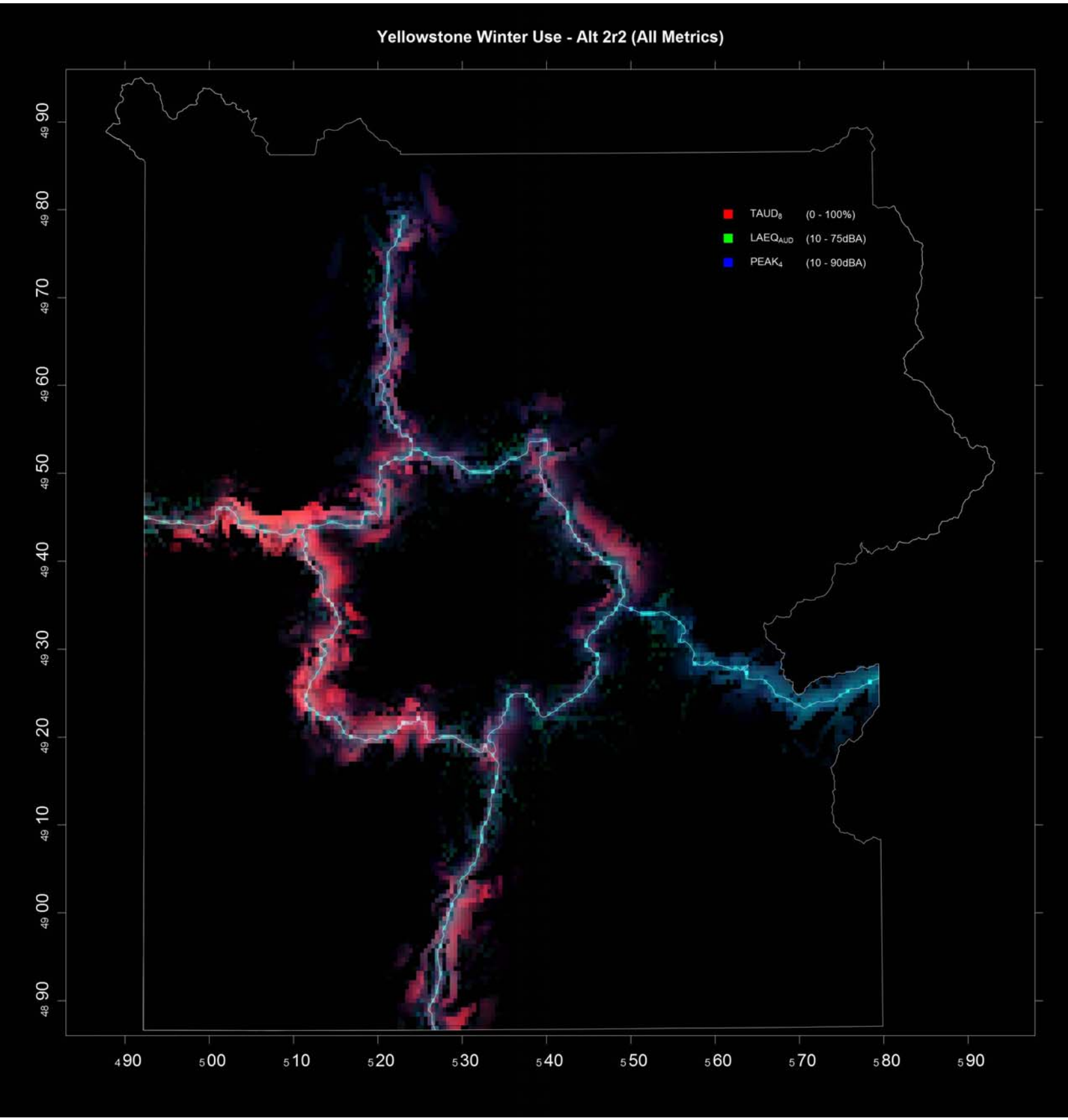
Yellowstone Winter Use - Alt 2r2 (All Metrics)
TAUD8 (0 - 100%)
LAEQAUD (10 - 75dBA)
PEAK4 (10 - 90dBA)
4990
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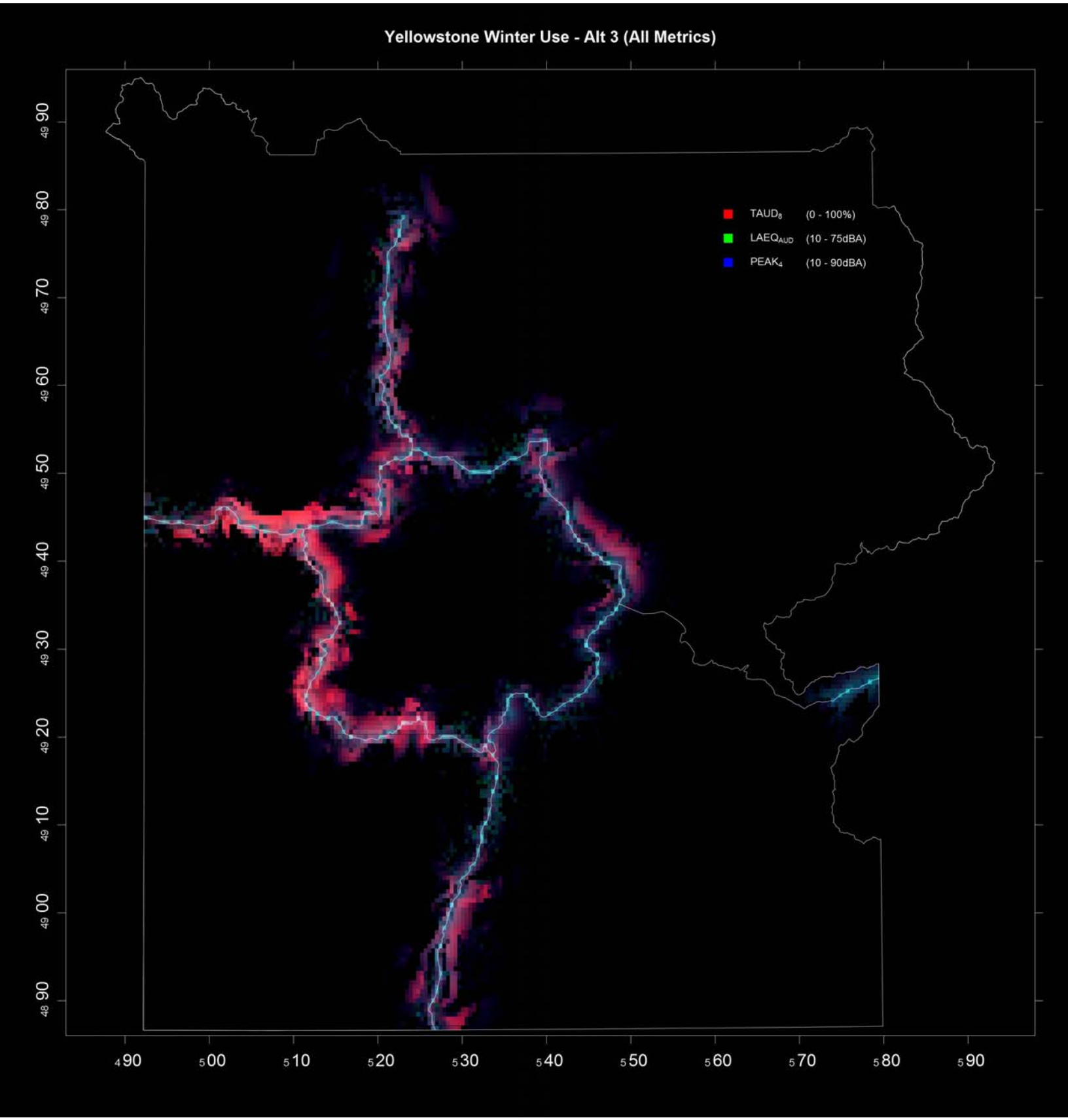
Yellowstone Winter Use - Alt 3 (All Metrics)
TAUD8 (0 - 100%)
LAEQAUD (10 - 75dBA)
PEAK4 (10 - 90dBA)
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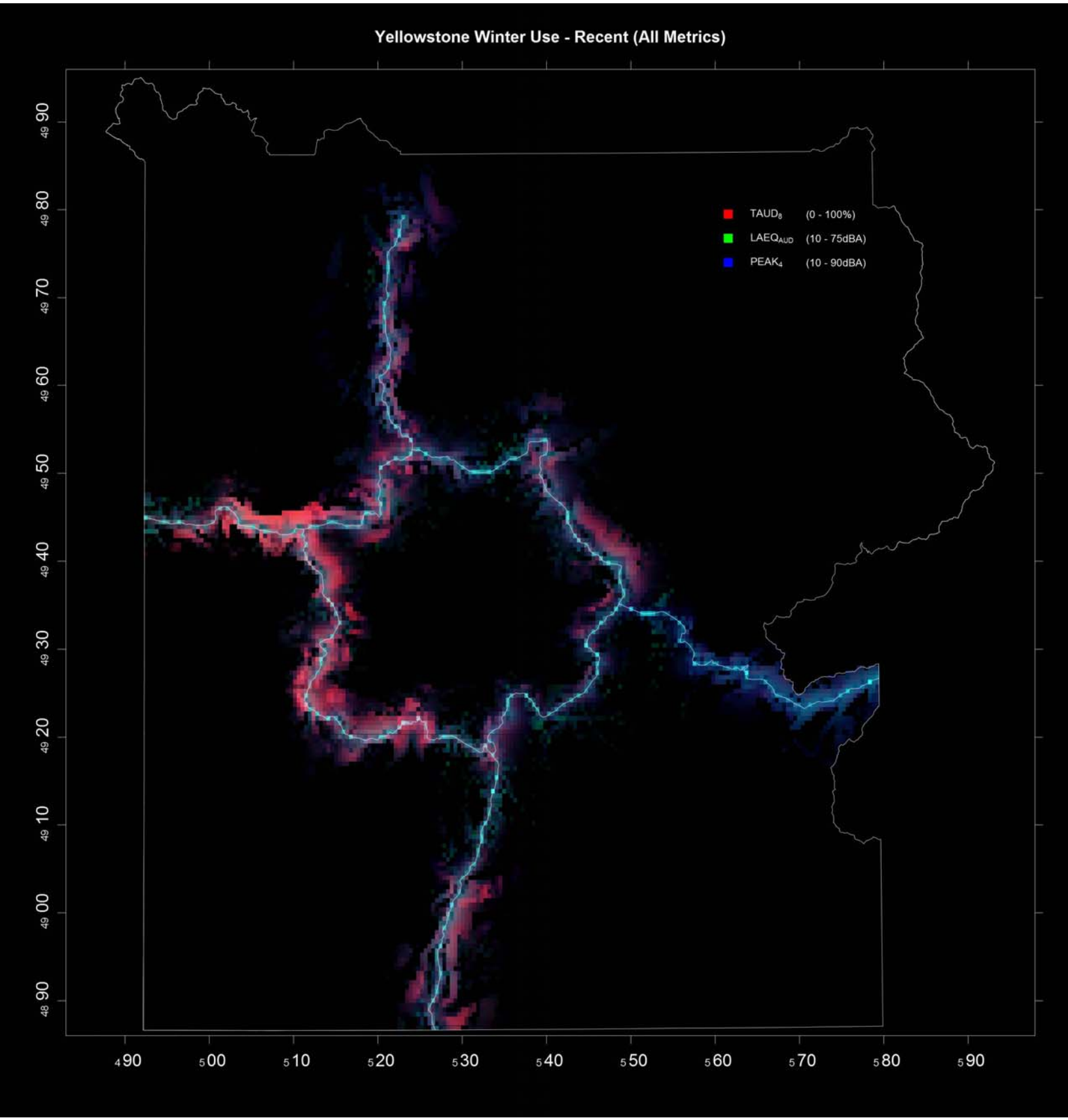
Yellowstone Winter Use - Recent (All Metrics)
TAUD8 (0 - 100%)
LAEQAUD (10 - 75dBA)
PEAK4 (10 - 90dBA)
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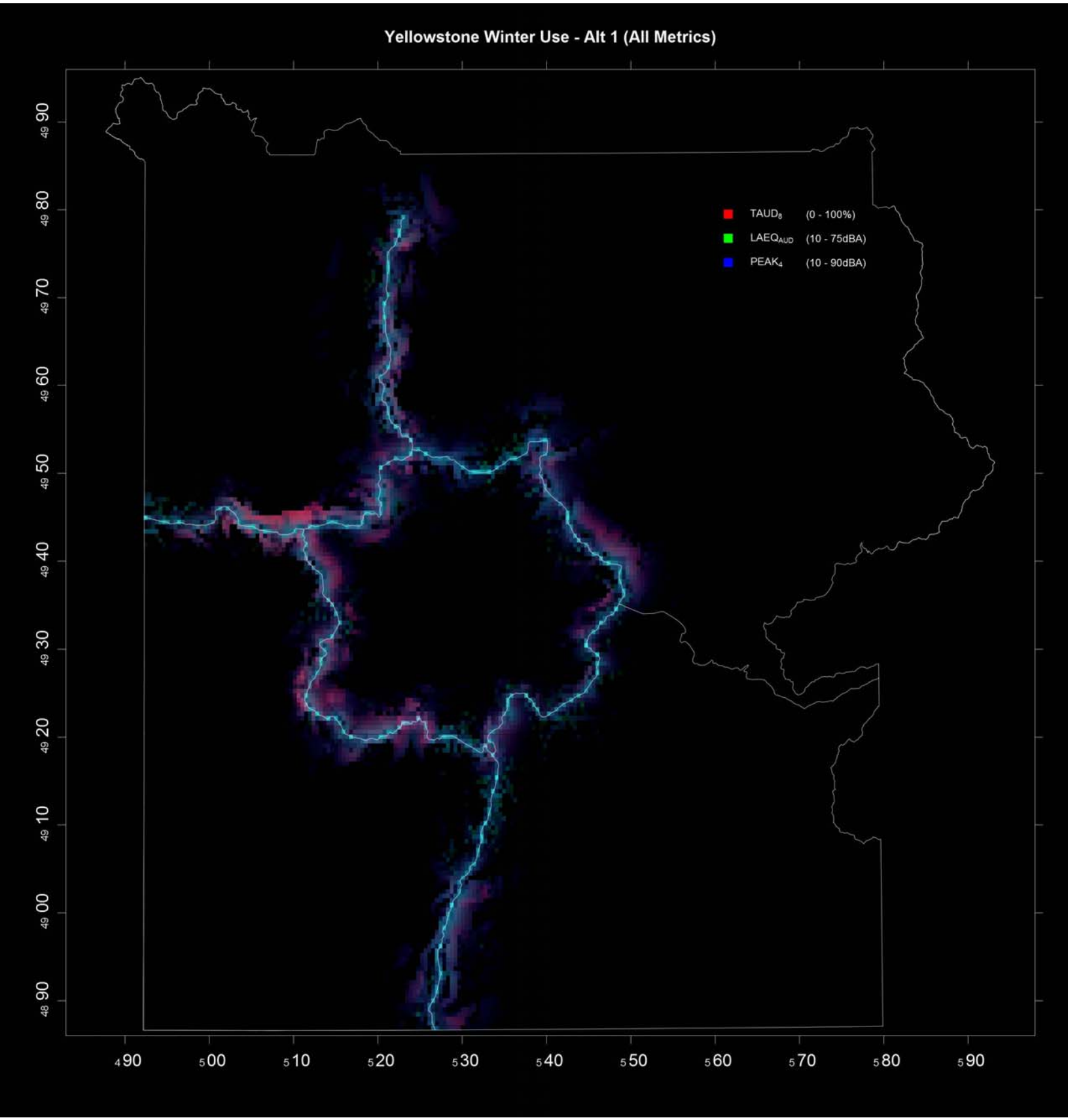
Yellowstone Winter Use - Alt 1 (All Metrics)
TAUD8 (0 - 100%)
LAEQAUD (10 - 75dBA)
PEAK4 (10 - 90dBA)
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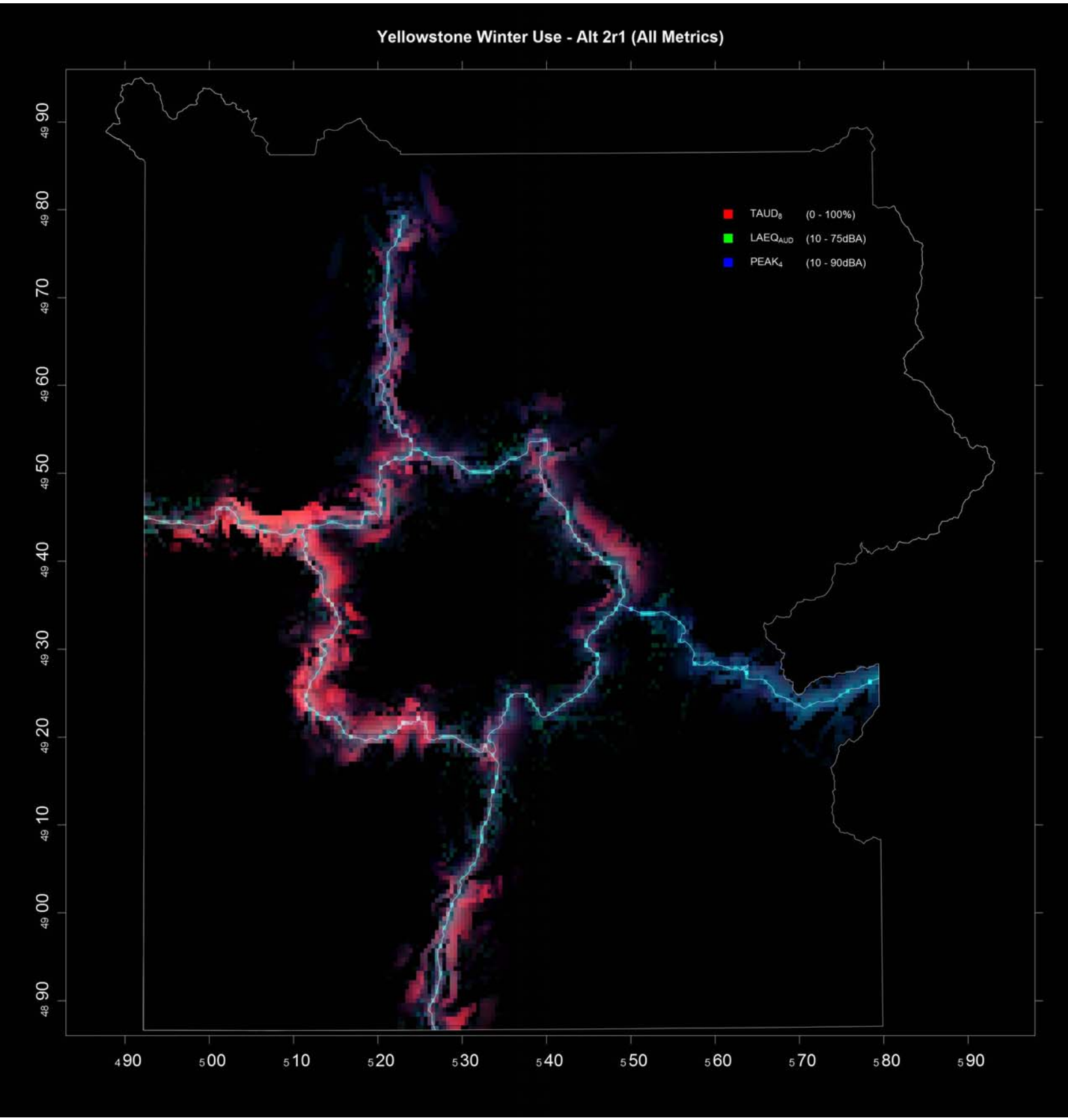
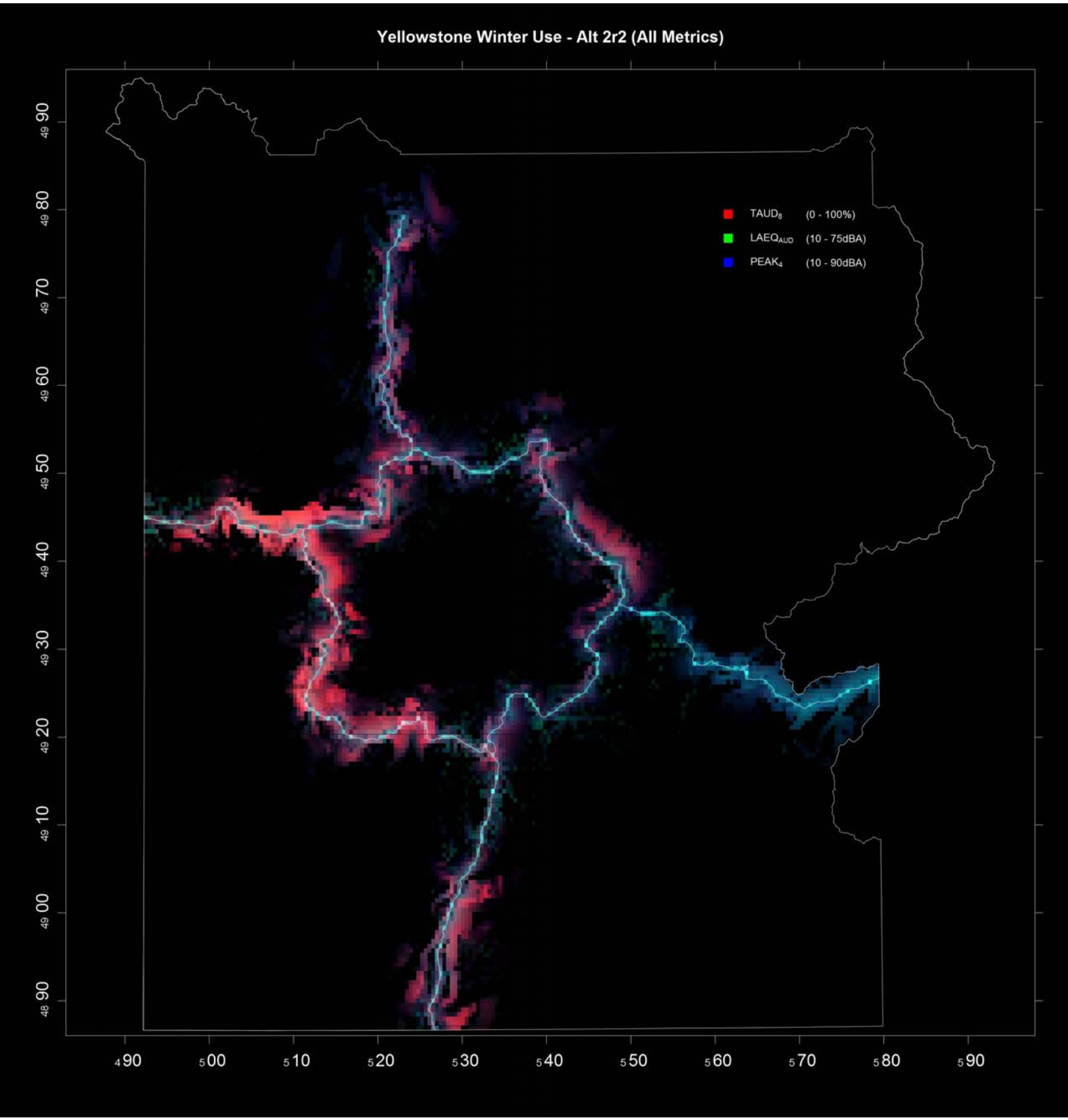
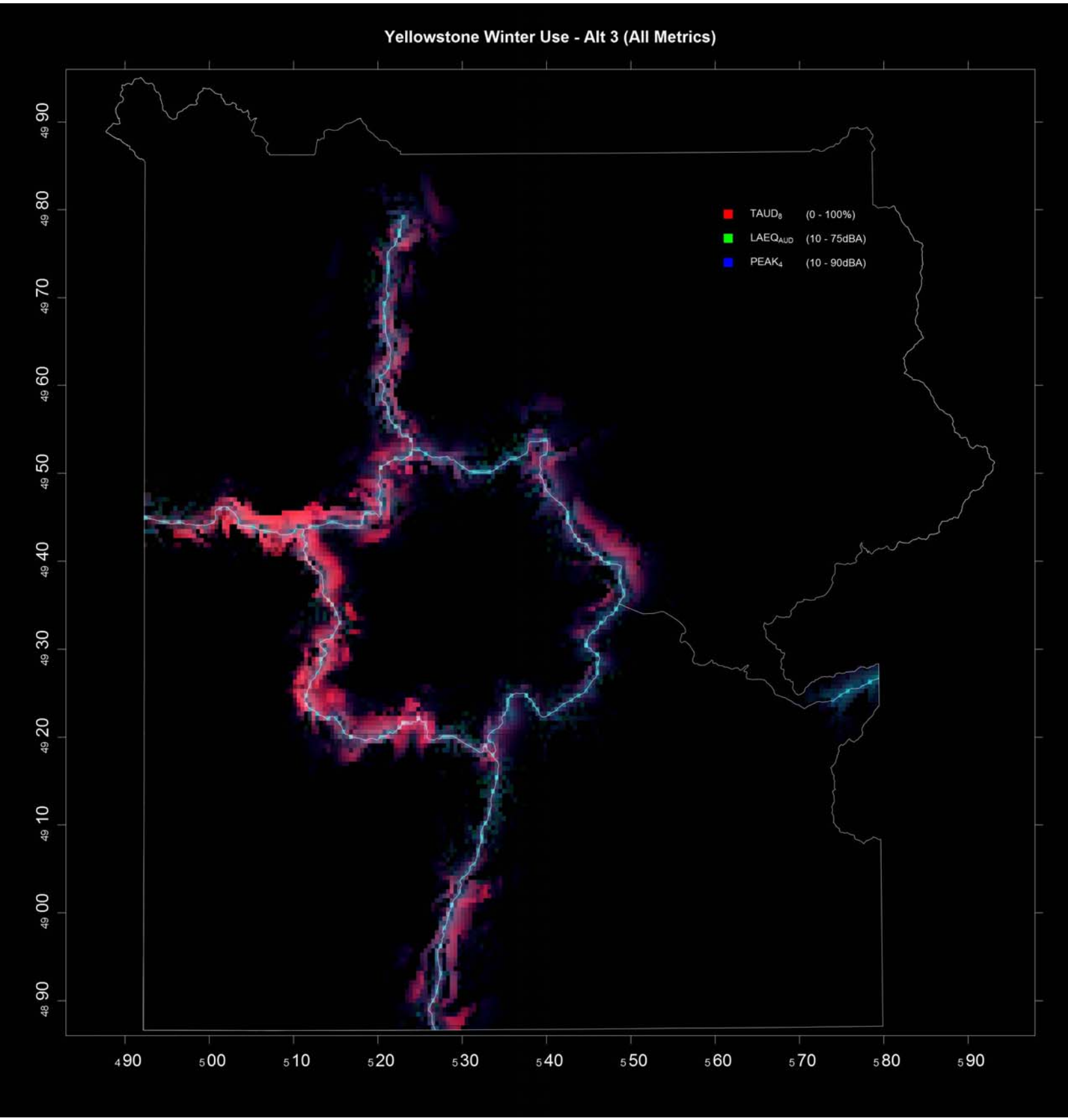
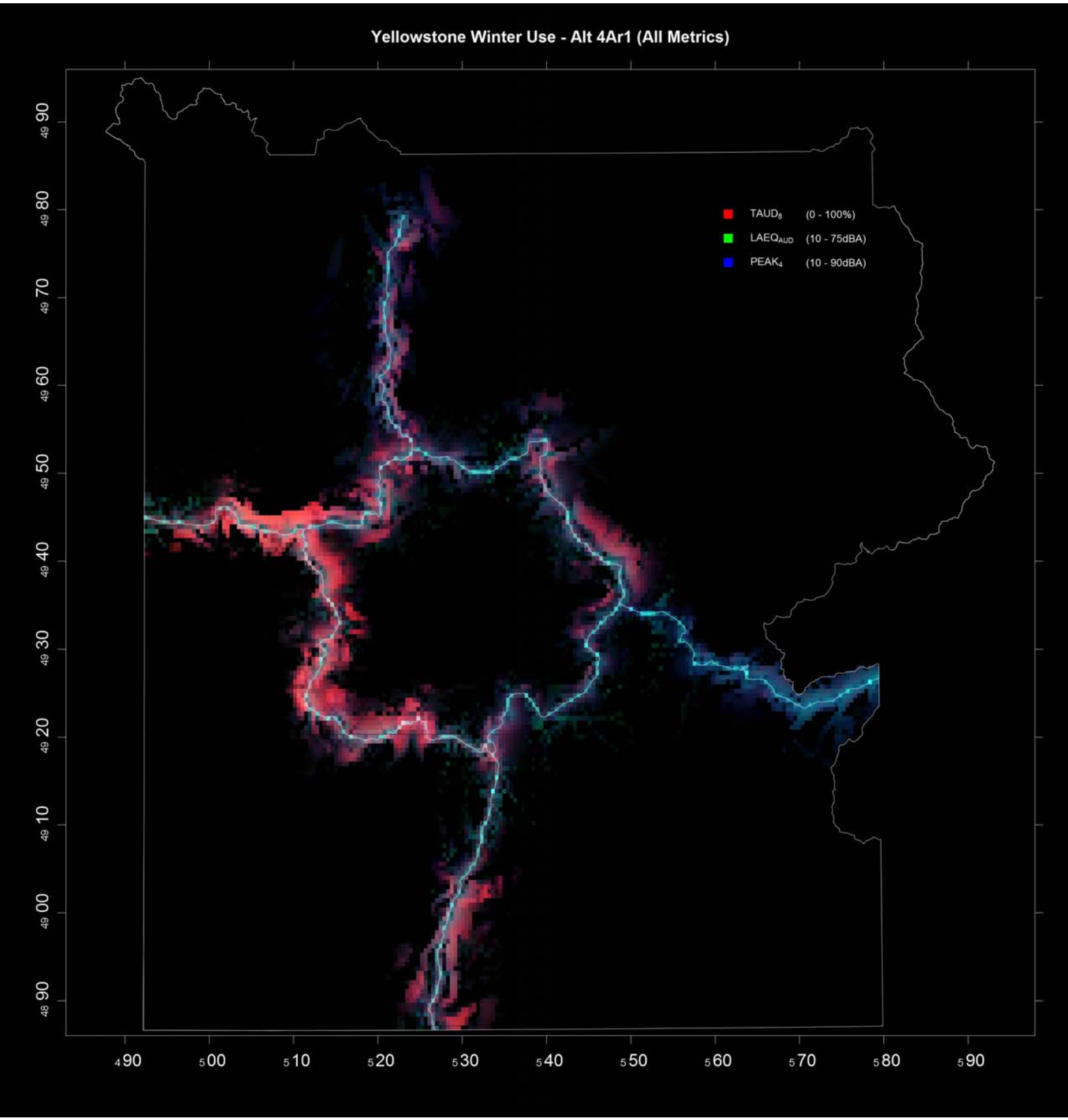
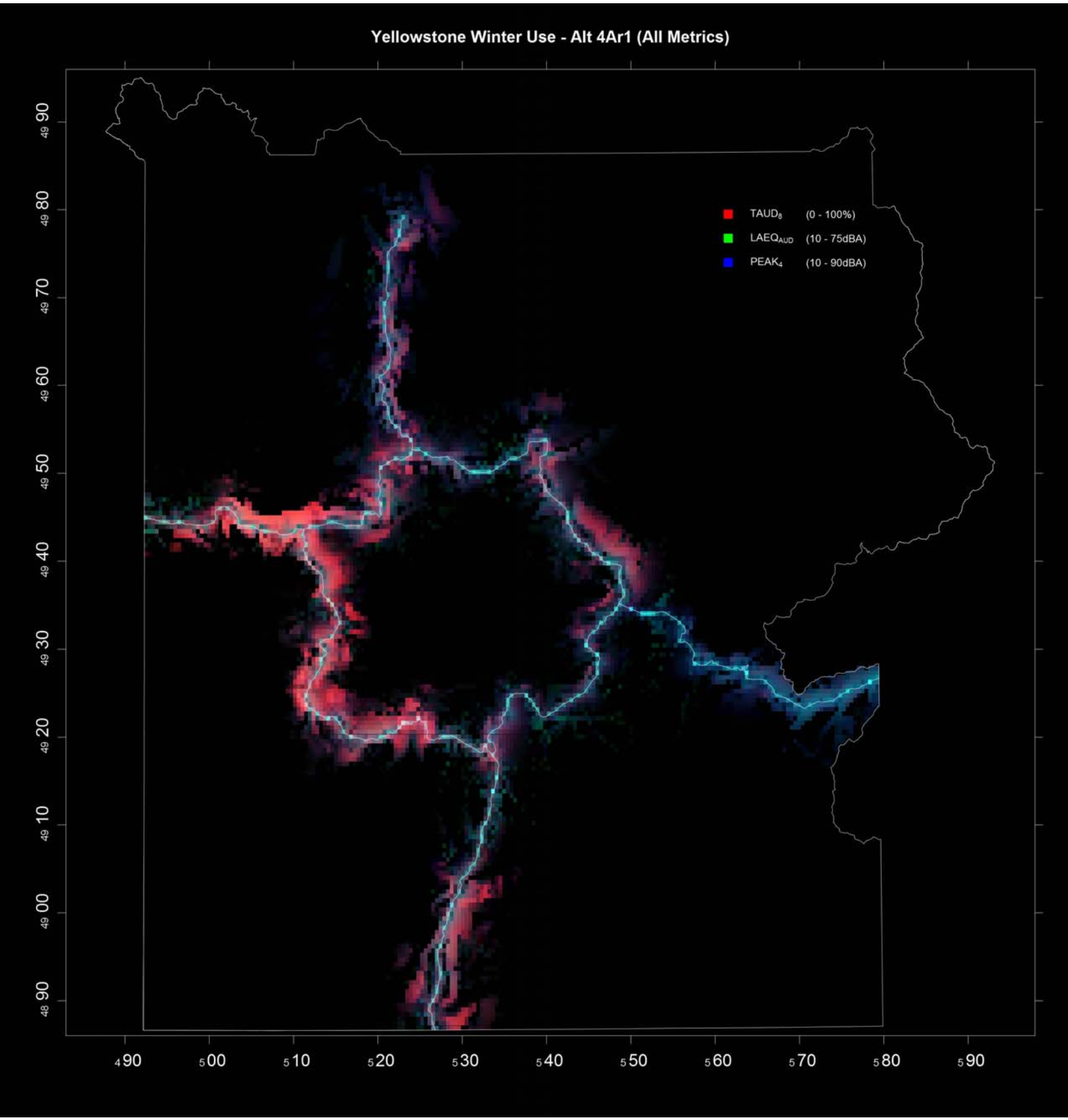
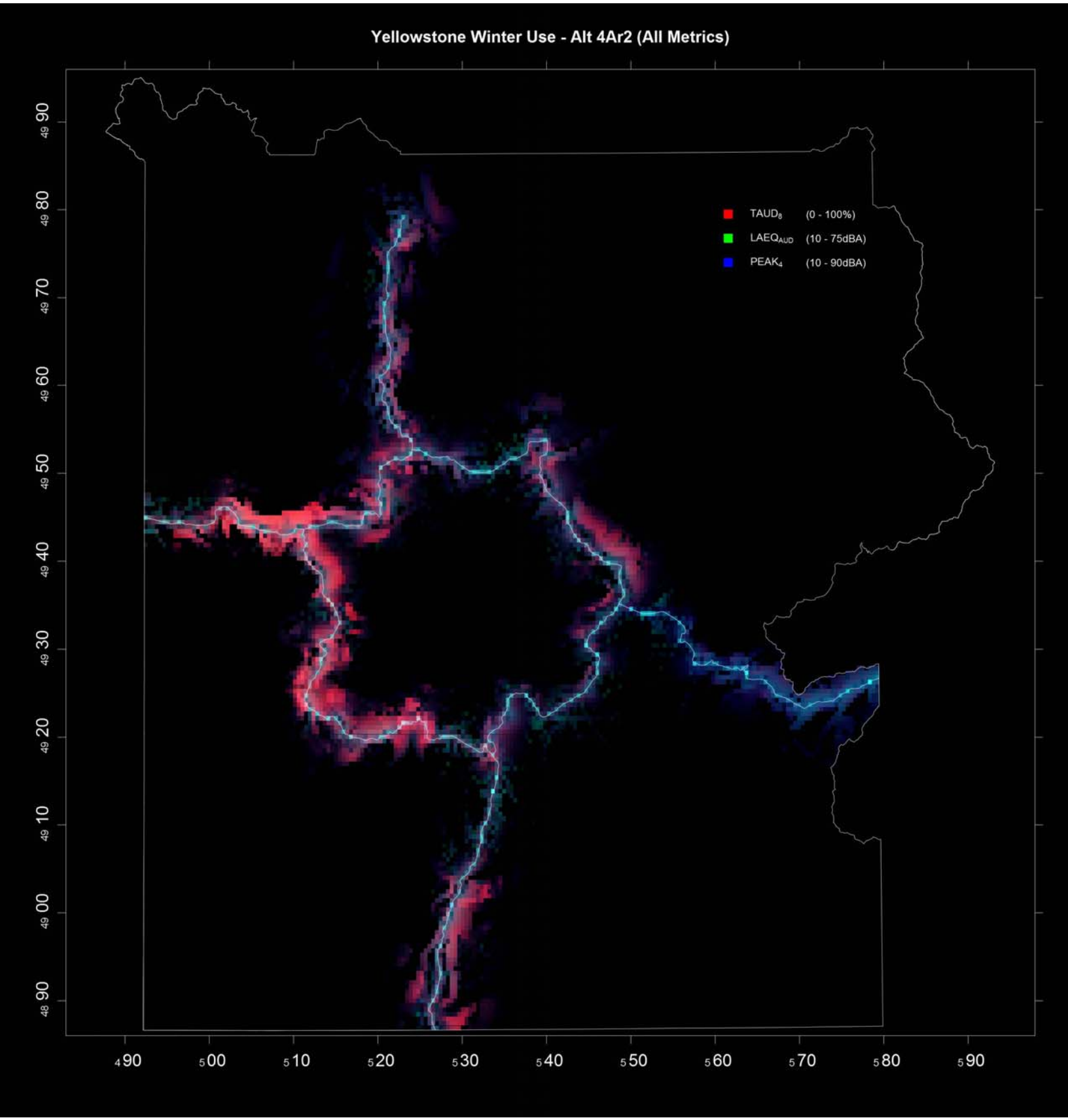

Yellowstone Winter Use - Alt 2r1 (All Metrics)
TAUD8 (0 - 100%)
LAEQAUD (10 - 75dBA)
PEAK4 (10 - 90dBA)
4990
5000
5010
5020
5030
5040
5050
5060
5070
5080
5090
4890
4900
4910
4920
4930
4940
4950
4960
4970
4980
4990

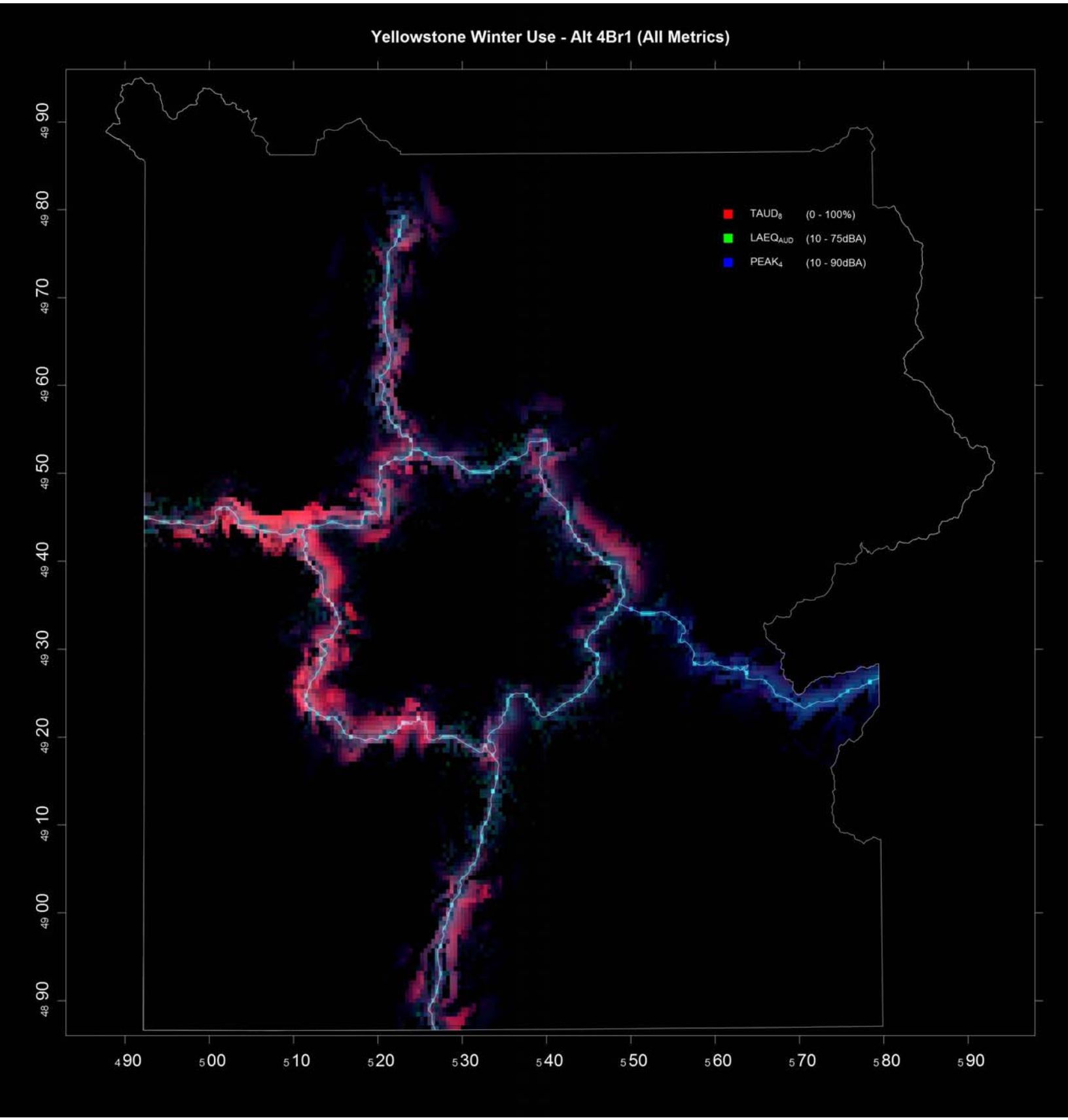

Yellowstone Winter Use - Alt 2r2 (All Metrics)
TAUD8 (0 - 100%)
LAEQAUD (10 - 75dBA)
PEAK4 (10 - 90dBA)
4990
5000
5010
5020
5030
5040
5050
5060
5070
5080
5090
4990
4980
4970
4960
4950
4940
4930
4920
4910
4900
4890


Yellowstone Winter Use - Alt 3 (All Metrics)
TAUD8 (0 - 100%)
LAEQAUD (10 - 75dBA)
PEAK4 (10 - 90dBA)
4990
4980
4970
4960
4950
4940
4930
4920
4910
4900
4890
490
500
510
520
530
540
550
560
570
580
590


Yellowstone Winter Use - Alt 4Ar1 (All Metrics)
TAUD8 (0 - 100%)
LAEQAUD (10 - 75dBA)
PEAK4 (10 - 90dBA)
4990
4980
4970
4960
4950
4940
4930
4920
4910
4900
4890
4900
5000
5010
5020
5030
5040
5050
5060
5070
5080
5090


Yellowstone Winter Use - Alt 4Ar1 (All Metrics)
TAUD8 (0 - 100%)
LAEQAUD (10 - 75dBA)
PEAK4 (10 - 90dBA)
4990
4980
4970
4960
4950
4940
4930
4920
4910
4900
4890
4900
5000
5010
5020
5030
5040
5050
5060
5070
5080
5090


Yellowstone Winter Use - Alt 4Ar2 (All Metrics)
TAUD8 (0 - 100%)
LAEQAUD (10 - 75dBA)
PEAK4 (10 - 90dBA)
4990
4980
4970
4960
4950
4940
4930
4920
4910
4900
4890
490
500
510
520
530
540
550
560
570
580
590


Yellowstone Winter Use - Alt 4Br1 (All Metrics)
TAUD8 (0 - 100%)
LAEQAUD (10 - 75dBA)
PEAK4 (10 - 90dBA)
4990
5000
5010
5020
5030
5040
5050
5060
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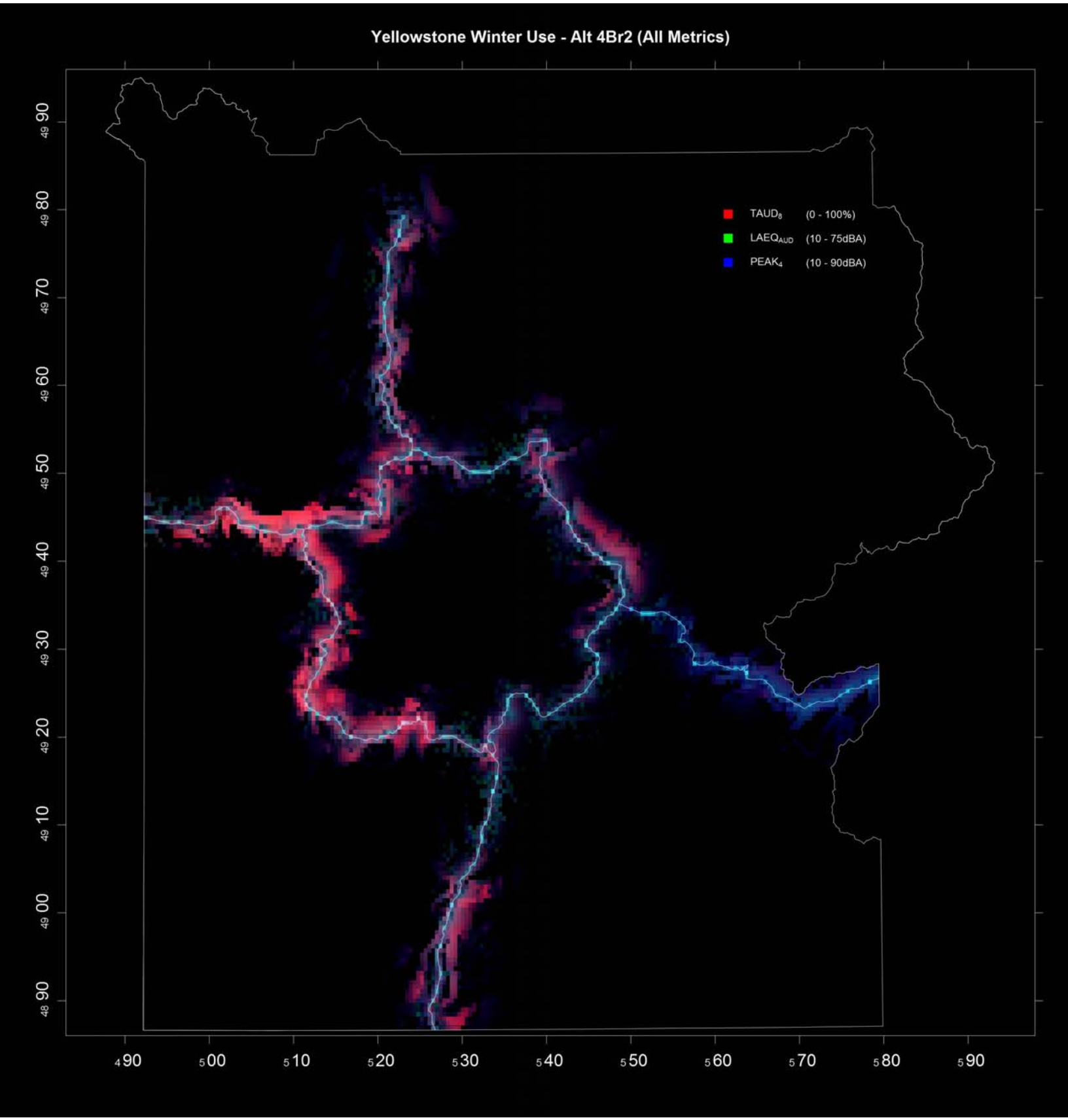
4930
4920
4910
4900
4890


Yellowstone Winter Use - Alt 4Br2 (All Metrics)
TAUD8 (0 - 100%)
LAEQAUD (10 - 75dBA)
PEAK4 (10 - 90dBA)
4990
4980
4970
4960
4950
4940
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4920
4910
4900
4890
490
500
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540
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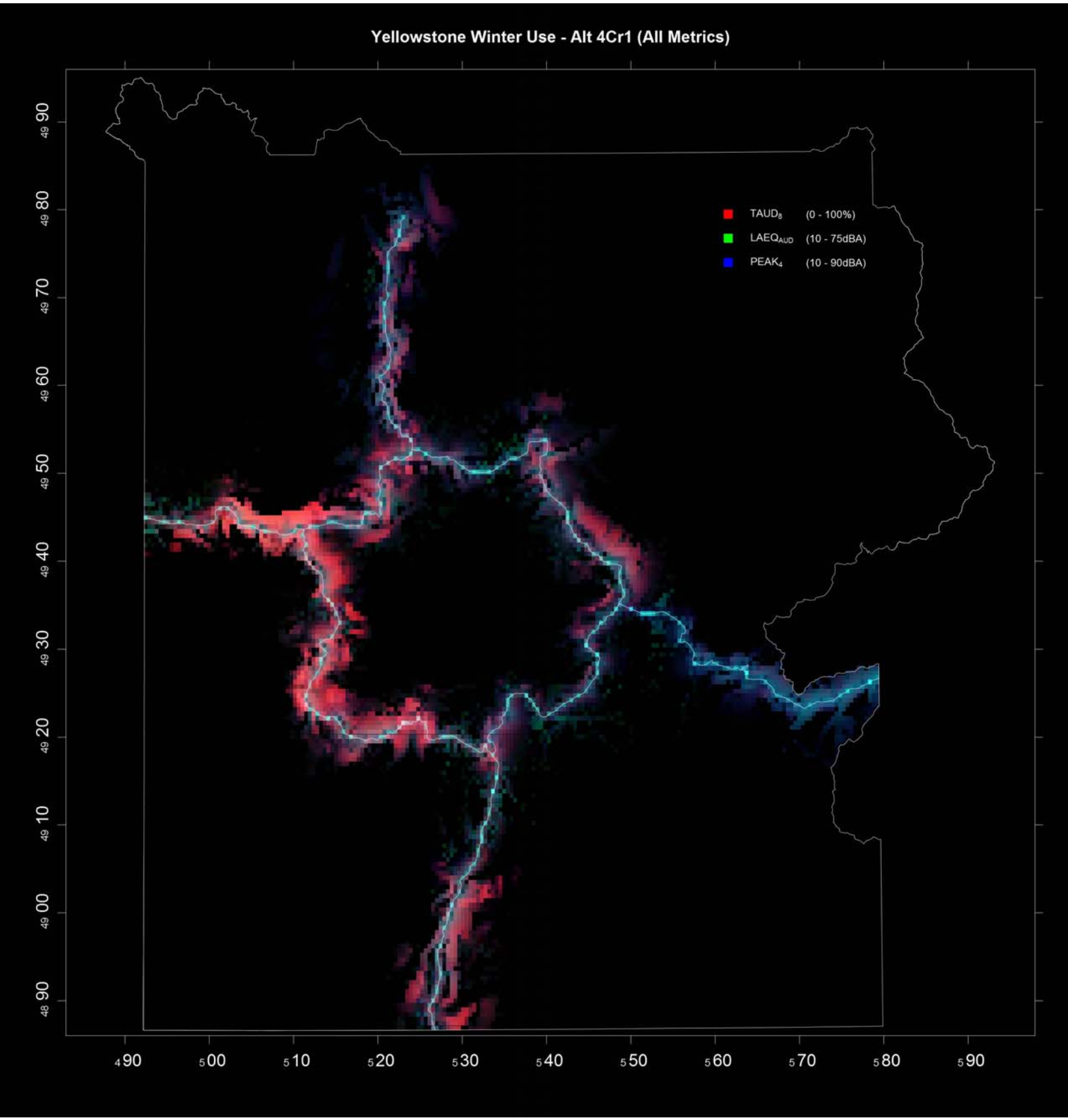
560
570
580
590


Yellowstone Winter Use - Alt 4Cr1 (All Metrics)
TAUD8 (0 - 100%)
LAEQAUD (10 - 75dBA)
PEAK4 (10 - 90dBA)
4990
5000
5010
5020
5030
5040
5050
5060
5070
5080
5090
4990
4980
4970
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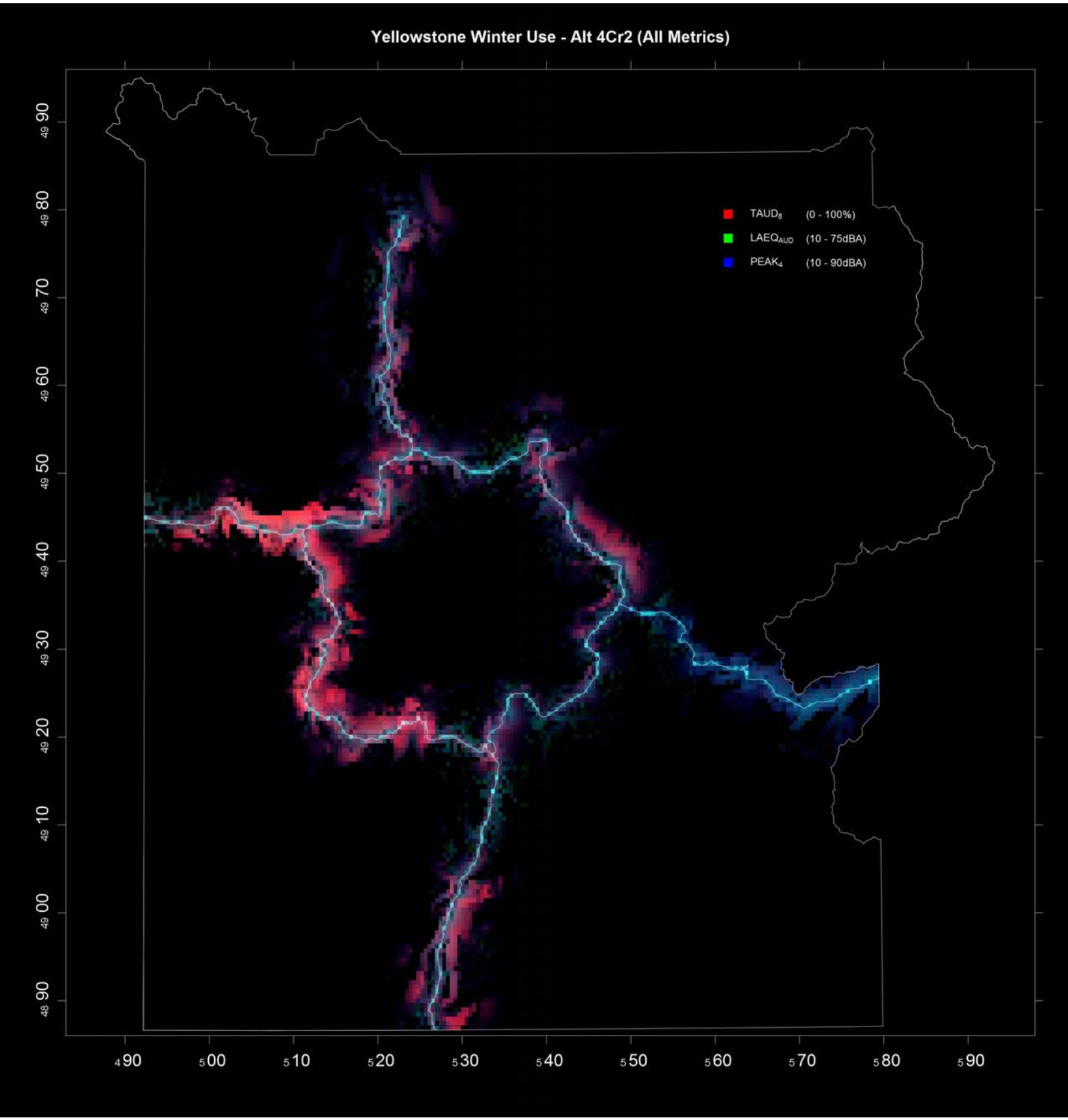
4930
4920
4910
4900
4890


Yellowstone Winter Use - Alt 4Cr2 (All Metrics)
TAUD8 (0 - 100%)
LAEQAUD (10 - 75dBA)
PEAK4 (10 - 90dBA)
4990
5000
5010
5020
5030
5040
5050
5060
5070
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4890
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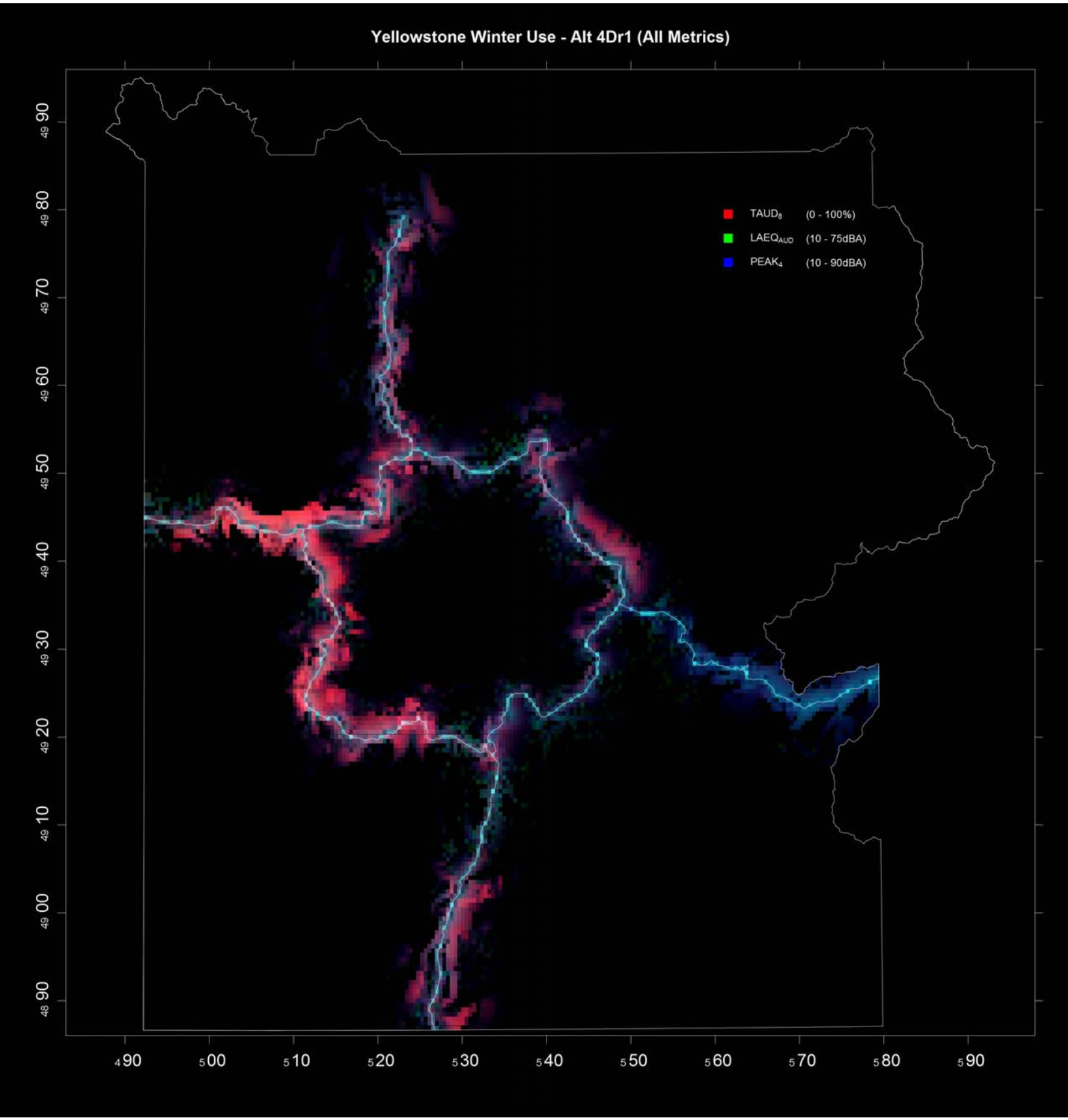
4940
4950
4960
4970
4980
4990


Yellowstone Winter Use - Alt 4Dr1 (All Metrics)
TAUD8 (0 - 100%)
LAEQAUD (10 - 75dBA)
PEAK4 (10 - 90dBA)
4990
5000
5010
5020
5030
5040
5050
5060
5070
5080
5090
4890
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4910
4920
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4940
4950
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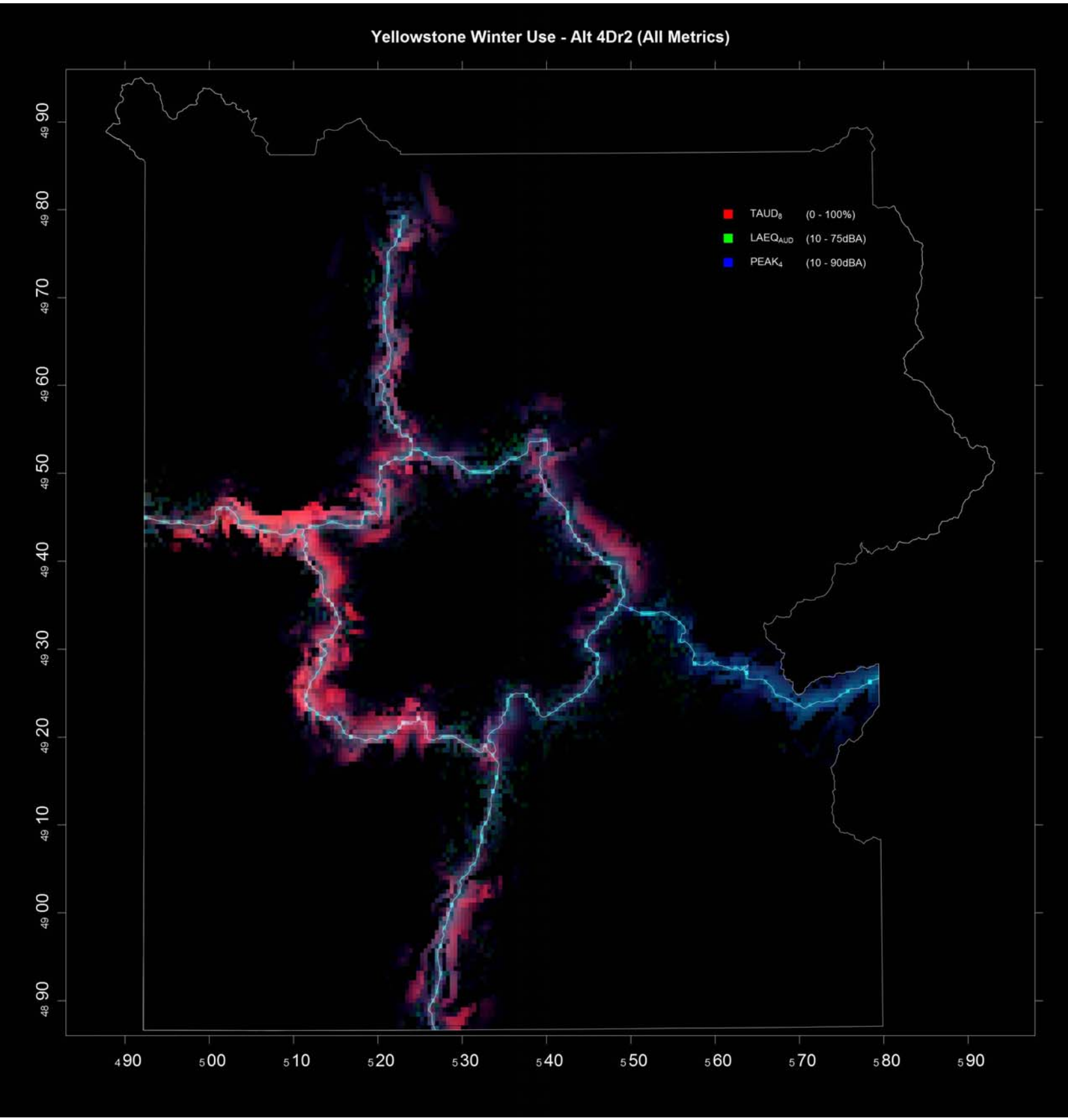
4970
4980
4990


Yellowstone Winter Use - Alt 4Dr2 (All Metrics)
TAUD8 (0 - 100%)
LAEQAUD (10 - 75dBA)
PEAK4 (10 - 90dBA)
4990
5000
5010
5020
5030
5040
5050
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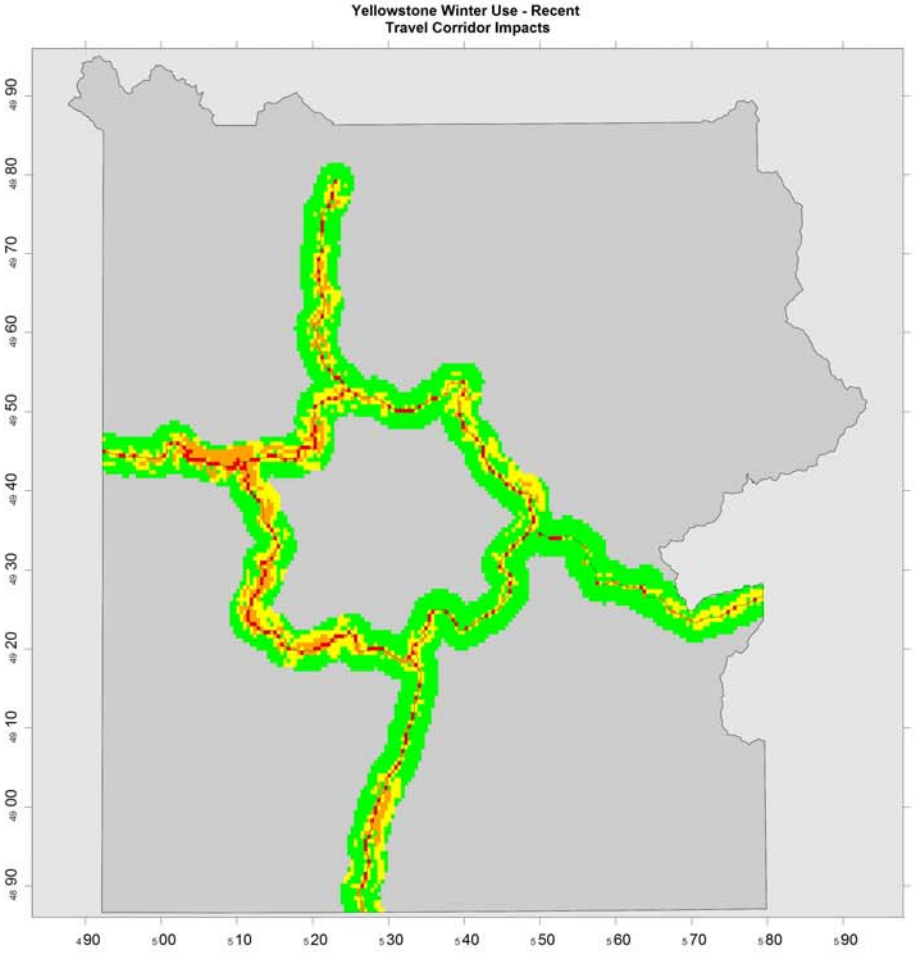
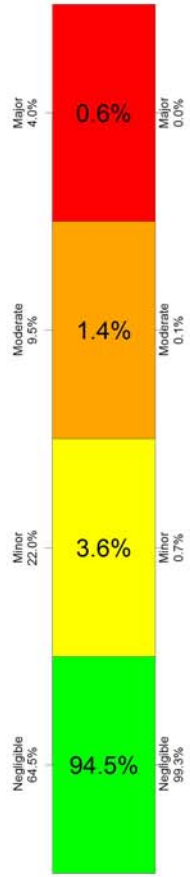
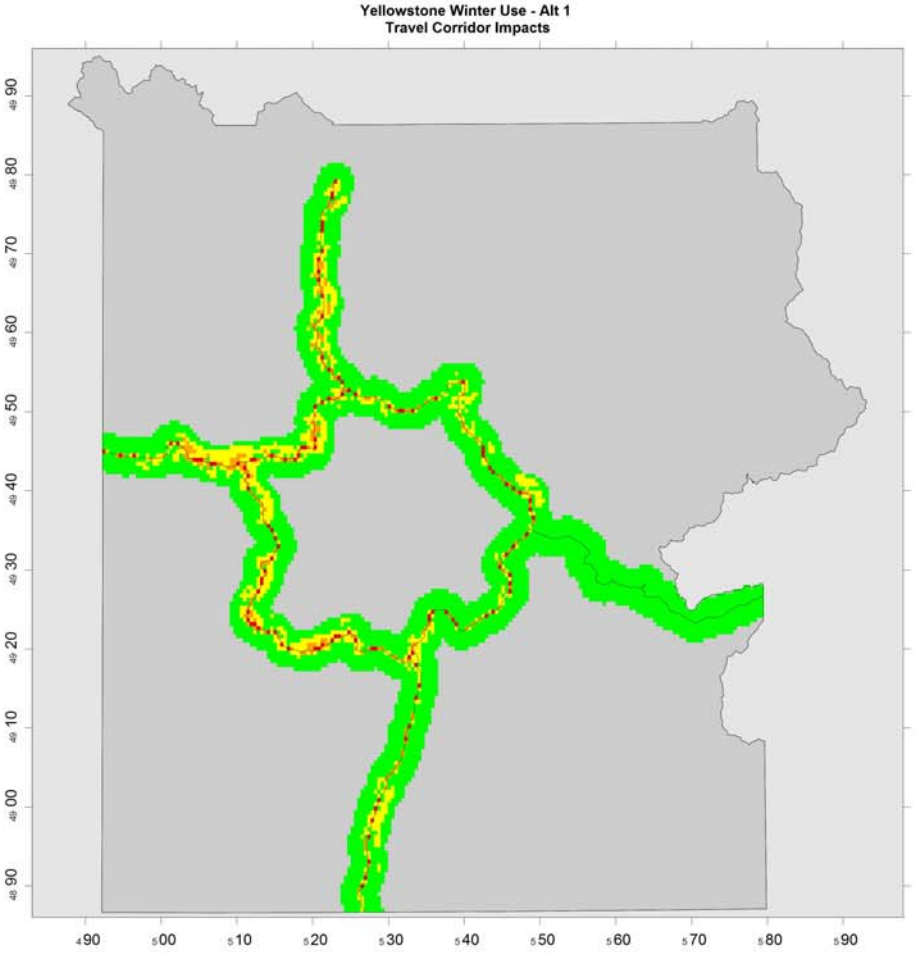
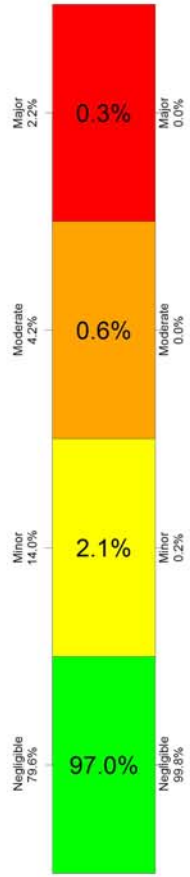
4890

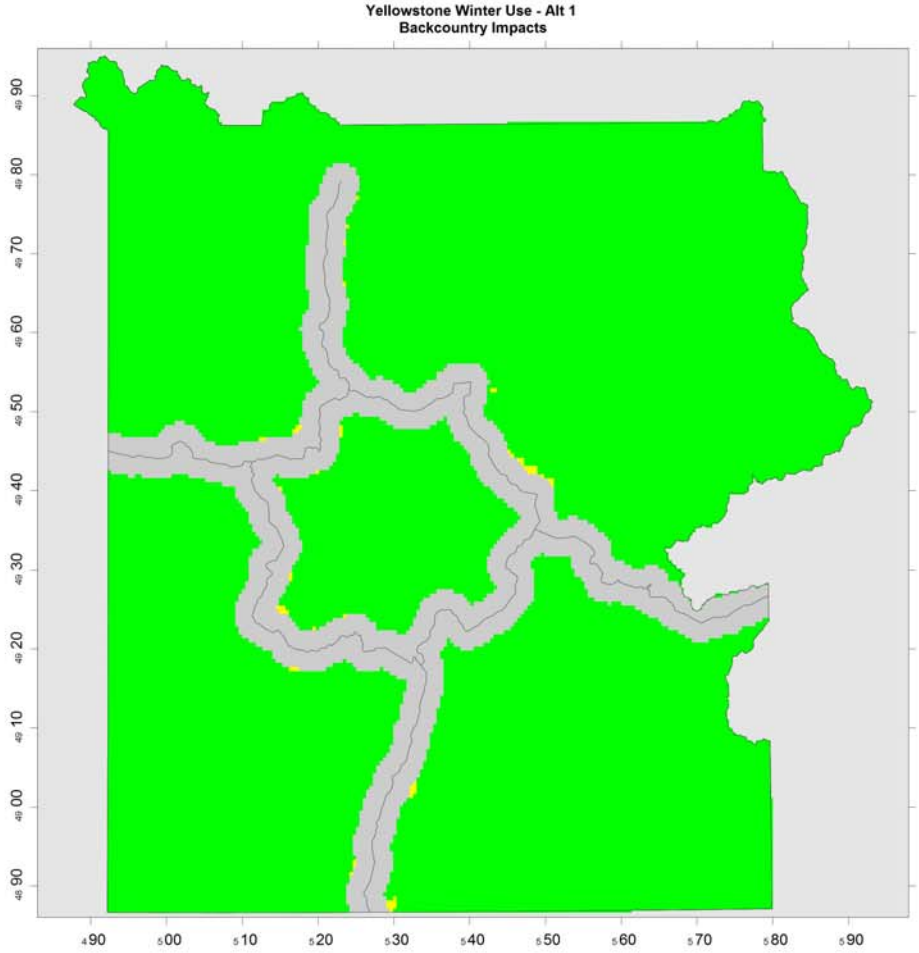

Yellowstone Winter Use - Recent
Travel Corridor Impacts

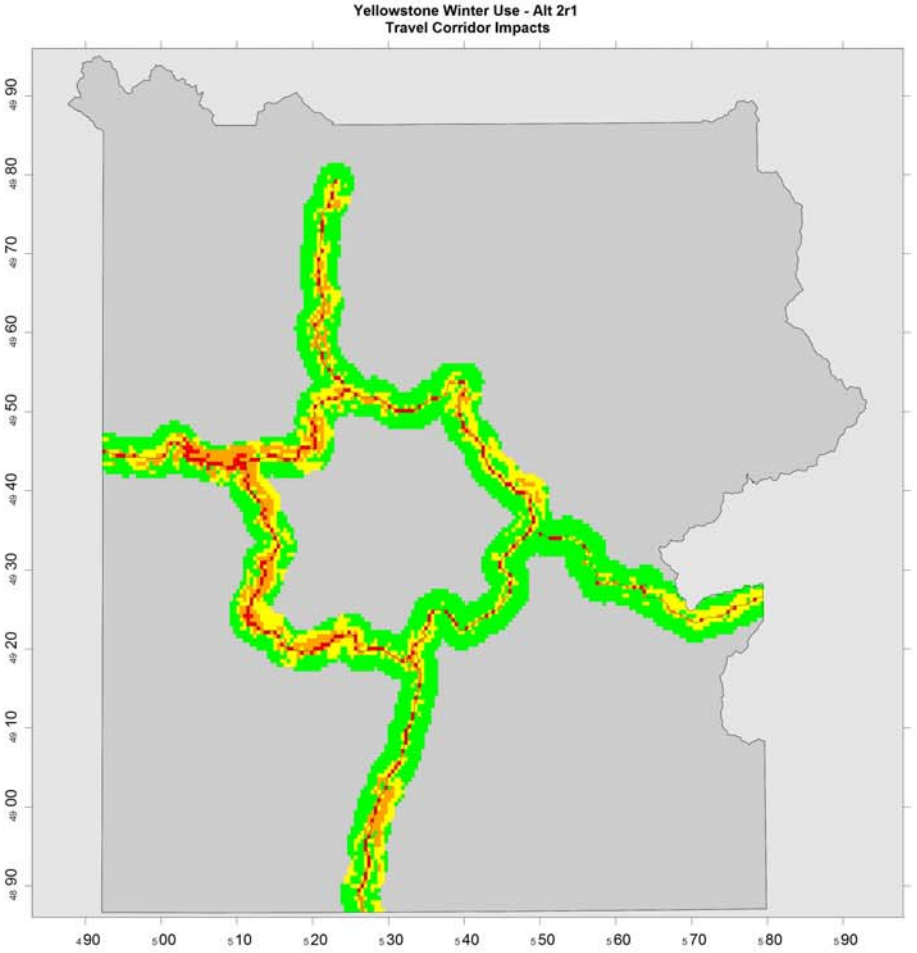

Major
4.0%
0.6%
Major
0.0%
Moderate
9.5%
1.4%
Moderate
0.1%
Minor
22.0%
3.6%
Minor
0.7%
Negligible
64.5%
94.5%
Negligible
99.3%

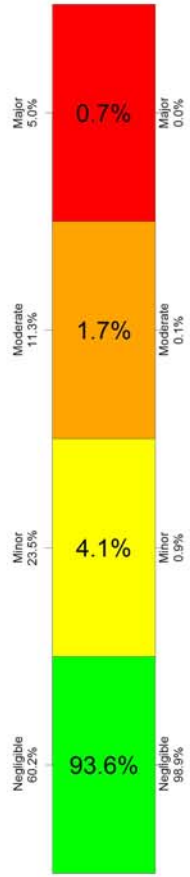
Yellowstone Winter Use - Recent
Backcountry Impacts

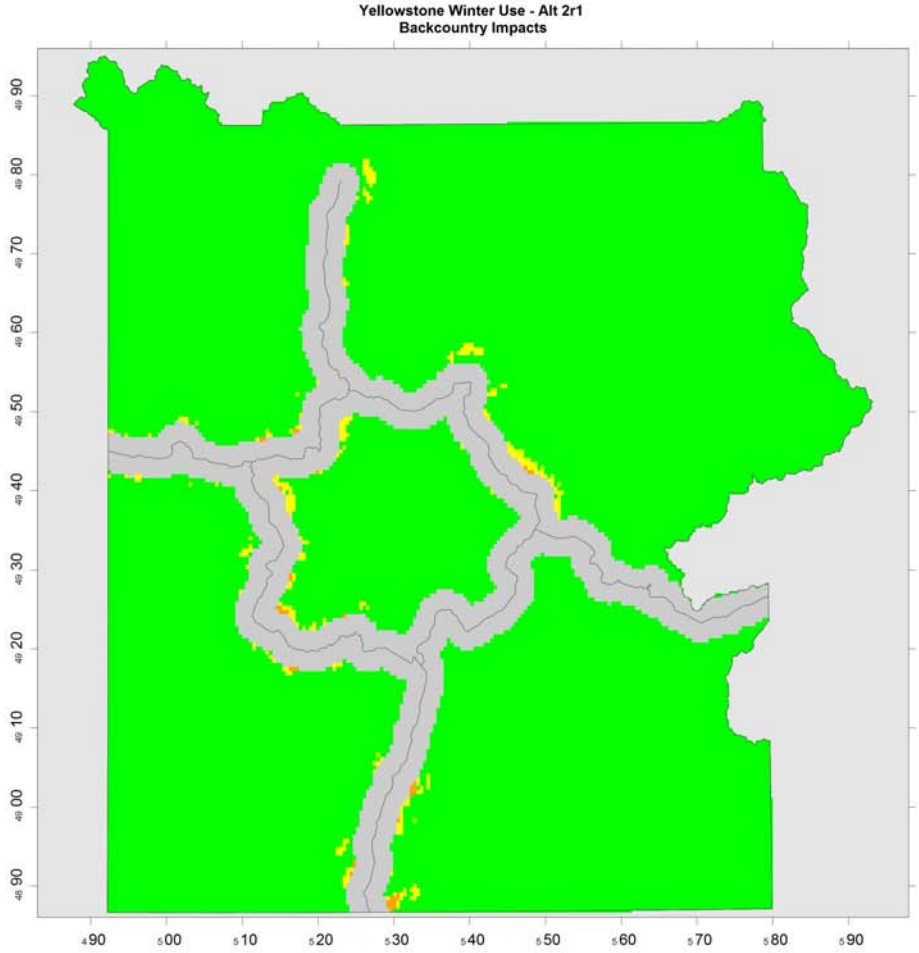

Yellowstone Winter Use - Alt 1
Travel Corridor Impacts

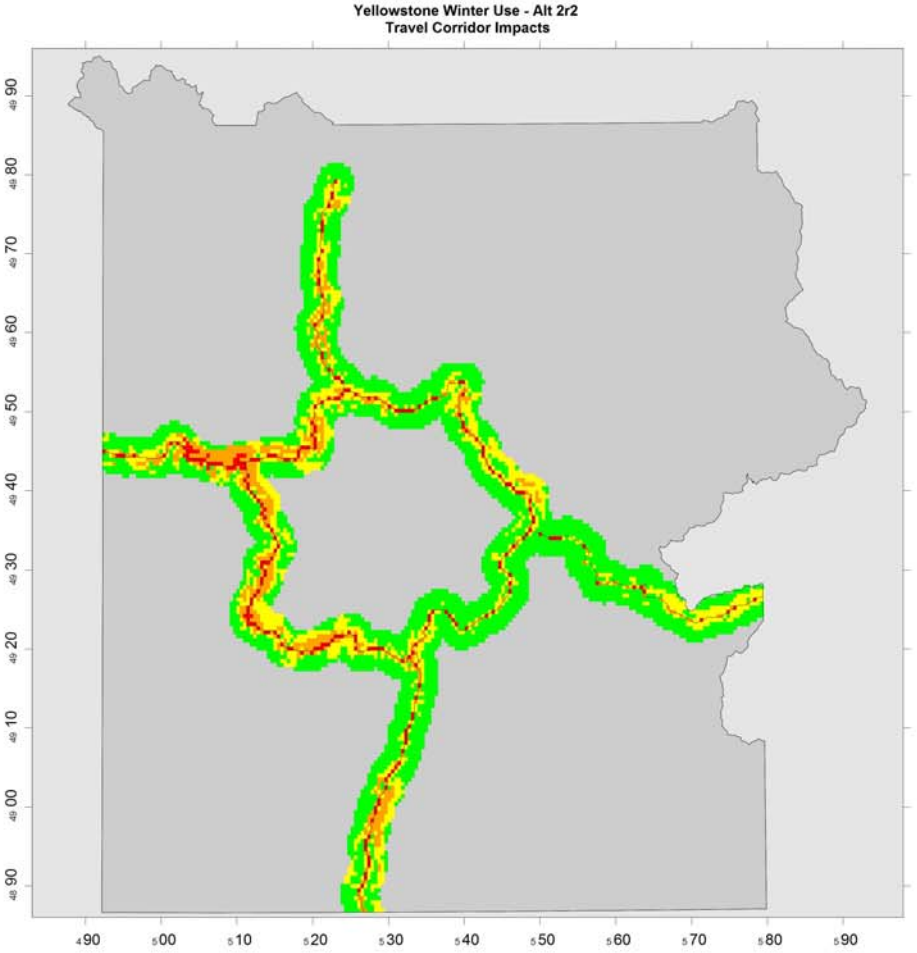

Major 2.2%
0.3%
Major 0.0%
Moderate 4.2%
0.6%
Moderate 0.0%
Minor 14.0%
2.1%
Minor 0.2%
Negligible 79.6%
97.0%
Negligible 99.8%

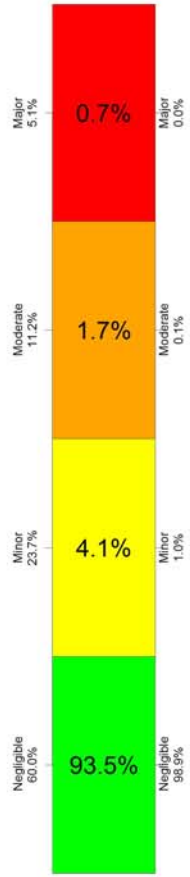

Yellowstone Winter Use - Alt 1
Backcountry Impacts

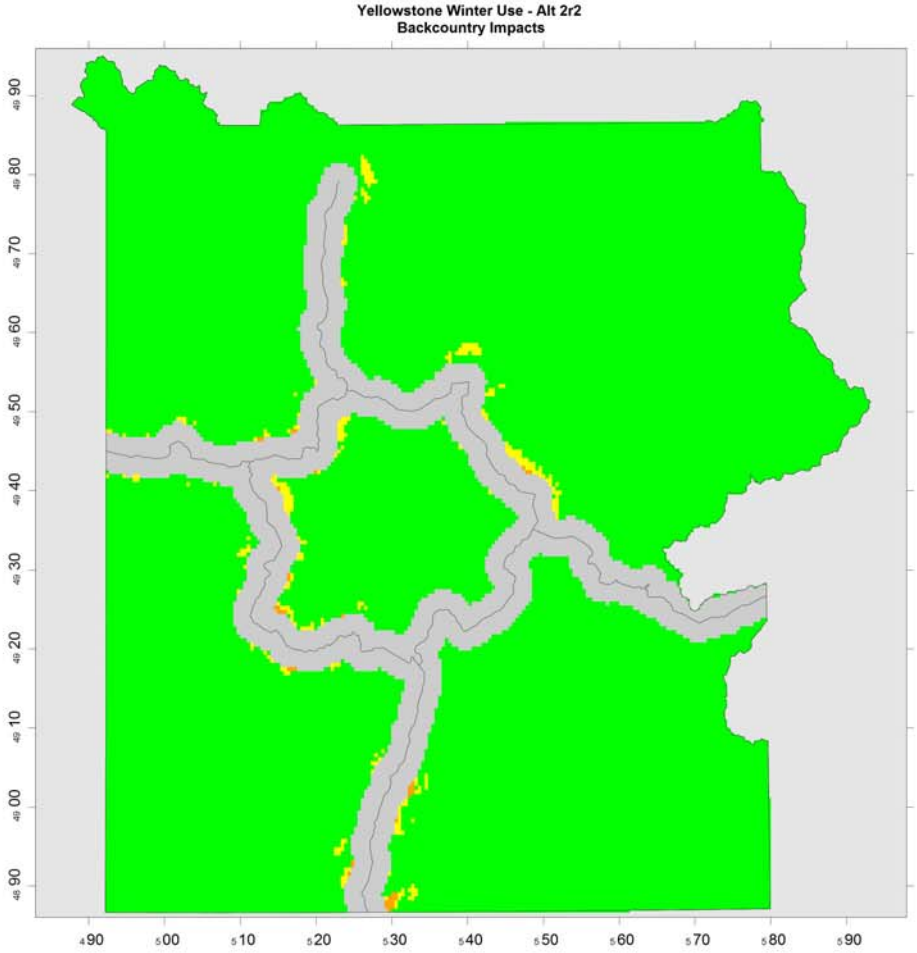

Yellowstone Winter Use - Alt 2r1
Travel Corridor Impacts

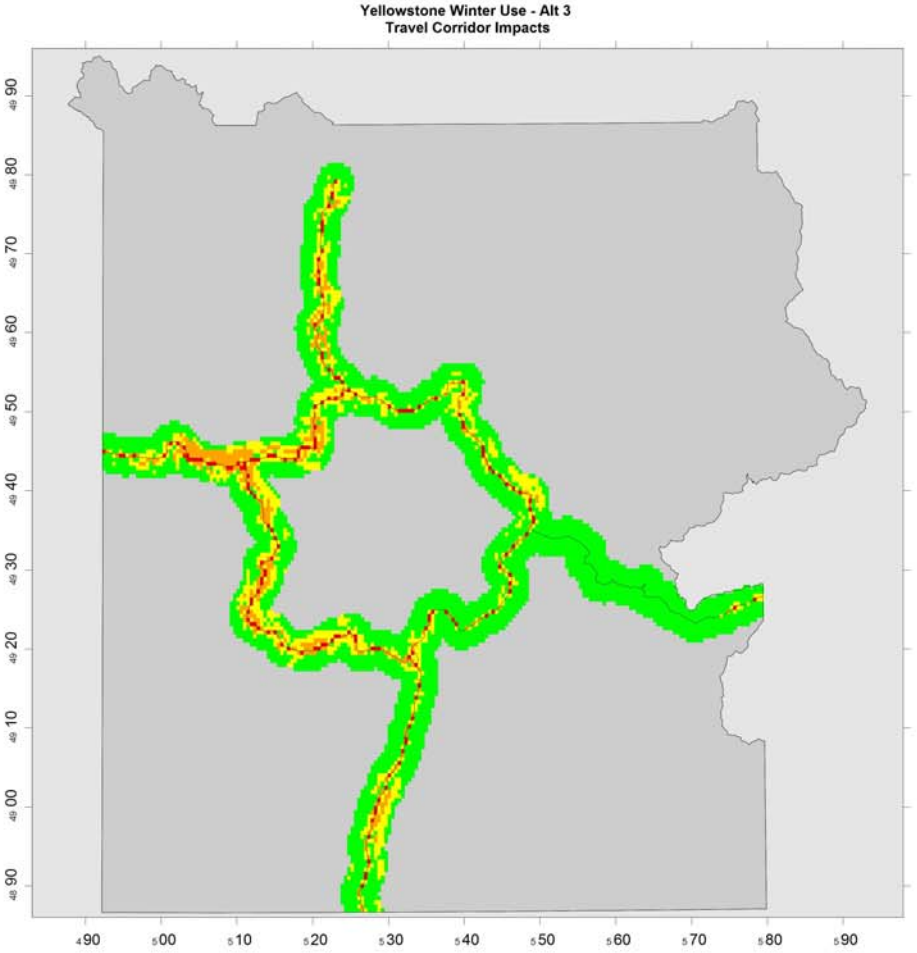

Major 5.0%
0.7%
Major 0.0%
Moderate 11.3%
1.7%
Moderate 0.1%
Minor 23.5%
4.1%
Minor 0.9%
Negligible 60.2%
93.6%
Negligible 98.9%

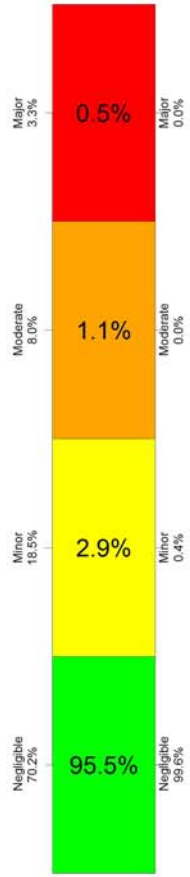

Yellowstone Winter Use - Alt 2r1
Backcountry Impacts

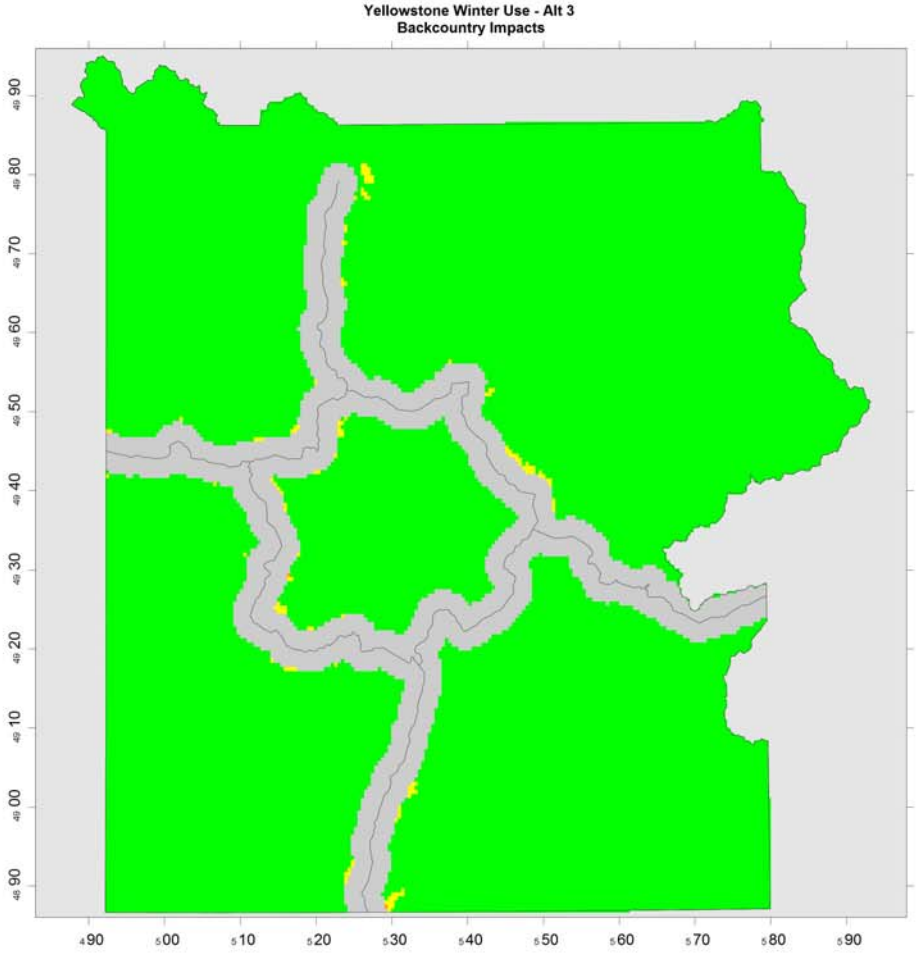

Yellowstone Winter Use - Alt 2r2
Travel Corridor Impacts

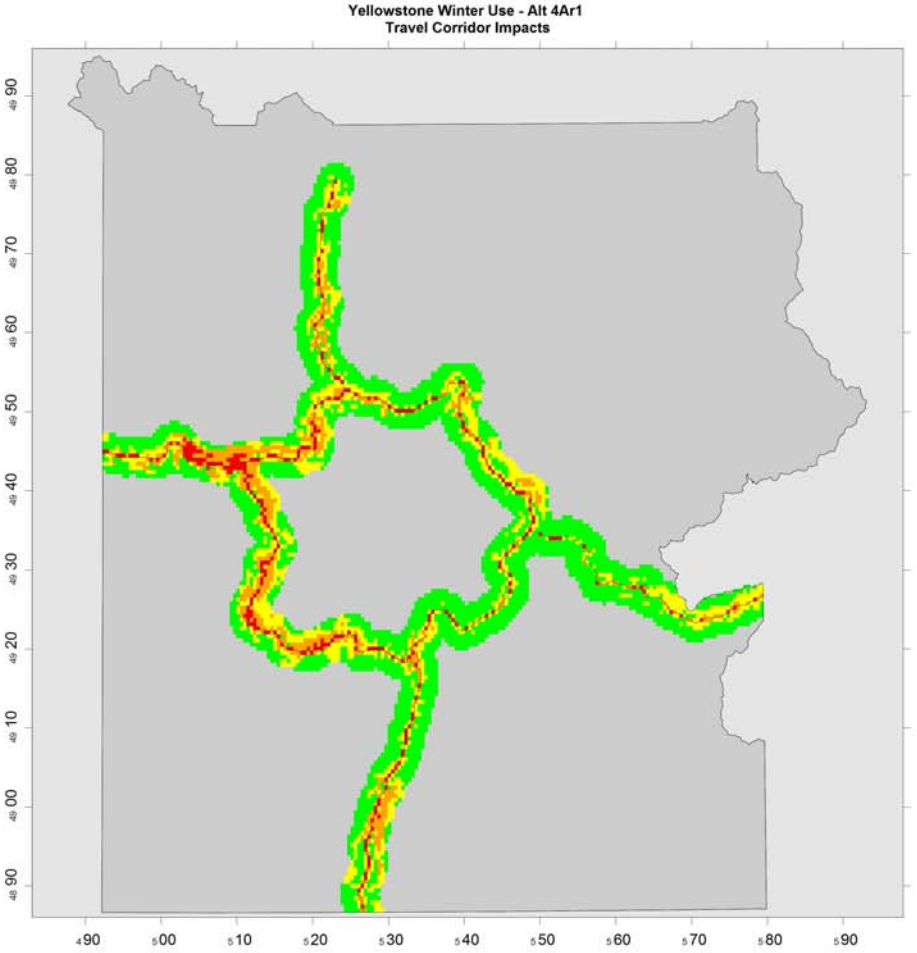

Major 5.1%
0.7%
Major 0.0%
Moderate 11.2%
1.7%
Moderate 0.1%
Minor 23.7%
4.1%
Minor 1.0%
Negligible 60.0%
93.5%
Negligible 98.9%

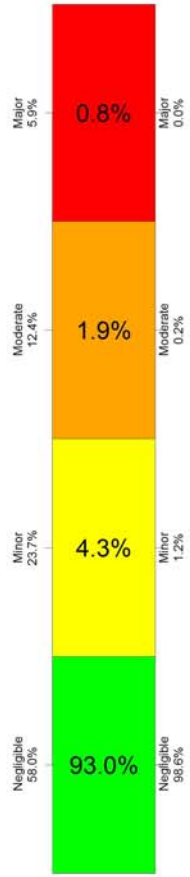

Yellowstone Winter Use - Alt 2r2
Backcountry Impacts

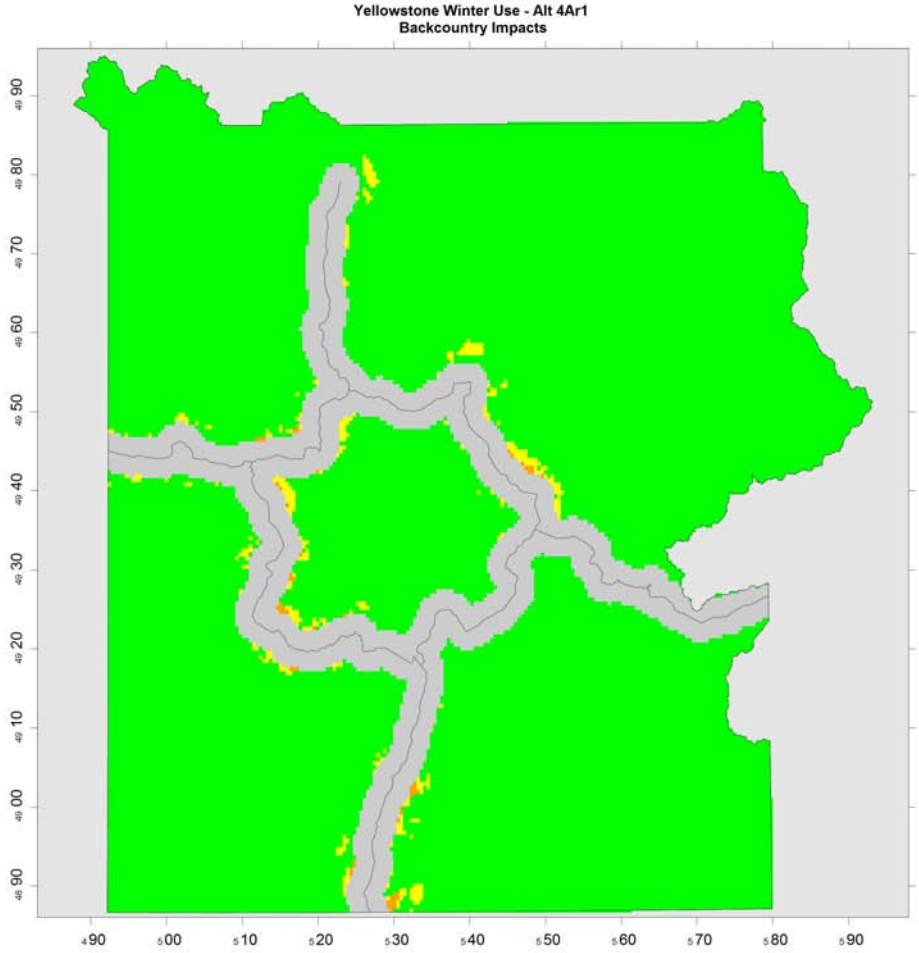

Yellowstone Winter Use - Alt 3
Travel Corridor Impacts

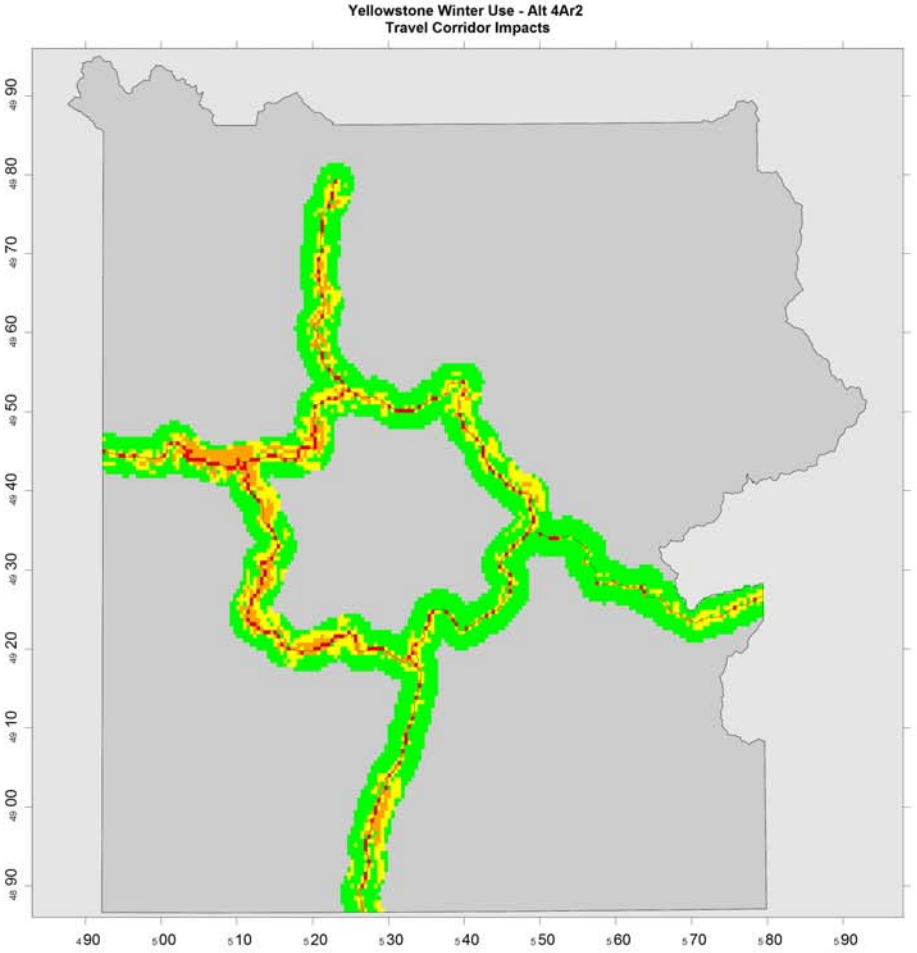

Major 3.3%
0.5%
Major 0.0%
Moderate 8.0%
1.1%
Moderate 0.0%
Minor 18.5%
2.9%
Minor 0.4%
Negligible 70.2%
95.5%
Negligible 99.6%

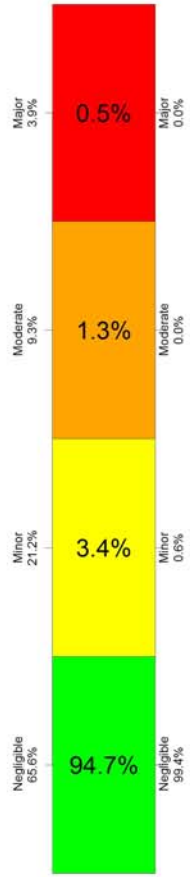

Yellowstone Winter Use - Alt 3
Backcountry Impacts


Yellowstone Winter Use - Alt 4Ar1
Travel Corridor Impacts

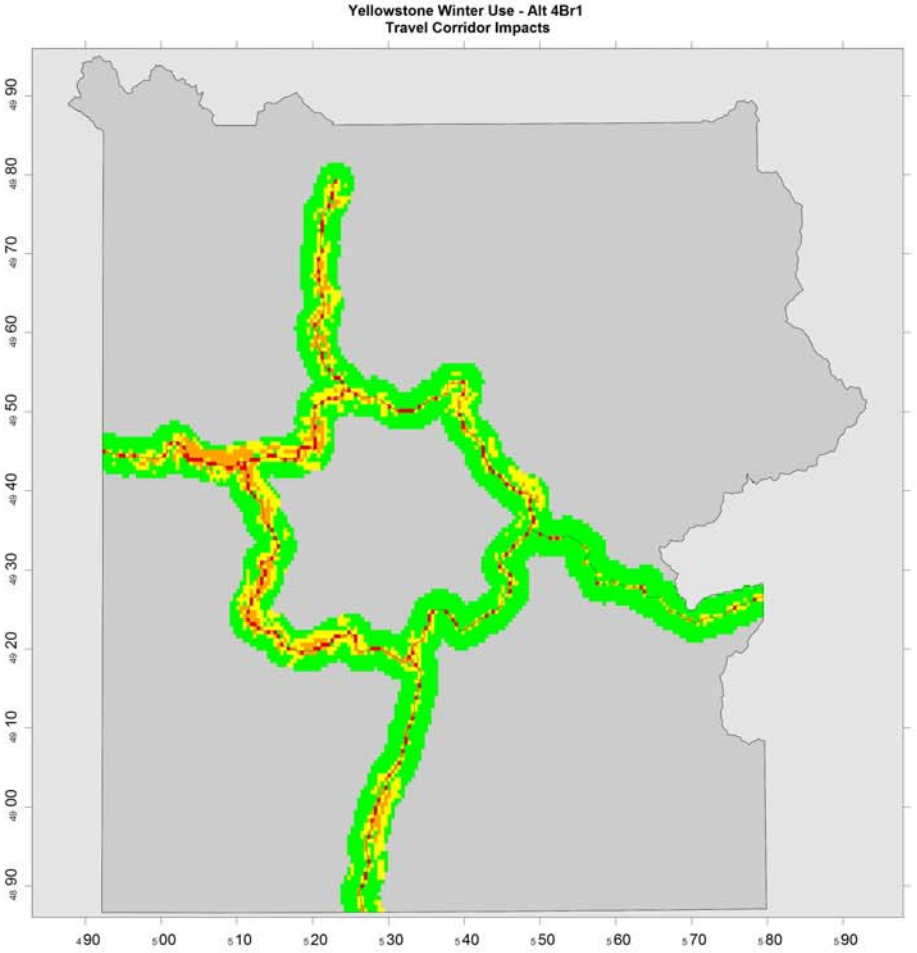

Major 5.9%
0.8%
Major 0.0%
Moderate 12.4%
1.9%
Moderate 0.2%
Minor 23.7%
4.3%
Minor 1.2%
Negligible 58.0%
93.0%
Negligible 98.6%

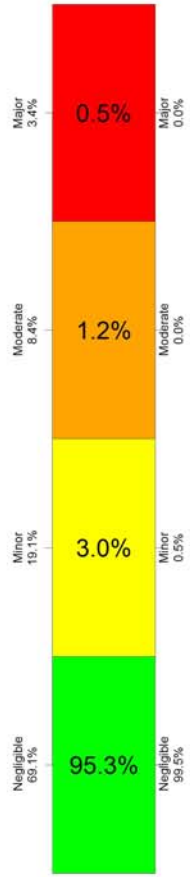

Yellowstone Winter Use - Alt 4Ar1
Backcountry Impacts


Yellowstone Winter Use - Alt 4Ar2
Travel Corridor Impacts

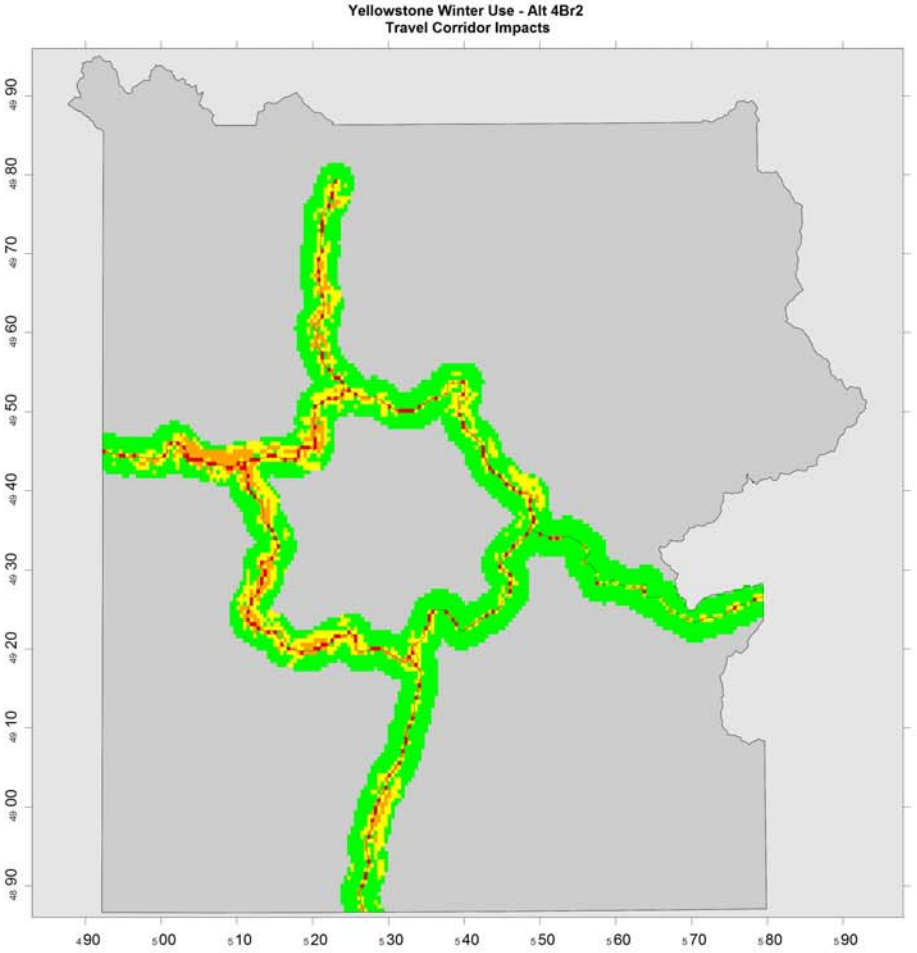

Major 3.9%
0.5%
Major 0.0%
Moderate 9.3%
1.3%
Moderate 0.0%
Minor 21.2%
3.4%
Minor 0.6%
Negligible 65.6%
94.7%
Negligible 99.4%

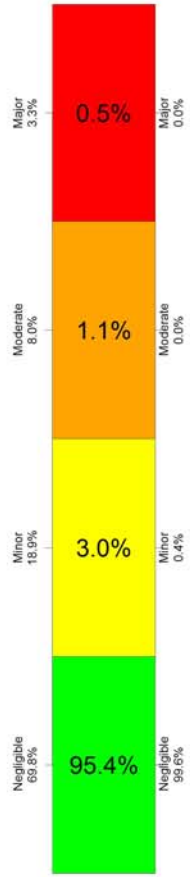
Yellowstone Winter Use - Alt 4Ar2
Backcountry Impacts

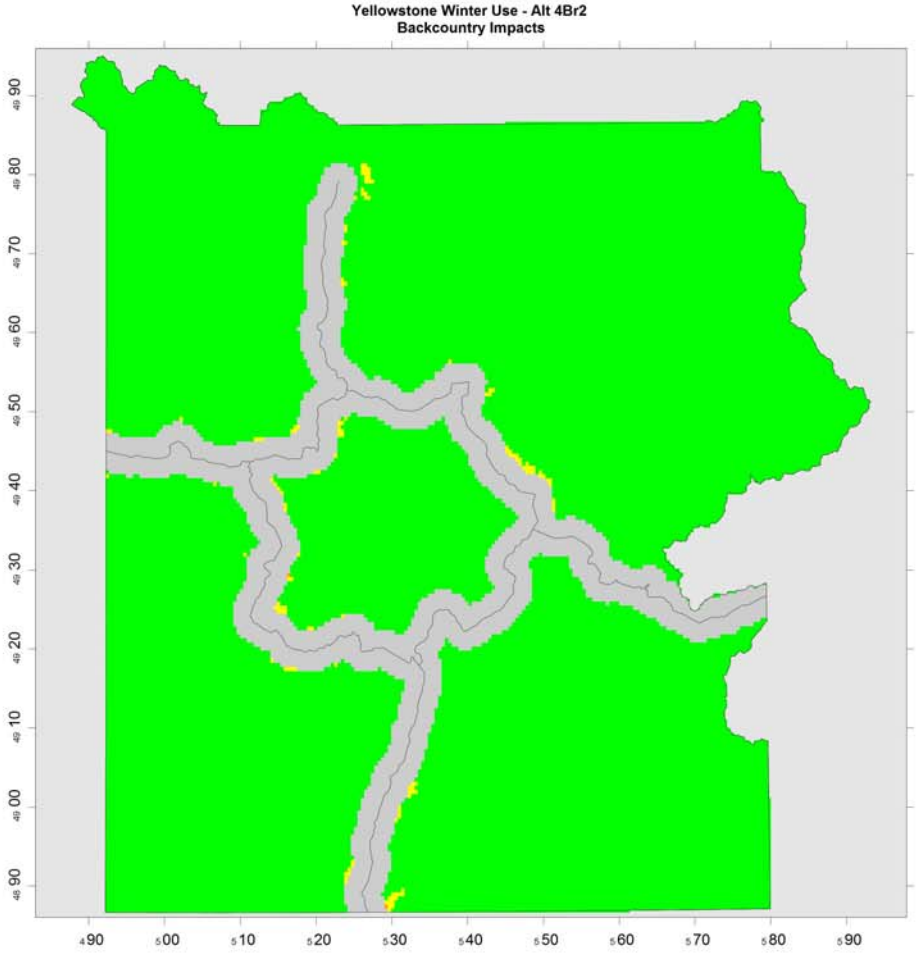

Yellowstone Winter Use - Alt 4Br1
Travel Corridor Impacts

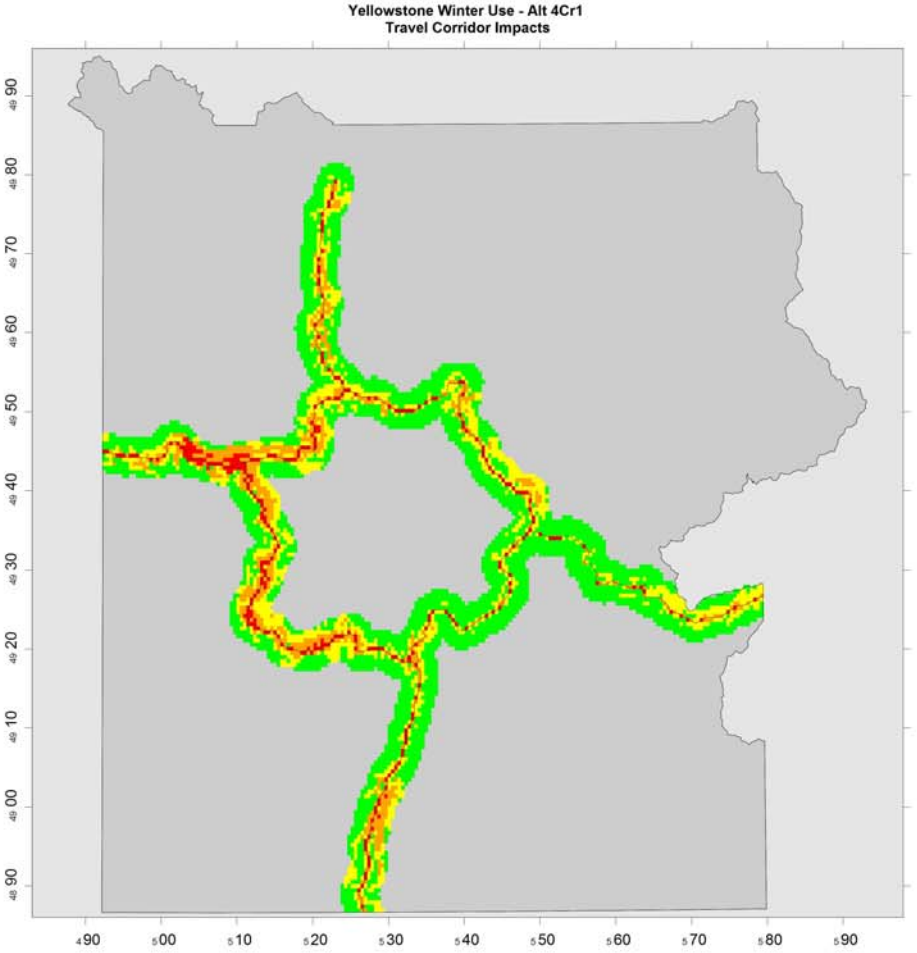

Major 3.4%
0.5%
Major 0.0%
Moderate 8.4%
1.2%
Moderate 0.0%
Minor 19.1%
3.0%
Minor 0.5%
Negligible 69.1%
95.3%
Negligible 99.5%

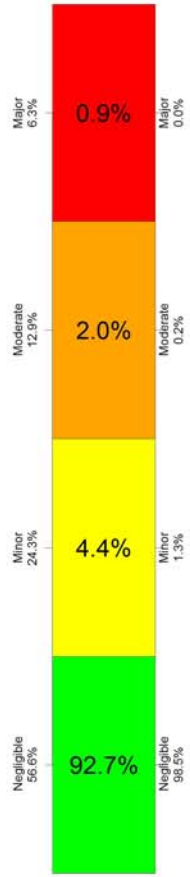
Yellowstone Winter Use - Alt 4Br1
Backcountry Impacts

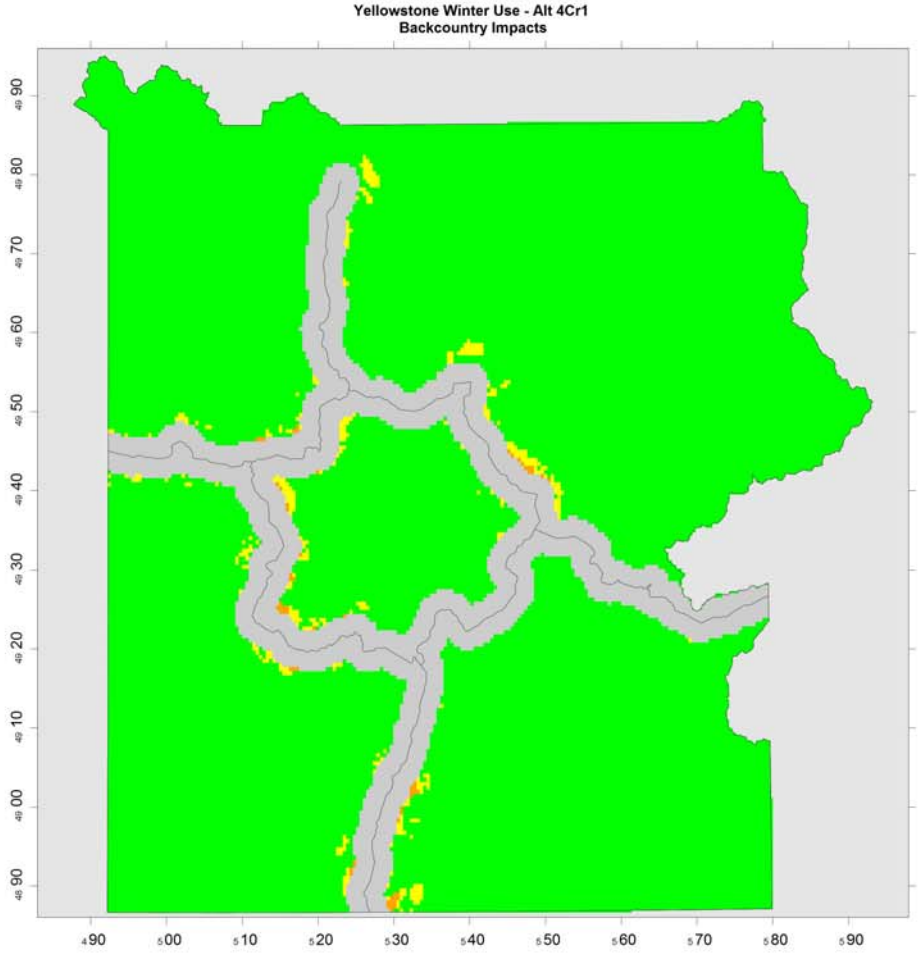

Yellowstone Winter Use - Alt 4Br2
Travel Corridor Impacts

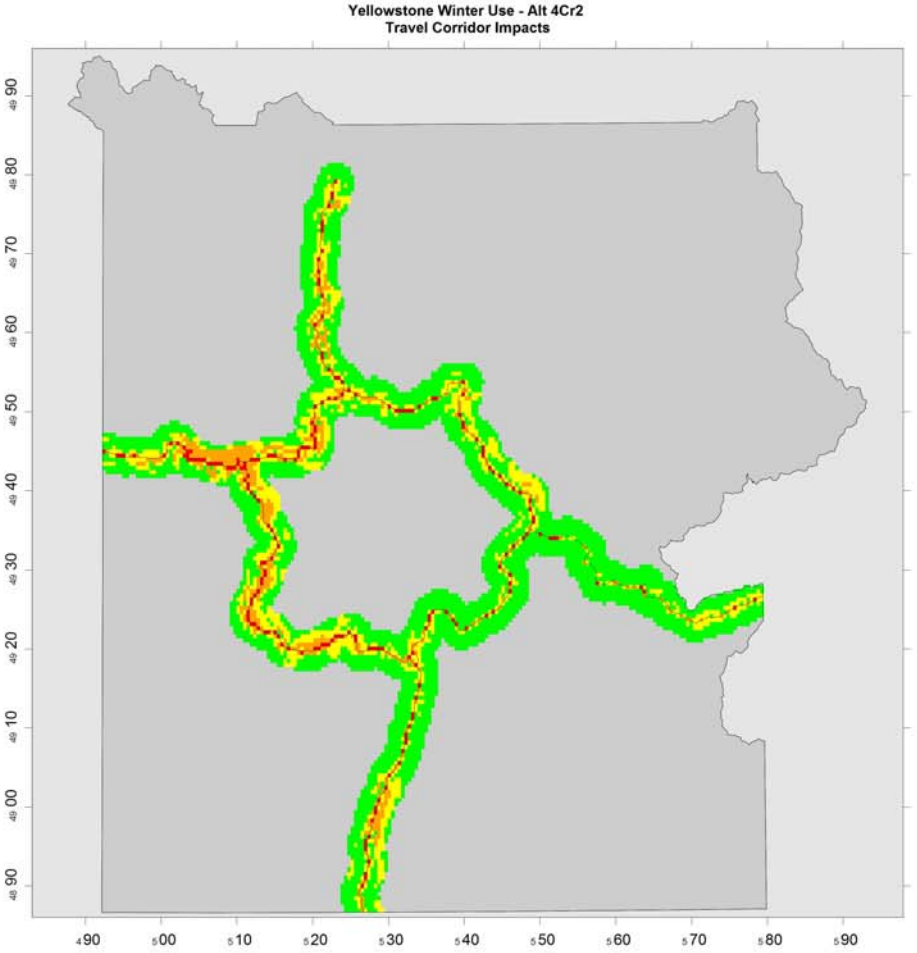

Major 3.3%
0.5%
Major 0.0%
Moderate 8.0%
1.1%
Moderate 0.0%
Minor 18.9%
3.0%
Minor 0.4%
Negligible 69.8%
95.4%
Negligible 99.6%

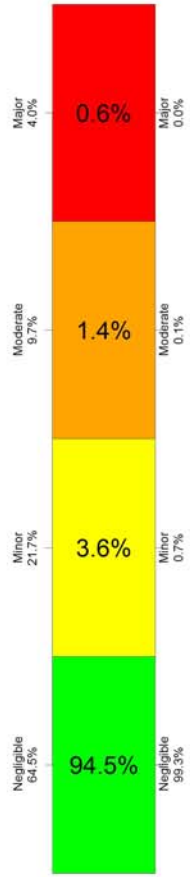

Yellowstone Winter Use - Alt 4Br2
Backcountry Impacts


Yellowstone Winter Use - Alt 4Cr1
Travel Corridor Impacts

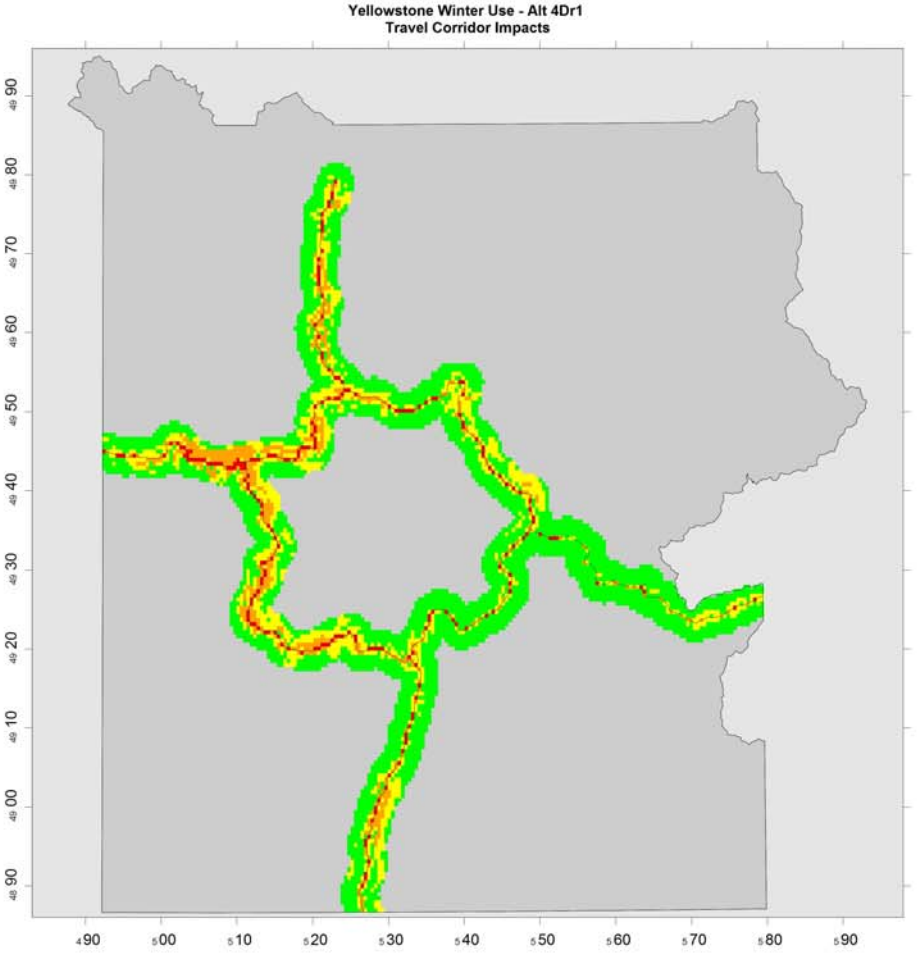

Major 6.3%
0.9%
Major 0.0%
Moderate 12.9%
2.0%
Moderate 0.2%
Minor 24.3%
4.4%
Minor 1.3%
Negligible 56.6%
92.7%
Negligible 98.5%


Yellowstone Winter Use - Alt 4Cr1
Backcountry Impacts


Yellowstone Winter Use - Alt 4Cr2
Travel Corridor Impacts


Major 4.0%
0.6%
Major 0.0%
Moderate 9.7%
1.4%
Moderate 0.1%
Minor 21.7%
3.6%
Minor 0.7%
Negligible 64.5%
94.5%
Negligible 99.3%

Yellowstone Winter Use - Alt 4Cr2
Backcountry Impacts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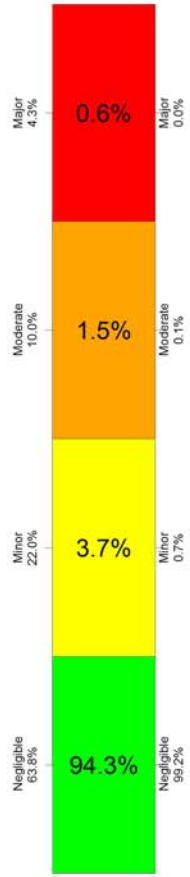
Travel Corridor Impacts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Major 0.0%
Moderate 10.0%
1.5%
Moderate 0.1%
Minor 22.0%
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Negligible 63.8%
94.3%
Negligible 99.2%

Yellowstone Winter Use - Alt 4Dr1
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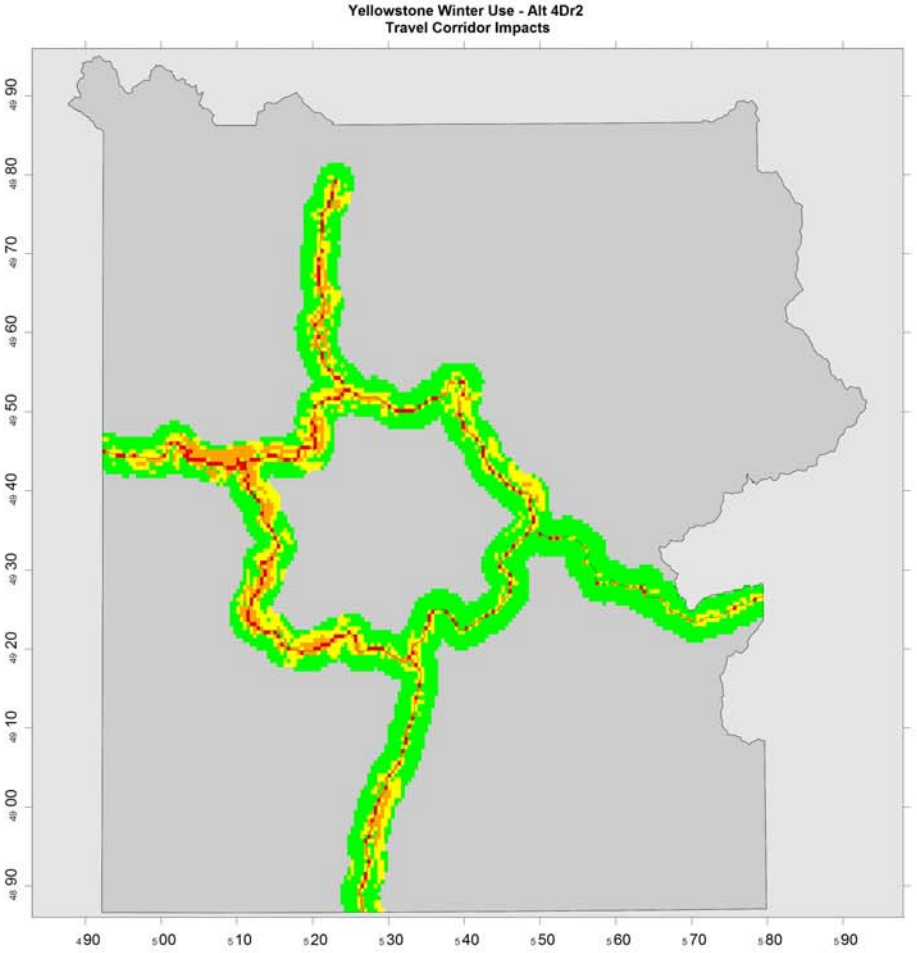
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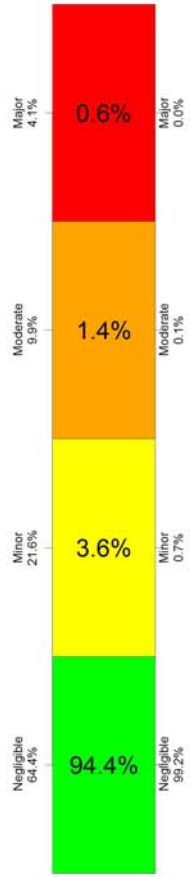
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Negligible 64.4%
94.4%
Negligible 99.2%

Yellowstone Winter Use - Alt 4Dr2
Backcountry Impacts

APPENDIX F: YELLOWSTONE WINTER USE NOISE MODELING FOR THE 2011 EIS AND 2013 SEIS

Charlotte Formichella, Cecilia Leumas, Katy Warner: Colorado State University

Damon Joyce, Kurt Fristrup: NPS Natural Sounds and Night Skies Division (NSNS)

One of the most spatially extensive environmental effects of any transportation system is noise. Noise models are routinely used in airport and road projects to compare the effects of different alternatives. Accordingly, acoustical modeling has played an important role in previous winter use planning for Yellowstone and Grand Teton National Parks. Perhaps the most significant challenge for noise modeling at Yellowstone is the requirement that the audibility of oversnow vehicle (OSV) noise be predicted, in terms of spatial extent and duration of effects. The challenge arises from two causes: the extremely low background sound levels that occur during winter in the park, and uncertainties regarding the attenuation of noise energy at very long ranges. This report describes the methods that were used to model OSV noise to support the next winter use plan.

There are two noise propagation models available to the National Park Service (NPS) that can model audibility: the Integrated Noise Model (INM) developed by the John A. Volpe National Transportation Systems Center (Volpe: Cambridge, MA), and the Noise Simulation Model (NMSim) developed by Wyle Laboratories (Arlington, VA). NMSim was derived from the Noisemap model used by the U.S. Air Force. Both models were developed to address aircraft noise, but they are readily adaptable to ground noise sources. INM and NMSim take slightly different approaches to noise modeling. INM integrates noise exposure from route segments for each vehicle using the time required to transit that segment and the vehicle noise output. NMSim simulates the noise radiated by each vehicle at closely spaced points along each route. NMSim can explicitly simulate the scheduling of multiple vehicle movements, and can produce noise map animations to illustrate its results.

In 1998 an interagency, multidisciplinary noise model validation study was initiated to empirically test the ability of four noise models to predict the audibility of aircraft noise at Grand Canyon. Forty-seven scientists and engineers from ten federal agencies and engineering companies participated in the study design, execution, and review of the results. The final report (Miller et al. 2003) concluded: “Overall, NMSim proved to be the best model for computing aircraft audibility, because it is shown to have the most consistent combination of low error, low bias, and low scatter for virtually all comparisons.” A subsequent review by the Federal Interagency Committee on Aircraft Noise (Fleming et al. 2005) included the following statements comparing INM and NMSim:

> The components of both INM Version 6.2 and NMSim are based on well-established physics, and have been field validated.
>
> Substantial gains have been made with regard to understanding model-to-model differences; and many of those differences have been reduced or eliminated. However, when comparing INM Version 6.2 and NMSim, there still remain some differences, particularly with point-to-point comparisons.
>
> Both INM Version 6.2 and NMSim are performing equally well, on average, when compared with the “gold standard” audibility data measured in the GCNP MVS.

GCNP MVS refers to Miller et al. 2003.

INM was used in the OSV noise study conducted by Volpe in support of the 2007 Yellowstone Environmental Impact Statement (EIS) (Hastings et al. 2006). The report found that the percent of the park area in which any OSV noise would be audible varied from 10-15% for the modeled alternatives. However, the 2007 EIS noted that INM underestimated the measured sound level of OSVs at eight of twelve monitoring sites in the park and underestimated the percent time audible at seven of twelve sites (and overestimated audibility at one site).

INM and NMSim take slightly different approaches to noise modeling, but they should generate comparable results (Fleming et al. 2005). Continued use of INM offers the strongest basis of comparison between any forthcoming alternatives modeling and the previous results, because differences in model outputs will be entirely due to differences in model inputs. Use of NMSim offers an opportunity to broadly cross-validate the results of the different noise models, and to identify modeling results that are contingent on the model used. Stated differently, INM offers more precise comparisons between future noise model results and the 2006 studies, while NMSim modeling would explore how strongly the noise mapping results depend upon the model used.

Given the systematic underestimation of noise exposure in the previous INM model results, we were inclined to use NMSim to see if a different model would produce better agreement with the monitoring data. Two additional considerations further tipped the balance of this choice towards NMSim. NMSim's capability to produce animated maps showing the temporal and spatial dynamics of noise exposure will be valuable for public outreach and interpretation. In addition, NSNS is working with one of the developers of NMSim to integrate sound propagation code that can account for some effects of wind and temperature inversions into NMSim. Previous winter use National Environmental Policy Act (NEPA) documents have acknowledged the substantial effects of these atmospheric conditions on noise propagation in the park. For example, temperature inversions will cause OSV noise to be audible at greater distances than would be predicted under neutral atmospheric conditions (when sound travels along straight ray paths). NMSim will provide the capacity to evaluate these effects quantitatively in the near future.

NMSIM PARAMETERS

We used NMSim (Noise Model Simulation; Wyle Laboratories) to simulate OSVs and potential wheeled vehicle traffic in Yellowstone National Park. These models were based on data from several sources. A topographic raster file of the study area was ingested from the U.S. Geological Survey (USGS) Seamless Data Warehouse (www.seamless.usgs.gov). To realize compatibility with NMSim, this file was converted into an ASCII file using ArcCatalog version 9.3. The acoustic ground impedance was set to 40 Rayls, corresponding to snow-covered terrain. The air temperature and relative humidity were set to -8.4°C and 73.9% respectively, the seasonal averages for Yellowstone (Hastings et al. 2006). NMSim, like INM, can calculate several summary metrics of noise exposure at sites of interest. Thirteen sites were specified (ibid., Figure 28), with a receiver height of four feet above ground level (AGL). All of these choices conformed to the values used for the previous INM modeling (ibid.). One difference between the NMSim modeling and the previous INM models was the ambient sound level specification. The INM models designated two zones of ambient; these NMSim runs simplified the analysis by applying the 1/3 octave spectra data from the "Forested Area Acoustic Zone" (ibid. Table 1) throughout the park.

The NMSim simulations utilized a grid size of 200×200 points to evaluate noise exposure throughout Yellowstone. This corresponded to a spatial resolution of approximately 500 m. The full grid and receiver location data for every run were both saved to text files. The full grid data provided the raw material for subsequent evaluations of the aggregate noise exposure due to the full complement of OSV traffic on each route for each of the proposed management alternatives. The receiver location data provided convenient summaries of noise exposure at specific locations. The full grid output is a text file containing all of the 1/3 octave band data at each time step for every grid point. The receiver output is a text file that contains all of the 1/3 octave band data at each time step for every point of interest and some additional summary metrics.

Each NMS simulation required a trajectory file for the modeled vehicle. This trajectory file incorporated vehicle type, speed, direction of travel, and noise source height as parameters. The snow roads in the park were split into modeled road segments and saved as shape files using ArcGIS 9.3. Each segment shape file was imported into NMSim as a base layer. This base layer was used as a frame of reference to digitize each trajectory. OSV noise source heights were 0.47 m AGL for snowmobiles and 0.91 m AGL for snowcoaches. Wheeled vehicles source heights were 0.47 m AGL for the car and 0.61 m AGL for the bus and medium truck sources.

The road segments that make up the West Entrance to Old Faithful route were modeled at 40 kph (25 mph) and 56 kph (35 mph) for the snowmobile and 40 kph (25 mph) for the snowcoaches. Every other route in the park was modeled using 56 kph (35 mph) and 72 kph (45 mph) for the snowmobile and 40 kph (25 mph) for the snowcoaches. All wheeled vehicles were modeled at 56 kph (35 mph). These speeds were based on local speed limits and park expert observations regarding typical operating speeds. A 5-second time step was used for these simulations, resulting in an approximate spatial resolution of 100 m.

The noise source spectra for the simulations were obtained from the U.S. Department of Transportation (DOT) Volpe Transportation Center. These source data were obtained at a standard measurement distance of 15 m (50 ft). They were transformed for use in NMSim by changing the levels to correspond to a reference distance of 305 m (1000 ft). This transformation utilized instructions provided by the developers of NMSim.

INTERACTIVE MAPPING FRAMEWORK

Noise modeling is a computationally intensive process. Modeling a full alternative can require more than one week of continuous processing on several computers. This delay inhibits an iterative, interactive process of alternative development and evaluation. In order to remove this obstacle, NSNS developed a software framework to separate the computationally intensive effort from the assessment of composite noise impacts. The isolated noise impacts of each component of all planned alternatives were computed in advance. Subsequently, an interactive program was used to add the individual noise contributions together to calculate the composite noise exposure from all operations.

The first step was to identify all of the unique combinations of vehicle type, operating parameters, and route segment that might be evaluated in the alternatives development process. For Yellowstone, this involved identifying the segments of the snow road network that could have different traffic levels. The following table lists the junctions that defined the endpoints of the road segments that were modeled:

Location	Vehicles modeled
Upper Terrace, Mammoth Hot Springs	Snowcoaches, Snowmobiles, wheeled vehicles
Norris Junction	Snowcoaches, Snowmobiles, wheeled vehicles
Canyon Village	Snowcoaches, Snowmobiles
West Entrance	Snowcoaches, Snowmobiles, wheeled vehicles
Madison Junction	Snowcoaches, Snowmobiles, wheeled vehicles
Fishing Bridge	Snowcoaches, Snowmobiles
East Entrance	Snowcoaches, Snowmobiles
Old Faithful	Snowcoaches, Snowmobiles, wheeled vehicles
West Thumb	Snowcoaches, Snowmobiles
South Entrance	Snowcoaches, Snowmobiles

Note that typical routes involved a combination of two or more segments. A trip from Mammoth Hot Springs to Old Faithful would involve a combination of the Mammoth-Norris, Norris-Madison, and Madison-Old Faithful segments. For the winter use analysis, ten road segments were modeled.

Each segment was modeled in both directions of travel. NMSim accounts for the change in engine loading with the slope of the road, as well as the speed of the vehicle. Seven vehicle types were modeled to support evaluation of the Yellowstone winter use alternatives: three types of snowcoaches, three types of wheeled vehicles, and a 4-stroke snowmobile. The wheeled vehicles were modeled for two routes: West Entrance to Old Faithful and Mammoth/Upper Terrace to Old Faithful (totaling four road segments). OSVs were modeled for all ten road segments.

More than 200 NMSim simulations were computed; 84 of these were used to evaluate the EIS alternatives (the EIS analysis was simplified by selecting a single snowcoach type). The simulations took more than a week, with several machines running continuously. They generated nearly one terabyte of output data. These data were processed by software developed by NSNS to compress and index the data for faster loading by a subsequent program. This compression required about one day of continuous processing time.

The interactive software developed by NSNS ingests two files: a comma separated value file containing the traffic levels for each vehicle, operating condition, and route segment, and the large data file with the NMSim noise data for each operation. This program generates several maps that graphically summarize the spatial extent of noise exposure, as well as tables providing numerical summaries of noise.

The NSNS iterative mapping framework has several benefits. New kinds of noise maps and tabular summaries can be rapidly implemented, thanks to the flexible structure of this software. All of the NSNS code was implemented in R, an open source software environment that is available for free (R Development Core Team 2010). More importantly, the consequences of revised alternatives can be evaluated in a few minutes, or about 1000 times quicker than would be possible if the revised alternative had to be modeled by computing a full set of noise models.

The computations in this iterative framework utilize the exact same computations that the models would employ if they were used to process the composite alternatives. For peak noise exposure levels, the iterative framework simply identifies the component of the local traffic that generated the loudest event. Aggregate noise energy is very simple to compute, as noise energy from multiple sources can be summed. This simple approach to summing noise energy assumes that the noise signals of different sources are uncorrelated, an assumption that will rarely be violated. For temporal metrics, like the duration of audibility, this framework uses a statistical formula that accounts for the probable overlap of adjacent

noise events. This formula is adapted from Tanner (1951). Tests of this formula by the U.S. DOT Volpe Transportation Center using data from the interagency model validation study at Grand Canyon (Miller et al. 2003) have proven this formula to provide the most accurate fit to the field data of the methods tested thus far.

NOISE METRICS

The choice of noise metrics was motivated by three considerations: sustaining connections to previous noise impact analyses for Yellowstone and other NPS park units, incorporating knowledge gained from recent research and engineering developments, and improving the robustness of the results by diminishing the potential effects of modeling idiosyncrasies.

The percent time that vehicle noise is audible was retained; it has been the foundation of all NPS noise impact assessments. Peak noise levels were modeled by Hastings et al. (2006), and a very similar metric was retained in this modeling effort. Instead of using the peak noise level, this analysis used the energy average (L_{eq}) of the four loudest noise levels ("peak 4"). This slight modification offered two benefits. First, it reduced the variation in estimated peak level that results from the precise locations that the model happened to select when projecting vehicle noise along a road. Second, it provides an indication of the duration of this high noise level: 15 seconds. The third metric modeled was audibility L_{eq}.

L_{eq} metrics have been extensively studied for more than four decades in relation to transportation noise. The World Health Organization (WHO 1999) recommends that: "Where there are no clear reasons for using other measures, it is recommended that $LA_{eq,T}$ be used to evaluate more-or-less continuous environmental noises." In the quoted text, the "A" refers to A-weighted integration of acoustic power spectra, and the "T" refers to the interval over which energy is averaged. FICON (1992) noted that criticism of L_{dn} (and other L_{eq} metrics) often stems from "lack of understanding of the basis for the measurement, calculation, and application of that metric." Many people have difficulty relating an aggregate of perceived noise events to an average noise level, especially when the time interval for averaging extends over long periods. Hourly, daily, and even annual LA_{eq} metrics have been used by some U.S. Federal Agencies.

The noise models predict when the noise will be audible, so the $LA_{eq,T}$ metric used to support the winter use planning was $LA_{eq,audible}$. Instead of dividing the integrated noise energy by the entire modeling interval (0800-1600), this formula divides the energy by the total time audible. This summary noise level is more readily interpreted: it is the average noise level when the sound can be heard. $LA_{eq,audible}$ does not discount the average level because there are intervals of silence in the modeled day. Therefore, $LA_{eq,\ audible}$ is logically and statistically independent of percent time audible. One metric addresses noise intensity when present; the other addresses how often noise is present. This approach addresses the recommendations of Miller (1999) for NPS noise analyses.

Note that $LA_{eq,8h}$ can be calculated from percent time audible and $LA_{eq,\ audible}$:

$LA_{eq,\ T} = LA_{eq,\ audible} + 10*\log10(\text{time audible}/T)$

SCIENTIFIC RATIONALE FOR THE SELECTION OF ACOUSTICAL METRICS FOR WINTER USE ANALYSES

Section 4.9 of the NPS *Management Policies 2006* (NPS 2006) 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.

Sound is an intrinsically variable phenomenon that is often described by some basic properties: loudness, timing, pitch. However, the number of potential descriptors is quite large. For example, more than 40,000 measurements per second are required to fully capture the range of sounds audible to humans. The model used to predict noise exposure from winter use in this EIS (NMSim) generates a more compact summary of OSV sounds – 36 measurements per second – but these summaries are still far too complex for NEPA impact analysis. For management purposes, the time history of each OSV noise event is not pertinent. Instead, metrics are needed to concisely represent the aggregate noise exposure generated by each alternative.

In previous NEPA documents, OSV noise has been evaluated in terms of three metrics: the percent time that OSVs are audible, the maximum OSV noise level, and the percent of the park area in which OSV noise was audible. The present analysis retains part of this framework, and extends it to provide additional information. Percent time audible is used, as it has been in the past, to evaluate how often noise intrudes in the natural soundscape. This can be measured by an attentive listener with normal hearing, and it was modeled for this EIS using the NMSim software package. This measure of duration was complimented by a measure of the average loudness of OSV noise when it was audible: "Audible L_{eq}."

L_{eq} metrics have been the primary means of evaluating community noise since the 1970s (EPA 550/9-94-004: "Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate. Margin of Safety"). Virtually all of these metrics, including the metric used here, utilizes an A-weighted filter to sum up all the sound energy across the audible spectrum. The purpose of A-weighting is to add together sound energy across the entire audible spectrum to produce an aggregate measure of perceived loudness. L_{eq} stands for the A-weighted, average squared sound pressure deviations (the sound energy). Many forms of L_{eq} have been used, with one distinguishing feature being the time span over which sound energy is averaged. For the Federal Aviation Administration, the primary noise impact metric is DNL (or L_{DN}), which is a 24 hour L_{eq} with a 10 dBA penalty for noises at night. For Federal Highways, the primary metric is the hourly L_{eq}.

Studies of noise impacts in parks included L_{eq} as one of the metrics used to predict impacts (Anderson et al. 1993; Miller 1999; Rapoza et al. 2005). In the "dose-response" studies conducted at Grand Canyon, Bryce Canyon, Haleakala, and Hawai'i Volcanoes National Parks, L_{eq} referred to the sound energy averaged over the duration of a visit; observers recorded when each visitor entered and exited the study sites. A comprehensive reanalysis of these data (Anderson 2010) revealed that L_{eq} was the most consistent and accurate predictor of annoyance or perceived interference with natural quiet in these surveys. Percent time audible and several other metrics were evaluated in the reanalysis, but they did not perform quite as well across all conditions. A notable feature of the new statistical model is that the magnitudes of park-specific coefficients were dramatically reduced. In contrast to the earlier models (Anderson et al. 1993; Miller 1999; Rapoza et al. 2005), this suggests that the new analysis has revealed a generic predictor of visitor responses, which are much less contingent on the local context.

One difficulty with L_{eq}, especially when it refers to long intervals of time, is that it averages noise energy across the entire interval, which may include substantial periods when no noise is present. In order to address this issue, and produce a summary metric that is more readily interpreted, this EIS uses "Audible L_{eq}." Audible L_{eq} measures the average noise level when the noise can be perceived by an attentive listener. Intervals of time when no noise is audible are omitted from the calculation. Collectively, Percent Time Audible and Audible L_{eq} provide a direct link to previous L_{eq} metrics: L_{eq} = Audible L_{eq} + 10*log10(Percent Time Audible). This equation provides an opportunity to relate winter use noise impact criteria to the research and standards that addressed community noise impacts.

Combining Percent Time Audible and L_{eq} to analyze noise impacts was recommended more than ten years ago by a noise control expert with extensive experience working in national park settings (Miller 1999). Miller's paper utilized L_{eq} (aircraft)- L_{eq}(background) in combination with Percent Time Audible, where the averaging time for L_{eq} spanned the duration of a visit. In recent discussions with the Natural Sounds and Night Skies Division, Miller has acknowledged that Audible L_{eq} may be better. Audible L_{eq} is more readily interpreted, because it represents the average level of the noise when it is perceptible. Second, Audible L_{eq} is statistically independent of Percent Time Audible because it is unaffected by periods of silence.

In addition to Percent Time Audible and Audible L_{eq}, one more metric was computed and analyzed for this EIS. Previous analyses used the peak noise level – L_{max} – to assess the most acute noise conditions. The current analysis utilized a very similar metric – Peak 4 – which summarized the L_{eq} of the four loudest noise levels. Peak 4 has two advantages over L_{max}. First, this measurement is highly repeatable in modeling, because it is not sensitive to the timing of a vehicle's movement along a route or the location of the modeled receiver points. Second, this metric also indicates the minimum duration of the loud event. Successive time steps in the Winter Use models were about five seconds apart, so a Peak 4 event had to be at least 15 seconds long.

SCIENTIFIC BASES FOR TRANSLATING METRIC VALUES INTO PLAUSIBLE LEVELS OF IMPACT

Each metric focuses on a particular aspect of noise exposure, deemphasizing or neglecting others. Peak 4 measures the loudest noise events, but does not indicate how often they occur. Peak 4 will not vary among alternatives unless the loudest vehicles in one alternative are completely eliminated from other alternatives; it is insensitive to changes in daily traffic levels. Audible L_{eq} measures how loud noise is on average (when it can be heard), but does not indicate how often it occurs. Audible L_{eq} will not vary among alternatives if the traffic mix does not vary, even if overall traffic levels change. Percent Time Audible measures how often noise is detectable, and it provides a measure of one effect of changing traffic levels. However, it provides no information about how loud the noise is.

L_{eq}, the metric that has been used for most community noise studies, measures total noise energy, regardless of when it occurs and from what source. The numeric value of L_{eq} is difficult to interpret in a park setting, where there are long intervals of silence, but comparisons among L_{eq} values for different alternatives can be readily translated into changes in effective traffic level. Accordingly, NPS has decided to utilize L_{eq} as an aggregate measure of the effects of OSV traffic as measured by noise level.

For this EIS, an L_{eq} of 35 dB has been selected as the criterion corresponding to a major impact to travel corridor acoustical environments. A variety of authoritative and scientific sources point to 35 dBA as a pertinent sound level criterion for quiet environments. ANSI Standard 12.2 – Criteria for Evaluating Room Noise – specifies 35 dBA as the desired background condition for many indoor spaces where quiet and outstanding listening conditions are important (bedrooms, auditoria, theatres, conference rooms).

ANSI 12.60 – Acoustical Performance Criteria, Design Requirements, and Guidelines for Schools – specifies 35 dBA as the background criterion for empty classrooms, recognizing that children are demonstrably less capable of distinguishing speech in noise and that noise affects attention. Note that an L_{eq} of 35 dB can be realized by several combinations of Percent Time Audible and Audible L_{eq}: 50% and 38 dB, 25% and 41 dB, 10% and 45 dB, 1% and 55 dB. Higher intensity exposures can be evaluated as having equivalent impacts to the acoustical environment if the duration of the exposure is shortened sufficiently.

The lesser impact criteria of moderate and minor have been chosen by successive decrements of 10 dB from the major impact criterion: moderate impacts when L_{eq} is greater than 25 dB, minor impacts when L_{eq} is greater than 15 dB. For backcountry settings, the impact criteria are equal to the travel corridor values minus 10 dB: major impacts when L_{eq} is greater than 25 dB, moderate impacts when L_{eq} is greater than 15 dB, and minor impacts when L_{eq} is greater than 5 dB. Note that a 10 dB decrease in noise exposure is equivalent to a tenfold decrease in traffic or a tenfold increase in distance from a straight segment of road. In accordance with recommendations in the NPS Visitor Experience and Resource Protection Handbook (NPS 1997) and other management guidance, the overall impact determinations for the park incorporate provisions for exceptions. If less than 10 percent of the travel corridor or backcountry was within a given category, the overall conclusion for the alternative would drop to the next lower category. For example, if 5 percent of the travel corridor was in the major impact category and 6 percent was in the moderate impact category, the overall conclusion would be moderate impacts in the travel corridor.

Although these impact criteria do not specify pristine acoustical conditions, they are highly protective. The major impact criterion for the travel corridor corresponds to recommendations for quiet indoor environments where good listening conditions are important. For backcountry sites, the major impact criterion would correspond to requirements for recording studios and other indoor settings demanding the lowest possible sound levels (at significant expense). These criteria should also be protective for wildlife. Landon et al. (2003) found that Sonoran pronghorn antelope avoid areas with L_{eq} >55 dB and preferred areas with L_{eq} < 45 dB.

Audible Leq provides an additional basis for relating these impact criteria to a peer-reviewed study. Aasvang and Engdahl (1999) conducted two days of surveys in a park setting near a large airport. On day 1, 10 of 20 subjects found sounds exceeding 60 dBA to be unacceptable in the park setting. On the second day, 9 of 16 subjects found sounds above 50 dBA to be unacceptable. In the travel corridor, events exceeding 60 dBA would have be limited to less than 0.3% of the day, or about one and half minutes in total. Events exceeding 50 dBA would have be limited to less than 3% of the day, or about fifteen minutes in total. In backcountry sites the allowable durations would be one tenth of these values.

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National Park Service
U.S. Department of the Interior

Yellowstone National Park
Wyoming, Montana, Idaho

Appendix G

Yellowstone National Park
Draft Winter Use Plan / Supplemental Environmental Impact Statement

Comment Response Report

February 2013

Appendices

Table of Contents

Introduction and Guide G-1
Introduction G-1
Public Meetings G-1
The Comment Analysis Process G-2
Definition of Terms G-3
Guide to This Document G-3
Content Analysis Report G-4
Concern Response Report G-11

INTRODUCTION AND GUIDE

INTRODUCTION

Pursuant to the National Environmental Policy Act (NEPA), its implementing regulations, and National Park Service (NPS) guidance on meeting the NEPA obligations, Yellowstone National Park (Yellowstone or the park) invited the public to submit comments on the Draft Winter Use Plan/Supplemental Environmental Impact Statement (draft plan/SEIS). This report describes how the NPS considered public comments and provides responses to those comments.

After the Environmental Protection Agency's (EPA's) release of the Notice of Availability to prepare the draft plan/SEIS, a 45-day public comment period was open between June 29, 2012, and August 20, 2012. This public comment period was announced on the park website (www.nps.gov/yell); in a newsletter sent to interested parties, elected officials, and appropriate local and state agencies; and through press releases.

The park opened an additional comment period starting on August 31, 2012, the day the EPA published its notice in the Federal Register. The new 30-day comment period was open between August 31, 2012, and October 7, 2012. The second public comment period allowed the park an additional opportunity to address public and cooperating agency comments on the draft plan/SEIS. The additional comment period was announced on the park website and through a press release.

The draft plan/SEIS was made available through several outlets, including the NPS Planning, Environment, and Public Comment (PEPC) website at http://parkplanning.nps.gov/, hardcopies at the parks headquarters and visitor centers, and by request to receive a copy through the mail. After reviewing the draft plan/SEIS, the public was encouraged to submit comments about the draft plan/SEIS through the NPS PEPC website, by postal mail sent directly to the park, or delivered in person directly to the park. Oral statements and written comments were accepted during the public comment meetings.

PUBLIC MEETINGS

The draft plan/SEIS was available for public review and comment between June 29, 2012, and August 20, 2012, and August 31, 2012, and October 7, 2012. Four public meetings were held in July 2012. Public meetings were held to describe the plan, continue the public involvement process, and obtain input on the draft plan/SEIS for winter use and Yellowstone National Park. The public meetings held during the public comment period for the draft plan/SEIS are listed below:

- July 16, 2012: The Virginian in Jackson, Wyoming
- July 17, 2012: Holiday Inn in West Yellowstone, Montana
- July 18, 2012: Wingate by Wyndham in Bozeman, Montana
- July 19, 2012: Holiday Inn in Cody, Wyoming

A total of 144 meeting attendees signed in during the four meetings. The meetings began with an open house where displays were stationed around the room and the public was able to ask questions to Yellowstone and NPS personnel. Next, a presentation was given about the draft plan/SEIS, followed by a question-and-answer period and an opportunity to provide oral comment. Following the comment portion of the meeting, as time allowed, the open-house portion of the meeting resumed. Those attending the meeting received a handout that described the NEPA process, detailed the alternatives, and listed additional opportunities to comment on the project, such as providing comments on the NPS PEPC website at http://parkplanning.nps.gov/. Public comments received are categorized in the following sections of this report.

Park staff were available at the meetings to answer questions and provide additional information to open house participants. During the public comment period, 11,989 pieces of correspondence were entered into the PEPC website. Some comments were entered directly by the commenter. The NPS or the NPS contractor uploaded hard copy letters, emails, and comment forms sent to the NPS by the public.

THE COMMENT ANALYSIS PROCESS

Comment analysis is a process used to compile and correlate similar public comments into a format that can be used by decision makers and the interdisciplinary team. Comment analysis assists the team in organizing, clarifying, and addressing technical information pursuant to NEPA regulations. It also aids in identifying the topics and issues to be evaluated and considered throughout the planning process.

The process includes five main components:

- Developing a coding structure
- Employing a comment database for comment management
- Reading and coding public comments
- Interpreting and analyzing the comments to identify issues and themes
- Preparing a comment summary

A coding structure was developed to help sort comments into logical groups by topics and issues. The coding structure was derived by analyzing the range of topics discussed during internal NPS scoping, past planning documents, and the comments themselves. The coding structure was designed to capture all comment content rather than to restrict or exclude any ideas.

The NPS PEPC database was used for managing the comments. The database stores the full text of all correspondence and allows each comment to be coded by topic and issue. Outputs from the database include the total number of correspondence and comments received, sorting and reporting of comments by a particular topic or issue, and demographic information for the sources of the comments.

Analysis of the public comments involved assigning codes to statements made by the public in their letters, email messages, and written comment forms. All comments were read and analyzed, including those of a technical nature; opinions, feelings, and preferences of one element or one potential alternative over another; and comments of a personal or philosophical nature.

During coding, comments were classified as substantive or non-substantive. As stated in Director's Order 12, substantive comments "raise, debate, or question a point of fact or policy." Comments that suggested changes to the preliminary range of draft alternatives or suggested new alternatives or alternative elements were also considered substantive. Comments in favor of or against the preliminary range of draft alternatives, or comments that only agree or disagree with NPS policy, are not considered substantive. All comments were read and considered and were used to help create the final plan/SEIS; however, only those determined to be substantive were used to develop concern statements.

Although the analysis process attempts to capture the full range of public concerns, this report should be used with caution. Comments from people who chose to respond do not necessarily represent the sentiments of all members of the public. Furthermore, comment analysis is not a vote counting process; comment analysis emphasizes the content of the comment rather than the number of times a comment is received.

DEFINITION OF TERMS

Primary terms used in the document are defined below.

Correspondence: An item of correspondence is the entire document received from a commenter. It can be in the form of a letter, email, written comment form, note card, open house or webinar transcript, or petition.

Comment: A comment is a portion of the text within an item of correspondence that addresses a single subject. A comment could include such information as an expression of support or opposition to the use of a potential management tool, additional data regarding the existing condition, or an opinion debating the adequacy of an analysis.

Code: A code is a grouping centered on a common subject. Codes were developed during the public comment process and were used to track major subjects.

Concern: A concern summarizes the issues identified by each code. Each code is further characterized by concern statements that focus on the content of comments. Some codes require multiple concern statements. In cases where no comments were received about an issue, the issue was not identified or discussed in this report.

All public comments were considered important as useful guidance and input to the public comment process, but only substantive comments were analyzed in the Concern Response Report.

GUIDE TO THIS DOCUMENT

This report is organized as follows.

Content Analysis Report: This basic report generated by PEPC provides information about the numbers and types of comments received, organized by code. Table 1 summarizes the number of comments that were coded under each topic. Tables 2–5 show general demographic information, such as the states where commenters live and the number of letters received from different organizations.

Correspondence by Organization Type: This table lists all groups that submitted comments, arranged by the following organization types as defined by PEPC (and in this order): businesses; churches and religious groups; civic groups; conservation/preservation groups; federal government; NPS employees; non-governmental groups; recreational groups; state government; town or city government; tribal government; unaffiliated individuals; university/professional society. Each item of correspondence was assigned a unique identification number upon entry into PEPC. This number can be used to assist the public in identifying how the NPS addressed their comments.

Concern Response Report: This report summarizes the substantive comments received during the scoping process. These comments are organized by codes and further organized into concern statements. Below each concern statement is a response to that concern.

CONTENT ANALYSIS REPORT

Table 1: Comment Distribution

Note: Each comment may have multiple codes. As a result, the total number of comments may be different than the actual comment totals.

Code	Description	# of Comments (# of signatures if different)	% of Comments
AE1000	Affected Environment - General (Substantive)	2	Less than 1%
AE1005	Affected Environment - General (Non-Sub)	16	Less than 1%
AE12000	Affected Environment: Wildlife And Wildlife Habitat	7	Less than 1%
AE120010	Affected Environment: Wildlife And Wildlife Habitat (Non-Sub)	281	Less than 1%
AE21010	Affected Environment: Socioeconomics (Non-Sub)	19	Less than 1%
AE22500	Affected Environment: Visitor Use and Experience	1	Less than 1%
AE22510	Affected Environment: Visitor Use and Experience (Non-Sub)	386	1.01%
AE30000	Affected Environment: Health and Safety	3	Less than 1%
AE30010	Affected Environment: Health and Safety (Non-Sub)	19	Less than 1%
AE7000	Affected Environment: Air Quality	3	Less than 1%
AE7010	Affected Environment: Air Quality (Non-Sub)	109	Less than 1%
AE9500	Affected Environment: Soundscapes	2	Less than 1%
AE9510	Affected Environment: Soundscapes (Non-Sub)	275	Less than 1%
AL1000	Alternatives: Elements Common To All Alternatives	3,242 (4,519)*	8.52%
AL1005	Alternatives: Elements Common To All Alternatives (Non-Sub)	33 (35)	Less than 1%
AL1100	Alternatives: Alternative 1	4	Less than 1%
AL1200	Alternatives: Support Alternative 1	18	Less than 1%
AL1300	Alternatives: Oppose Alternative 1	107 (1,382)	Less than 1%
AL2100	Alternatives: Alternative 2	5	Less than 1%
AL2200	Alternatives: Support Alternative 2	77 (584)	Less than 1%
AL2300	Alternatives: Oppose Alternative 2	55 (824)	Less than 1%
AL3100	Alternatives: Alternative 3	10	Less than 1%
AL3200	Alternatives: Support Alternative 3	5,375*	14.13%

Code	Description	# of Comments (# of signatures if different)	% of Comments
AL3300	Alternatives: Oppose Alternative 3	108 (1,383)	Less than 1%
AL4100	Alternatives: Alternative 4	3,101 (3,606)*	8.15%
AL4200	Alternatives: Support Alternative 4	270 (1,041)	Less than 1%
AL4300	Alternatives: Oppose Alternative 4	1,035*	2.72%
AL9000	Alternatives: New Alternatives or Elements	238	Less than 1%
AL9005	Alternatives: Alternatives or Elements	123	Less than 1%
AL9020	Alternatives: Support More OSVs	16	Less than 1%
AL9030	Alternatives: Support Less OSVs	813 (815)	2.14%
AL9040	Alternatives: Support Snowcoach Only	453	1.19%
AL9050	Alternatives: Support OSV Access	64 (66)	Less than 1%
AL9100	Alternatives: Support No OSV Access	1,337*	3.52%
AL9110	Alternatives: General Access to the Park (Non-Substantive)	54	Less than 1%
AL9115	Alternatives: Non-Guided OSV Use	4	Less than 1%
AL9120	Alternatives: Non-Guided OSV Use (Non-Substantive)	13	Less than 1%
AL9150	Alternatives: Non-commercially guided OSV Use	3,434 (4,709)*	9.03%
AL9200	Alternatives: Non-commercially guided OSV Use (Non-Substantive)	789	2.10%
AL9210	Alternatives: Non-commercially guided OSV Use: BAT	3	Less than 1%
AL9250	Alternatives: Support Snowmobiles Using Sylvan Pass and East Entrance	126 (1,400)	Less than 1%
AL9300	Alternatives: Oppose Snowmobiles Using Sylvan Pass and East Entrance	66	Less than 1%
AL9350	Alternatives: Sylvan Pass	3,442*	9.05%
AL9360	Alternatives: Sylvan Pass (Non-Substantive)	2,507 (2,510)*	6.59%
AL9400	Alternatives: Best Available Technology (BAT)	3,808 (5,085)*	10.01%
AL9500	Alternatives: Best Available Technology (BAT) (Non-Substantive)	1,384*	3.64%
AL9600	Alternatives: Summer Use	11	Less than 1%
AL9650	Alternatives: Summer Use (Non-Substantive)	27	Less than 1%
AL9700	Alternatives Dismissed: Allow use of personal, wheeled vehicles on plowed roads	5	Less than 1%
AL9750	Alternatives Dismissed: General (Non-Substantive)	14	Less than 1%

Code	Description	# of Comments (# of signatures if different)	% of Comments
AL9800	Alternatives Dismissed: Snowbikes	136	Less than 1%
AM1000	Adaptive Management	7	Less than 1%
AQ2000	Air Quality: Methodology And Assumptions	6	Less than 1%
AQ4000	Air Quality: Impact Of Proposal And Alternatives	7	Less than 1%
AQ4005	Air Quality: Impact Of Proposal And Alternatives	37	Less than 1%
CC1000	Consultation and Coordination: General Comments	10	Less than 1%
GA1000	Impact Analysis: Impact Analyses	11	Less than 1%
GA1010	Impact Analysis: Impact Analyses (Non-Sub)	89	Less than 1%
GA1500	General: Methodology and Assumptions	1	Less than 1%
HS2000	Health and Safety: Impact Of Proposal And Alternatives	1	Less than 1%
MT1000	Miscellaneous Topics: General Comments	1,987*	522%
PN2000	Purpose And Need: Park Purpose And Significance	1,326*	3.49%
PN2005	Purpose And Need: Park Purpose And Significance (Non-Sub)	133	Less than 1%
PN3000	Purpose And Need: Scope Of The Analysis	3	Less than 1%
PN4000	Purpose And Need: Park Legislation/Authority	10	Less than 1%
PN8000	Purpose And Need: Objectives In Taking Action	7	Less than 1%
PN8005	Purpose And Need: Objectives In Taking Action	3 (4)	Less than 1%
PR1000	Comments on the Proposed Rule	6 (10)	Less than 1%
SE2000	Socioeconomics: Methodology And Assumptions	2	Less than 1%
SE4000	Socioeconomics: Impact Of Proposal And Alternatives	14	Less than 1%
SE4005	Socioeconomics: Impact Of Proposal And Alternatives	13	Less than 1%
SS1000	Soundscapes: Methodology And Assumptions	8	Less than 1%
SS2000	Soundscapes: Impact Of Proposal And Alternatives	9	Less than 1%
SS2005	Soundscapes: Impact Of Proposal And Alternatives	135	Less than 1%
VE4000	Visitor Experience: Impact Of Proposal And Alternatives	58 (827)	Less than 1%

Code	Description	# of Comments (# of signatures if different)	% of Comments
VE4005	Visitor Experience: Impact Of Proposal And Alternatives	115	Less than 1%
WH2000	Wildlife And Wildlife Habitat: Methodology And Assumptions	3	Less than 1%
WH4000	Wildlife And Wildlife Habitat: Impact Of Proposal And Alternatives	16	Less than 1%
WH4005	Wildlife And Wildlife Habitat: Impact Of Proposal And Alternatives	228	Less than 1%
XX1000	Duplicate Correspondence/Duplicate Comment	30	Less than 1%
XX2000	Spam Email	318	Less than 1%
Total		**38,032**	

*denotes code for which form letters were received; 23 total form letters were received

Table 2: Correspondence by Type

Type	# of Items of Correspondence
Web Form*	11,882
Letter	86
Transcript	21
Total	**11,989**

*The letter and web form categories include 23 form letters, totaling 11,675 items of correspondence.

Table 3: Correspondence by Organization Type

Organization Type	# of Items of Correspondence (# of signatures, if different)
Business	6
Conservation/Preservation	4
Federal Government	1
Non-Governmental	2
Recreational Groups	10
State Government	7
County Government	4 (8)
Town or City Government	4
Unaffiliated Individual	11,949 (13,233)
University/Professional Society	2
Total	**11,989 (13,277)**

Note: This table includes 23 form letters, totaling 11,675 items of correspondence

Table 4: Correspondence Distribution by State, Territory, or Country

State	Percentage	# of Correspondence
AK	Less than 1%	60
AL	Less than 1%	44
AR	Less than 1%	57
AZ	2.8 %	339
CA	11.7 %	1,397
CO	4.1 %	496
CT	1.3 %	153
DC	Less than 1%	36
DE	Less than 1%	34
FL	5.9 %	713
GA	1.4 %	168
HI	Less than 1%	68
IA	1.0 %	119
ID	1.7 %	198
IL	5.3 %	630
IN	1.4 %	171
KS	Less than 1%	87
KY	Less than 1%	83

State	Percentage	# of Correspondence
LA	Less than 1%	62
MA	2.2 %	264
MD	2.4 %	287
ME	Less than 1%	88
MI	2.8 %	341
MN	2.5 %	296
MO	1.6 %	195
MS	Less than 1%	29
MT	2.5 %	304
NC	2.6 %	317
ND	Less than 1%	18
NE	Less than 1%	40
NH	1.0 %	116
NJ	2.0 %	240
NM	1.7 %	204
NV	Less than 1%	87
NY	4.2 %	501
OH	2.0 %	236
OK	Less than 1%	45
OR	3.5 %	421
PA	2.8 %	332
PR	Less than 1%	11
RI	Less than 1%	27
SC	Less than 1%	85
SD	Less than 1%	34
TN	1.2 %	146
TX	4.4 %	522
UT	1.3 %	153
VA	2.0 %	235
VT	Less than 1%	71
WA	3.6 %	426
WI	2.4 %	291
WV	Less than 1%	42
WY	1.3 %	158
Unknown or Outside the USA	4.3%	512
Total		**11,989**

Table 5: Correspondence Distribution by Country

Country	Percent	# of Items of Correspondence
United States of America	95.8%	11,489
Canada	Less than 1%	19
Germany	Less than 1%	16
Great Britain	Less than 1%	12
France	Less than 1%	10
Australia	Less than 1%	8
Puerto Rico	Less than 1%	7
Spain	Less than 1%	7
Azerbaijan	Less than 1%	6
Ecuador	Less than 1%	6
Cape Verde	Less than 1%	6
Mexico	Less than 1%	6
Netherlands	Less than 1%	6
Republic of Congo	Less than 1%	6
Additional Countries, all making up less than 1%, with five correspondence or less	3.2%	385
Total		**11,989**

YELLOWSTONE NATIONAL PARK
2012 DRAFT WINTER USE PLAN / SUPPLEMENTAL EIS

CONCERN RESPONSE REPORT

Report Date: 02/12/2013

AE1000 - Affected Environment - General (Substantive)

Concern ID: 40263

CONCERN STATEMENT: Commenters noted that the "Affected Environment" chapter of the draft plan/SEIS indicates that recreational oversnow vehicle (OSV) use is currently allowed, while the no-action alternative (which is supposed to be a continuation of current management) indicates that recreational OSV use is prohibited. Another commenter indicated that because the no-action alternative is no OSV use, the "Affected Environment" chapter should note that audibility of OSVs has been eliminated (not reduced), that the number of OSVs and groups of OSVs has been eliminated (not limited), and that motorized access to park roads and travel corridors has been eliminated (not limited, as stated in the draft plan/SEIS).

Response: Per the Director's Order 12 Handbook, the "affected environment" is a description of the resources that are expected to experience environmental impacts. Chapter 3 of the plan/SEIS describes the state of these resources based on available data. Because OSV use has been allowed for decades, the resources are described in a context where OSV use has affected the resources. In contrast to the "affected environment," the no-action alternative describes what would happen if the NPS were to take no action at all, which would result in no public OSV use. Therefore, the impacts of no-action appropriately predict what park resources would look like if there were no public OSV use.

AE12000 - Affected Environment: Wildlife And Wildlife Habitat

Concern ID: 40264

CONCERN STATEMENT: One commenter asked if the number of elk and bison presently in Yellowstone during the winter is down (with the implementation of Best Available Technology (BAT) restrictions) as compared to years before the restrictions.

Response: Population trends for bison and elk in the park are discussed in chapter 3 of the plan/SEIS. Bison and elk numbers in the park have fluctuated over time; however, population trends are attributed to drought, severe winter weather, hunting, and predation. Motorized winter use in the park has not been cited as a major reason for population or demographic trends.

CONCERN STATEMENT: One commenter suggested that the draft plan/SEIS affected environment is misleading in regard to wolverines, given their current U.S. Fish and Wildlife Service (USFWS) status, and that he role of climate change should be discussed as a potential threat. Another commenter suggested that the draft plan/SEIS does not incorporate the current status of wolverines, because the USFWS, on July 12, 2011, entered into a settlement agreement to accelerate a final listing determination and publish a proposed listing rule for wolverines.

Response: At this time, wolverines have been proposed for listing under the Endangered Species Act, but are not listed under the Endangered Species Act. Procedurally, it is not feasible to examine impacts or manage for species that are not yet listed. Should wolverines come under the protection of the Endangered Species Act, the NPS will

consult with the USFWS and, if necessary, make adjustments to the winter-use management framework. Additional information has been added to "Chapter 3: Affected Environment" of the plan/SEIS regarding current threats to wolverines, including climate change.

Concern ID: 40268

CONCERN STATEMENT: One commenter asked how many animals are killed by cars and snowmobiles.

Response: The scope of the plan/SEIS is limited to the winter season; the document does not examine the number of vehicle-caused mortalities during summer months. During the winter, twenty-four individuals of six mammal species are recorded as having been killed by OSVs in the park from 1989-2003. However, these documented cases of vehicle-caused mortality all occurred before the 2004/2005 winter season when the requirement that all oversnow vehicles entering the park be guided was first put in place. No OSV related vehicle-caused mortalities were reported from the 2004/2005 season through the 2012/2013 season.

AE7000 - Affected Environment: Air Quality

Concern ID: 40260

CONCERN STATEMENT: One commenter noted that the draft plan/SEIS states that the NPS will "continue to monitor NO_2 to better understand trends in concentrations and the relationship between NO_2 concentrations and specific OSV types," but questioned whether NPS has the ability to better understand the relationship between OSV types and NO_2.

Response: The NPS has collected data on nitrogen oxides from tailpipe emissions of OSVs and expects to conduct additional research regarding nitrogen oxides in the future. Fixed-site air monitoring stations in the park also collect data regarding nitrogen oxides. Where possible, the NPS will correlate this data to individual vehicle types in order to better understand the issues and impacts related to emission of NO_2 by OSVs.

Concern ID: 40261

CONCERN STATEMENT: Commenters stated that while the "Affected Environment" chapter of the draft plan/SEIS addresses air quality from 2003 to 2009, it should also address the air quality (particularly at Old Faithful) from 2007 to 2009, noting that the air quality during this time period has not remained stable.

Response: The NPS has updated the air quality sections of the plan/SEIS in chapters 3 and 4 to include the most recent data available, including data specific to air quality at Old Faithful.

Concern ID: 40262

CONCERN STATEMENT: One commenter suggested that a reduction of noise and air pollution in Yellowstone should be addressed in the draft plan/SEIS.

Response: The NPS has addressed the need to reduce air and sound emissions. Under the preferred alternative, the NPS would implement new sound and air quality emission (BAT) requirements for both snowmobiles and snowcoaches in order reduce the impacts of OSVs to both air quality and the park's soundscapes.

AL1000 - Alternatives: Elements Common To All Alternatives

Concern ID: 40271

CONCERN STATEMENT: Commenters made suggestions for elements related to speed limits. Some commenters stated that decreasing the speed limit from 35 mph to 25 mph in sensitive wildlife corridors is a step in the right direction, but that lower speed limits are also warranted. Other commenters opposed the 25 mph and 35 mph limits, in favor of higher speed limits, particularly at the section between Norris Junction and Canyon, and the section from Lake Hotel to near West Thumb. Other commenters suggested keeping the speed limits as they currently are.

Response: Under the preferred alternative, the speed limit for snowmobiles would be 35 mph and the speed limit for snowcoaches would be 25 mph. These speeds represent the typical maximum cruising speed of each type of vehicle, respectively. The NPS believes these speed limits are appropriate to protect visitor safety and to limit impacts to park resources, including the minimization of OSV-caused noise. Under the preferred alternative, the NPS would have the authority to reduce speed limits in any area should concerns over impacts to park resources arise.

Concern ID: 40272

CONCERN STATEMENT: One commenter suggested that a one-year transition period should be implemented instead of the proposed two-year transition period, so that non-commercial use can begin earlier.

Response: Under the preferred alternative, there would be a one-year transition period for the 2013/2014 season, during which OSV use would be allowed at the same levels and with the same restrictions as have been in place under the interim regulations in effect from the 2009/2010 season through the 2012/2013 season. The NPS intends to use this time to work with stakeholders to develop the non-commercially guided access program so that it can be implemented beginning in the 2014/2015 season.

Concern ID: 40274

CONCERN STATEMENT: Commenters suggested that all snowmobiles should be registered by the state in which the owner resides. They also suggested that having driver's licenses should be a requirement, but that other requirements (particularly requiring snowmobilers to carry avalanche equipment) could be overbearing, unnecessary, and discourage visitation.

Response: Under the preferred alternative, all OSV drivers must possess and carry a valid state-issued motor vehicle driver's license at all times. Snowmobiles and snowcoaches must be properly registered and display a valid registration from a state or province in the United States or Canada, respectively. As stated in chapter 2 of the SEIS under "Elements Common to all Action Alternatives," personal protective equipment including avalanche rescue gear (shovel, probe, and transceiver) is encouraged but not required.

Concern ID: 40276

CONCERN STATEMENT: One commenter suggested that snowmobiles in Yellowstone should be confined to existing paved roads, and no further efforts to improve access to remote areas should be sought.

Response: Consistent with 36 CFR 2.18 (c), under the preferred alternative, all OSV use would be confined to groomed routes over existing paved roads. No new OSV routes that have not been used in the past, including new routes accessing remote areas, are proposed.

AL1100 - Alternatives: Alternative 1

Concern ID: 40279

CONCERN STATEMENT: One commenter questioned whether Table 37 in the draft plan/SEIS is correct.

Response: The table referred to by the commenter includes only public OSV use, not administrative OSV use. Under alternative 1, there would not be a regulation allowing public OSV use, therefore the numbers of zero snowmobiles and zero snowcoaches used for the analysis is correct.

Concern ID: 40280

CONCERN STATEMENT: One commenter stated that the impacts of administrative OSV use are only analyzed for alternative 1, which provides an incorrect bias against alternative 1.

Response: Because administrative use is the only OSV use that would occur under alternative 1, the impacts of administrative use are specifically called out. The impacts of administrative use would be the same across all action alternatives (110 administrative snowmobiles and 13 administrative snowcoaches in the park per day), which all allow for public OSV use. Therefore, while the impact analysis takes into account administrative use and the results of the modeling for air and soundscapes include the emissions expected from administrative use, the discussion of the impacts of each alternative focuses on public OSV use.

Concern ID: 40281

CONCERN STATEMENT: One commenter stated that the description of alternative 1 is unfocused and unclear. They state that the draft plan/SEIS indicates that alternative 1 would be responsible for an OSV ban in Yellowstone, but that it would be more precise to state that alternative 1 would result in a continuation of the ban and its impacts.

Response: Under alternative 1, the current interim regulation would expire in March of 2013 and the NPS would not promulgate a new regulation allowing OSV use. Therefore, no OSV use by park visitors would be allowed in the future. OSV use has been allowed in the park every season for five decades, and therefore the ban on OSVs would begin under the first year of implementation of alternative 1, if that alternative were ultimately selected for implementation.

Concern ID: 40282

CONCERN STATEMENT: One commenter stated that Yellowstone needs to balance the Congressional mandate to “promote” and “provide for the use and enjoyment” of park resources, and “leave unimpaired for the enjoyment of future generations” implying that alternative 1 is not consistent with this.

Response: While NPS agrees that public use and enjoyment is part of the fundamental mandate of Yellowstone and the entire national park system, the suggestion that the Yellowstone statute or the NPS Organic Act mandate some particular level or type of snowmobile use is incorrect.

Concern ID: 40283

CONCERN STATEMENT: Commenters suggested that the draft plan/SEIS should base the analysis on no previous use of snowmobiles/snowcoaches in the park, rather than evaluating alternative 1 by assessing what would be lost in regard to visitor use and experience if Yellowstone were to remain closed to oversnow motorized vehicle use.

Response: Pursuant to 43 CFR 46.415 (b)(1), the analysis of the effects of the no-action alternative may be documented by contrasting the current condition and expected future condition should the proposed action not be undertaken with the impacts of the proposed action and any reasonable alternatives. Chapter 3 of the SEIS describes the current state of park resources based on available data. Because OSV use has been allowed for five decades, the resources are described in a context where OSV use has affected them. In contrast to the "affected environment," the no-action alternative describes what would happen if the NPS were to take no action at all, which would result in no public OSV use. The impacts of no-action appropriately predict what park resources would look like if there were no public OSV use, compared to the description of the "affected environment."

Concern ID: 40285

CONCERN STATEMENT: One commenter suggested that alternative 1 be modified to prohibit the packing/grooming of snow roads (even for administrative use) and must delay any preparations for spring opening of the park to wheeled vehicle use by at least one month, in order to fully protect the wildlife in Yellowstone.

Response: Even if no public OSV use is allowed, administrative use would still be necessary to protect park resources and values and such use would necessitate road grooming. Most park facilities are closed through the winter and require extensive preparation during the winter season for visitors in the spring. Delaying access to wheeled vehicles by a month would not allow enough time for park facilities to be ready for the spring opening date each year. Furthermore, employees living in the park's interior need groomed roads to have access to their homes and to allow access to groceries, supplies, and medical care.

AL2100 - Alternatives: Alternative 2

Concern ID: 40259

CONCERN STATEMENT: Commenters stated that alternative 2 does not allow for reasonable access to the park based on historic OSV use.

Response: The park's enabling legislation and the Organic Act reserve ample discretion to the NPS to determine how best to promote the enjoyment of the park while protecting park resources. The suggestion that the NPS must provide access to the park based on historic use levels is incorrect.

AL3100 - Alternatives: Alternative 3

Concern ID: 40289

CONCERN STATEMENT: One commenter suggested that education and interpretation components are critical for public support of the program, adding that using snowmobiles do not offer education or interpretation opportunities (whereas snowcoaches do).

Response: There is no NPS policy that requires a continuous opportunity for education or interpretation. The data in chapter 3 demonstrates that even inside a snowcoach, unamplified spoken communication is difficult. The NPS recognizes the value of providing visitors with a variety of interpretative experiences that cater to differing preferences. Both snowmobile and snowcoach guides stop at features of interest in the park, which allow for both educational and interpretive experiences.

Concern ID: 40292

CONCERN STATEMENT: One commenter questioned whether it would be economically feasible for the park to transition to snowcoaches only.

Response: Based on the cost assumptions for alternative 3 in the SEIS, the NPS believes a transition to BAT snowcoaches is feasible, but whether a specific operator can afford the transition would depend on cash flow, available financing, and other business specific characteristics.

Concern ID: 40293

CONCERN STATEMENT: Commenters supported alternative 3 because they believe it would provide the most access while resulting in the least impacts to park resources.

Response: Based on the analysis in the SEIS, the NPS believes that with implementation of transportation event management, BAT for snowcoaches, New BAT for snowmobiles, and the concept of voluntary E-BAT standards for both snowmobiles and snowcoaches, alternative 4 has the potential to allow the most number of visitors while resulting in the least overall impact to park resources.

Concern ID: 40294

CONCERN STATEMENT: One commenter, while stating support for alternative 3, suggested that Yellowstone implement a reduction in the number of snowmobile trips permitted during the phase-out period, and that commercial guiding should be required for all snowmobile parties. Other commenters suggested that there be no phase-out period (that snowmobiles should simply be banned), and that the number of snowcoaches be reduced.

Response: The NPS believes that in order to meet visitor demand, a phase-out period for snowmobiles would be necessary and the number of snowmobile trips permitted during the phaseout should remain as currently proposed in alternative 3. The NPS also believes that the number of snowcoaches permitted under alternative 3 should remain at 120 per day in order to meet visitor demand. Under alternative 3, all snowmobile use would be 100 percent commercially guided.

Concern ID: 40296

CONCERN STATEMENT: One commenter stated opposition to alternative 3, because it takes away visitors' freedom of choice as to the mode of authorized transportation they choose and would reduce the opportunity for an educational experience by the public.

Response: The NPS agrees with the commenter that eliminating one mode of transportation would affect visitors' choices regarding how to access and experience the park's unique winter resources.

AL4100 - Alternatives: Alternative 4

Concern ID: 40215

CONCERN STATEMENT: One commenter provided suggestions for allocating transportation events between commercial operators and also requested flexibility by allowing events to be used at any entrance.

Response: The contracting process for allocating transportation events to commercial tour operators is beyond the scope of the SEIS. However, the NPS will take the commenter's suggestions into account when determining the contract terms for allocating transportation events. Under alternative 4, exchanging transportation events would be allowed within entrances, but would not be allowed to be

exchanged between entrances. Tracking exchanges between entrances would add a layer of complexity for park managers and the majority of operators indicated they would not take advantage of such an option.

Concern ID: 40352

CONCERN STATEMENT: Commenters had questions regarding the definition of a "transportation event" and how the number of transportation events was established. Specifically, commenters wanted to know if an event covers multiple short trips, or if they are each separate events and how the total number of events as well as 10 snowmobiles per event was established. They also felt that more information was needed to demonstrate how one snowcoach and a group of snowmobiles are comparable. One commenter asked how snowmobile specific and snowcoach specific operators would be able to split their daily allotments.

Response: The transportation event definition was established based upon the recent average use of approximately 7 snowmobiles per group and based on the premise that a group of 7 New BAT snowmobiles has comparable impacts to park resources and the visitor experience to one BAT snowcoach. Appendix A of the plan/SEIS has been developed to assess the comparability of snowmobile and snowcoach transportation events.

Under alternative 4, any snowmobile transportation event can have a maximum of 10 snowmobiles on any day, as long as each operator averages 7 snowmobiles per group over the season (provided the transportation event is composed of all New BAT snowmobiles; 8 per group over the season if E-BAT standards are met). Allowing a maximum of 10 snowmobiles per group is intended to allow operators to meet demand on peak days.

A maximum group size of 10 snowmobiles per transportation event was specified for logistical and safety reasons.

The impact analysis of alternative 4 in the SEIS is based on the maximum of 10 snowmobiles per group.

In regard to the maximum of 110 transportation events, starting from the premise that the NPS was comfortable with the impacts expected under the interim regulation which has allowed an average of 123 transportation events per day (78 snowcoaches and 45 snowmobile groups (318 snowmobiles/7 per group), the idea was to slightly reduce the total number of transportation events in order to reduce impacts to park resources. Because humans and animals experience OSV impacts as combined events when OSV groups pass, rather than experiencing the impacts of individual vehicles, the goal was to reduce these impacts by reducing the overall number of transportation events. Further, in comments on the 2011 draft EIS, some environmental groups advocated for the NPS to select the alternative that would phase out snowmobiles and allow 120 snowcoaches per day, which would equal 120 transportation events. The 110 events allowed under alternative 4 represents fewer events than would be expected under both alternatives 2 and 3.

Each group entering the park, no matter how small, would count as use of one transportation event. Under alternative 4, operators would be able to exchange transportation events among each other, as long as both transportation events are specified for the same entrance.

Concern ID: 40353

CONCERN STATEMENT: One commenter had concerns regarding snowcoach restrictions under alternative 4, specifically the gross vehicle weight rating of the snowcoaches, which includes the track system. The commenter objected to considering the track system as part of the gross vehicle weight rating.

Response: Neither maximum vehicle weight nor width for snowcoaches is included under the preferred alternative. In the past, the NPS proposed specifying a maximum size and weight limit for snowcoaches in order to address issues related to rutting. Without detailed study that evaluates variables including pounds per square inch, snow conditions such as density, snow-water equivalency, and other factors such as grooming practices and equipment, snowcoach track design and configuration, etc., it is difficult to determine what specific requirements would lessen the potential for rutting of snow roads. The NPS acknowledges that some snowcoaches leave ruts on the roads and that these ruts negatively affect the visitor experience and present a potential safety hazard to other users. To address this concern, the NPS is currently studying this issue and is working to develop mitigation strategies once the determinants of rutting are positively identified. After further study, should any size, weight, or weight displacement restrictions for snowcoaches be necessary, these restrictions will be incorporated in the concessioners' annual operating plans.

Concern ID: 40354

CONCERN STATEMENT: Commenters stated opposition to alternative 4, for reasons such as: allowing more snowmobiles per day (up to 480) than has been allowed in the last decade, which will contribute to adverse air, sound, wildlife, and visitor experience impacts; it is contrary to the court decision regarding the 2007 Winter Use Plan; current operators will not have the flexibility in arranging their trips into the park; the vagueness of alternative 4 would generate confusion, disagreement, and frustration among concessionaires, guide services, NPS personnel, enforcement official, gateway community business people, and the public; and the BAT requirements are too restrictive.

Response: The NPS acknowledges that alternative 4 would allow more snowmobiles in the park per day than have been allowed since the 2008/2009 season. However, the impact analysis in the SEIS demonstrates that with implementation of transportation event management, BAT for snowcoaches, New BAT for snowmobiles, and voluntary E-BAT for both snowmobiles and snowcoaches, these higher number of vehicles would result in less overall impacts to park resources while allowing more visitors to access the park than have been allowed in recent years.

In the past, the NPS and interested parties have focused on the total number of vehicles authorized to access the park. However, this emphasis is misleading because impacts to wildlife and soundscapes stem from groups of vehicles, not individual vehicles. By packaging traffic into transportation events and capping the total daily number of transportation events, the park proactively reduces the amount of time vehicles are audible, therefore reducing impacts to natural soundscapes. By limiting the number of daily transportation events in the park, wildlife would be disrupted fewer times. These steps, in combination with continued 100 percent guiding requirements, BAT standards for snowcoaches, and New BAT standards for snowmobiles, will limit impacts on the park's flora, fauna, soundscape, and air quality into the future.

The NPS is committed to implementing alternative 4 should it be selected, and believes that any confusion that currently exists regarding transportation event management would fade over time. The NPS acknowledges that the snowmobile BAT requirements under alternative 4 are more restrictive than past snowmobile BAT requirements, but believes that they are attainable and necessary in order to reduce impacts to park resources.

Concern ID: 40355

CONCERN STATEMENT: One commenter suggested that under alternative 4 the park should determine fixed daily-use limits for snowmobiles and snowcoaches during the transition, rather than the variable limits proposed.

Response: Under alternative 4, daily numbers during the first year of the transition period (2013/2014) are fixed at 318 snowmobiles per day and 78 snowcoaches per day. Phase II (2014/2015 through 2016/2017) continues to implement transportation event management and has been modified for the final SEIS and now mandates that increases in OSV numbers could not occur until machines meet New BAT standards. A full discussion of how OSVs would be managed during Phase II is provided in chapter 2.

Concern ID: 40356

CONCERN STATEMENT: Commenters questioned the assumption that seven snowmobiles are comparable to one snowcoach, as is described under alternative 4.

Response: Appendix A was prepared in response to requests made during the public comment period on the Draft Supplemental Environmental Impact Statement/Winter Use Plan that a standalone section of the Final Supplemental Environmental Impact Statement/Winter Use Plan (plan/SEIS) be dedicated to discussing the comparability of snowmobile and snowcoach transportation events in terms of their relative impacts to park resources and values and visitor experience.

Concern ID: 40357

CONCERN STATEMENT: Commenters expressed concerns related to available park staff to manage the additional snowmobiles allowed under alternative 4.

Response: As described in the plan/SEIS, alternative 4 would not require any additional staff to implement beyond what is required today.

Concern ID: 40358

CONCERN STATEMENT: Commenters provided suggestions on ways in which to modify alternative 4, such as: re-defining “transportation events” to be split between commercial, private groups, addressing Old Faithful overnight lodging, and “banked” commercial events.

Response: As currently proposed, alternative 4 allows a maximum of 46 commercially guided snowmobiles events and 4 non-commercially guided transportation events and a minimum of 60 snowcoach transportation events per day. The plan/SEIS clarifies that overnight trips would count as one transportation event for each day in the park (an overnight trip would count as one transportation event on the day the group enters the park and another transportation event for the following day when the group exits the park). Transportation events cannot be “banked,” but each operator’s unused transportation events would count towards lowering their seasonal average number of snowmobiles (if an operator has a group of 10 one day and the next day does not use their transportation event, at that point their seasonal average would be 5 snowmobiles per group).

Concern ID: 40359

CONCERN STATEMENT: One commenter stated that using averages for snowmobiling numbers can be manipulated, which is not taken into account in the analysis.

Response: The concessions contracts will have mandatory reporting requirements so that the NPS can accurately track actual and average use. Operators who did not meet the daily and seasonal use limits would be penalized through the terms and conditions spelled out in their concession contract.

Concern ID: 40360

CONCERN STATEMENT: Commenters suggested that the maximum number allowed per transportation event should be 11, not 10, including the guide.

Response: Based on the impact analysis in chapter 4 of the plan/SEIS, the NPS believes that capping the maximum snowmobile group size at 10 will allow operators flexibility to meet demand on peak days, while minimizing impacts to park resources and ensuring the impacts of snowmobile and snowcoach transportation events remain at a comparable level. Comments from commercial operators have also indicated that 10 is an adequate maximum group size number based on logistical and safety concerns.

Concern ID: 40361

CONCERN STATEMENT: One commenter suggested that alternative 4 does not meet national ambient air quality standards.

Response: The impact analysis in chapter 4 demonstrates that all applicable pollutant levels under alternative 4 would remain well under the National Ambient Air Quality Standards (NAAQS), with CO and $PM_{2.5}$ levels remaining at well less than 50 percent of the NAAQS and NO_2, remaining at less than 70 percent of NAAQS under a worst-case scenario.

Concern ID: 40362

CONCERN STATEMENT: One commenter expressed concern that administrative use is not accounted for in the soundscape analysis for alternative 4, stating that the impacts would be double and that the administrative use negates the benefits from packaging transportation events.

Response: Administrative use is included in the modeling and impact assessment in chapter 4, for all alternatives. Text has been added to the plan/SEIS to clarify this.

AL9000 - Alternatives: New Alternatives or Elements

Concern ID: 40218

CONCERN STATEMENT: Commenters suggested that snowmobile use be limited to certain areas of the park, such as those areas with less wildlife activity, an open area blocked off from other areas, high-standard highways, and how often someone can use a snowmobile annually. Some commenters suggested working with the national forest system to encourage use there. Commenters also suggested if snowmobile use is permitted, there should be an increased fee for the use, a fee for carbon emissions, or a fee to cover avalanche control.

Response: The availability of areas outside the park (such as national forests) for snowmobiling is outside the scope of the plan/SEIS. The purpose of this plan/SEIS is to establish a management framework that allows the public to experience the unique winter resources and values at Yellowstone National Park, not to provide recreational snowmobile experiences. The NPS believes that providing visitor access to areas such as the Grand Canyon of the Yellowstone, Norris Geyser Basin, Gibbon Falls, Roaring Mountain, Mud Volcano, and other attractions is important for visitor enjoyment of Yellowstone in winter. This could not be achieved by allowing access to specific, limited areas of the park. Funding for avalanche control

activities is provided through base funding. However, all park visitors are required to pay entrance fees, which are used for various purposes throughout the park.

Concern ID: 40219

CONCERN STATEMENT: Commenters suggested implementing a bus, raised electric train, light rail, tram or other mass transit system (not specifically a snowcoach), pointing to other national parks, such as Zion, as an example. One commenter suggested a shuttle system from the park to the gateway communities that does not count against the allocation of transportation events.

Response: The NPS considered but dismissed from detailed analysis, alternatives that would have employed mass-transit such as a monorail or buses. Reasons for dismissal are included in chapter 2 of the plan/SEIS. The NPS believes the suggestion for a shuttle system from the park to gateway communities would result in substantially similar environmental effects as allowing snowcoaches in the park, with the only difference being that the shuttle system would be run by the park rather than private operators.

Concern ID: 40220

CONCERN STATEMENT: One commenter suggested that the NPS close the park for the winter, from October 21 to April 21.

Response: The NPS has defined the public visitation winter season as taking place from December 15 to March 15. The NPS believes that closing the park from October 21 to April 21 would unnecessarily deprive members of the public of the opportunity to experience the park's unique resources and values. Closure of the park to public OSV use in the winter is evaluated as part of the plan/SEIS, under alternative 1.

Concern ID: 40222

CONCERN STATEMENT: Commenters suggested that certain days have limited number of snowmobiles in order to create a different visitor experience. To achieve this commenters provided suggestions such as having certain weekends for snowmobile use and using a lottery system.

Response: The 2011 Winter Use Plan/EIS considered two alternatives that looked at variable use levels throughout the winter season. These alternatives were initially proposed to provide a range of experiences throughout the winter season, including high, low, and no motorized use days. Public comment on these concepts was received during the comment period on the 2011 draft Winter Use Plan/EIS as well as during public scoping for this plan/SEIS.

Public comments stated that variability was not desirable for operators or visitors. From the operators' view, it was too complex to implement and too difficult to maintain needed infrastructure. For example, commenters stated that it would not be economically feasible to buy the number of machines needed to take advantage of high use days, when those machines would not be used during other parts of the season. Operators also noted that visitors seeking multi-day trips may not be able to get the visitor experience they were looking for throughout their trip if the level of use changed from day to day. Variability was also viewed as too complex by visitors, who were looking for more certainty when planning their trip. Some commenters felt that the low and high use days were not equitably distributed, and that such an alternative would manage the park to different standards on different days. For the NPS, this alternative would result in unexpected impacts to park operations since the concept of variability was difficult to communicate and complex in implementation. Based on these comments, the NPS reconsidered the idea of variable use against its objectives and determined that, due to the complexity of the alternatives and concerns evident in public comment, this concept

would not meet the objectives of the plan. Because the idea of variable use would not meet the objectives of the plan, and would be difficult to implement technically and logistically for both the NPS and operators, alternatives 6 and 7 from the 2011 Winter Use Plan/EIS were not carried forward for detailed analysis in the plan/SEIS.

Concern ID: 40223

CONCERN STATEMENT: Commenters provided suggestions for different levels of OSV use that should be permitted, including reducing the number of snowmobiles by 50 percent, less than 200, 250 a day, 50 a day, 10 a day, no more than use levels of the past five seasons, and no snowmobiles. Commenters also suggested allowing certain days with higher levels of use, such as around holidays.

Response: The NPS considered but dismissed from detailed analysis, an alternative that would have allowed a maximum of 191 snowmobiles and 36 snowcoaches per day, which reflected the average use levels seen under the interim regulations in place since the 2009/2010 season. Based on visitation data from the 2004/2005 season through the present, the NPS believes that an alternative with those levels of authorized use would be very likely to result in significantly lower actual numbers, and based on those predicted numbers, commercial tour operators would not be able to maintain viable businesses. In the absence of a viable business model, commercial tour operators would likely cease to exist. Without commercial tour operators, visitors would not have the opportunity to visit the interior of the park via oversnow vehicles and therefore such an alternative could not be implemented. An alternative under which visitors would not have access to the interior of the park, where many of the park's unique winter resources are located, would not meet the purpose and need of this plan/EIS. This same argument applies to the numbers of authorized use suggested by commenters that would allow less use than the interim regulations.

The NPS did consider and carry forward for detailed analysis, an alternative that would allow no public OSV use (alternative 1), an alternative that would keep OSV use at the levels authorized during the past four seasons (alternative 2) and an alternative that would phase out snowmobiles completely (alternative 3). Alternative 4, the preferred alternative, does allow for days of higher use in terms of absolute vehicle numbers (operators must average 7 snowmobiles per group over the season but may allow up to 10 per group on any day) but proactively limits the number of transportation events at 110 (10 less transportation events than alternative 3 and 13 less transportation events than alternative 2).

Concern ID: 40224

CONCERN STATEMENT: Commenters suggested that only electric or battery operated snowmobiles be permitted, with some commenters suggesting that snowcoaches should also be electric. Commenters also suggested the requirement to use E-10 fuels.

Response: At this time, there are no fully electric snowmobiles or snowcoaches on the market, and therefore such technology could not be evaluated as part of the plan/SEIS. The NPS considered mandating the use of E-10 fuels, but dismissed this element from detailed analysis in chapter 2 of the plan/SEIS because E-10 fuel is not readily available in certain areas and is not proven to significantly reduce emissions in modern fuel injected engines.

Concern ID: 40225

CONCERN STATEMENT: Commenters suggested that snowmobile use only be allowed by park personal (including for research and management), those that are mobility challenged, and for emergencies. One commenter suggested the NPS use sled dogs for patrol purposes.

Response: Limiting OSV use to administrative purposes only is evaluated in under alternative 1. The use of sled dogs for patrol purposes would not be practical in Yellowstone due to the large area of the park that must be covered, the time it would take to cover this area with non-motorized transportation, and the potential for disruption of wildlife by sled dogs.

Concern ID: 40226

CONCERN STATEMENT: Commenters suggested that the park focus on non-motorized winter uses, including cross country skiing and snow shoeing, as well as a skier yurt system, stating that there is demand for these uses and that these uses would meet the goals of the plan. One commenter suggested that the NPS groom areas for non-motorized uses, suggesting that the current practice of paying for grooming of motorized uses is bias against non-motorized uses and is contrary to NPS Management Policies. They suggested increases be provided in base funding to groom non-motorized areas. The commenter also suggested the addition of 15 km of groomed trails within the park that connect to West Yellowstone, with suggestions for improvements to existing trails.

Response: The purpose of the plan/SEIS is to establish a management framework that allows the public to experience the unique winter resources and values at Yellowstone National Park. The plan/SEIS will be used to determine whether motorized winter use in the interior of the park is appropriate, and if so, the type, extent, and location of this use. While the NPS did evaluate an alternative that would cease to allow OSV use, solely focusing on non-motorized use would not meet the purpose of the plan/SEIS. As proposed, under the preferred alternative, approximately 35 miles of road would continue to be groomed for cross-country skiing and other non-motorized use in the park. In the future, the stakeholder driven adaptive management framework proposed under the preferred alternative would allow the park to further explore additional opportunities for non-motorized winter recreation at Yellowstone.

Concern ID: 40228

CONCERN STATEMENT: Commenters suggested including penalties if snowmobile use damages the park, such as eliminating OSV use and increased law enforcement.

Response: Violations of the regulation authorizing OSV use would be enforced through issuance of citations by NPS law enforcement personnel. The NPS would maintain the option of closing certain routes or reducing OSV numbers should damages to resources occur.

Concern ID: 40229

CONCERN STATEMENT: Commenters suggested that snowmobiles be required to have mufflers or that they be required to meet the same noise and pollution requirements for cars. Another commenter suggested that air quality could be improved if groups pre-registered so they did not have to wait in line to enter the park.

Response: All snowmobiles have some type of muffler system. Snowmobiles and snowcoaches have different emissions characteristics than on-road vehicles due to the fact that they are tracked vehicles running over snow, rather than wheeled vehicles running over pavement. Data has shown that a wheeled vehicle, converted into a snowcoach, does not have the same emission output and that emissions increase dramatically when the vehicle is operated as a snowcoach. The NPS believes that the BAT standards called for under the preferred alternative will ensure protection of park resources and values and recognizes that there are a number of ways to meet the BAT standards. For snowcoaches, the NPS has not prescribed specific devices to meet BAT standards, such as requiring catalytic

converters or mufflers and instead will require that snowcoaches meet EPA Tier 2 technical standards. Under the preferred alternative, idling time for oversnow vehicles is limited to 3 minutes, in order to reduce vehicle emissions. As part of the adaptive management and monitoring framework, the park may consider allowing pre-registration or other implement other methods for reducing idling at entrance stations, if such actions are deemed necessary.

Concern ID: 40230

CONCERN STATEMENT: Commenters suggested alternatives that allowed access from only specific gates. One commenter stated that the NPS improperly eliminated an alternative to look at OSV use from the South Entrance to Old Faithful only, and felt this alternative should be reexamined. Another commenter suggested snowcoach only through the East Entrance while another suggested a modification of alternative 4 that allowed access through Gardiner and West Yellowstone only, and reduced the number of transportation events. Access from West Yellowstone to Old Faithful only was also suggested. Use of a single entrance to reduce costs was suggested for low visitation days.

Response: The 2011 Final EIS considered OSV use from the South Entrance only, however this alternative was dismissed from detailed analysis. The NPS has reexamined the dismissal of this alternative and believes the rationale for the dismissal is still valid. Based on existing data, it does not appear that bison population dynamics and distribution patterns are affected by OSV use; therefore this is not a basis to limit visitation to the South Entrance only. Limiting access to other entrances without a valid basis would not meet the purpose of this plan/SEIS, since limiting motorized use to one entrance deprive many potential visitors the opportunity to experience the park's unique winter resources.

In general, the NPS believes that providing visitor access from each of the entrances provides a benefit to visitors. Prohibiting access from specific entrances could limit access to areas such as the Grand Canyon of the Yellowstone, Norris Geyser Basin, Gibbon Falls, Roaring Mountain, Mud Volcano, and other attractions are important for visitor enjoyment of Yellowstone in winter. Therefore, in the absence of compelling evidence that closure of specific entrances is necessary, the NPS has dismissed these suggested alternative elements from detailed analysis.

Concern ID: 40231

CONCERN STATEMENT: Commenters suggested alternative elements related to special use and concession permits. One commenter requested that winter concessioners still be permitted to run summer-based tours as part of their contracts while another asked that there be a process to transfer permits if one concessionaire goes out of business. One commenter requested that non-motorized uses not count toward allocations. One commenter also suggested that park employees be able to use their own snowmobiles, to reduce costs to the park. One commenter requested that NPS not use a single vendor for snowmobile rental/access to the park.

Response: These comments pertain to specific contracting mechanisms and conditions that are beyond the scope of the plan/SEIS. However, the NPS will take these comments into consideration when it implements the selected alternative and begins the contracting process. Under the preferred alternative, NPS employees may use their own snowmobiles as long as they meet BAT requirements.

Concern ID: 40232

CONCERN STATEMENT: Commenters requested that the NPS pursue Wyoming's offer to help fund trail maintenance and grooming.

Response: The NPS is willing to work with the State of Wyoming and other willing parties in order to explore ways to help fund trail maintenance and grooming.

Concern ID: 40233

CONCERN STATEMENT: Commenters suggested elements related to education and interpretation including encouraging use of the Grange for a visitor education facility, and conducting low-cost educational tours.

Response: Education and interpretation is provided at warming huts, entrance stations, visitor centers, and by guides. Other informational material may be found in the park newspaper and on the park webpage.

Concern ID: 40234

CONCERN STATEMENT: One commenter requested that an alternative be developed to address a future possibility of permanent insufficient snow for OSV use.

Response: Under the preferred alternative, OSV use would not be allowed unless there is sufficient snow to allow OSVs to operate safely. The assertion that there may not be enough snow in the future to allow any level of OSV use is speculative; however, the NPS did evaluate an alternative (alternative 1) under which no public OSV use would be allowed.

Concern ID: 40235

CONCERN STATEMENT: One commenter requested that NPS install more air quality monitoring at the entrances.

Response: The NPs believes the current air monitoring sites are sufficient to collect any necessary data. However, the park may add additional sites in the future should they be deemed necessary.

AL9115 - Alternatives: Non-Guided OSV Use

Concern ID: 40236

CONCERN STATEMENT: Commenters requested that personal OSV use, without a guide, be permitted. They suggested requiring them to have a tracking devise and also suggested allowing two stroke machines that met all standards.

Response: The NPS believes the 100 percent guiding requirements implemented in recent years have helped to minimize impacts to park resources and values and have increased visitor safety. Data shows that the introduction of guided snowmobile tours has also reduced the number of law enforcement incidents. While unguided use was dismissed from detailed analysis in the plan/SEIS, the preferred alternative does allow for limited numbers of non-commercially guided transportation events each day. Under the preferred alternative, if vehicles with two-stroke engines meet BAT standards, they would be allowed to enter the park.

AL9150 - Alternatives: Non-commercially guided OSV Use

Concern ID: 40237

CONCERN STATEMENT: Commenters requested that the requirement for a commercial guide be maintained, stating that it has contributed to minimizing impacts to park resources. Some commenters expressed concern about the assumption that impacts from non-commercially guided trips would be similar to those of commercially guided trips.

Response: Available data demonstrates that unguided use could have greater adverse impacts to park resources than guided use, but this data does not distinguish between commercial guides and non-commercial guides. The NPS believes that with appropriate training and enforcement, there would be no difference in impacts from commercially guided groups versus non-commercially guided groups. The NPS will develop a non-commercial guide training program and will monitor non-commercially guided groups through its adaptive management and monitoring program. If non-commercially guided groups are determined to have a greater impact to park resources and values than commercially guided groups, non-commercially guided use would be reduced or discontinued.

Concern ID: 40238

CONCERN STATEMENT: Commenters requested that the group size of non-commercially guided groups, as proposed under alternative 4, be modified. One suggestion was to have an even number group size to accommodate couples, with group sizes of between 6 and 10. Another commenter suggested increasing the number of groups permitted per day, and stated that if the allocations for commercially guided trips are not met, that non-commercially guided trips be able to fill those allocations. Commenters also suggested expanding the program by allocating a minimum number of entrance allocations for residents to use and also that the guide should not count in the total number for the group.

Response: The NPS believes non-commercially guided groups should be limited to 5 snowmobiles in order to ensure the non-commercial guide can successfully manage the number of vehicles and visitors in the group.

While the NPS acknowledges the commenters' concerns, other public comments on the proposed non-commercially guided snowmobile program indicated that four daily non-commercially guided snowmobile events is reasonable, consistent with anticipated demand, and that group size restrictions would not suppress public utilization of this proposed program.

Concern ID: 40239

CONCERN STATEMENT: Commenters provided suggestions related to the operation of the non-commercially guided program. These suggestions centered around details of how to execute the program and included how the lottery should be conducted, requirements for non-commercial guides, equipment requirements for non-commercially guided trips, suggestions for the non-commercial guide certification process, language regarding permits and cost equalization, points of origin, and logistics for entering the park.

Response: As discussed in appendix C of the plan/SEIS, the NPS intends to develop a non-commercially guided access program with stakeholder input. The NPS will consider these comments when developing that program.

Concern ID: 40241

CONCERN STATEMENT: Commenters asked how overnight stays will be factored into the non-commercially guided program, and how many events does would an overnight stay require. One commenter suggested that two events be available each day for overnight stays.

Response: Under the preferred alternative, all overnight trips would count as one transportation event for each day in the park (one transportation event on the day the group enters the park and another transportation event for the following day when the group exits the park).

Concern ID: 40245

CONCERN STATEMENT: Commenters requested that the NPS work with stakeholders and affected groups in further developing the non-commercial guide program, and offered possible assistance for this effort. Also in looking at metrics for the program, they requested that positive indicators also be included and that the indicators look at corrective actions at gates where there are issues, rather than park-wide. Other Commenters stated that they had concerns with the proposed non-commercially guided program, including that it is overly complicated and overly restrictive, and that the required safety equipment for non-commercially guided trips may be cost prohibitive and unnecessary.

Response: As discussed in appendix C of the plan/SEIS, the NPS intends to develop a non-commercially guided access program with stakeholder input. The NPS intends for the program to be as simple and easily understandable as possible and for the restrictions associated with the program to be limited to what is necessary for resource protection and visitor safety. The NPS will work with stakeholders to ensure this is the case.

Concern ID: 40246

CONCERN STATEMENT: One commenter expressed concern that the non-commercial guide program would take business away from commercial guides. They further suggested that the program be tried as a pilot and a market evaluation performed after 3 years.

Response: Under the preferred alternative, no more than 4 non-commercially guided snowmobile transportation events would be allowed in the park per day, while 46 allocations would be available for commercially guided snowmobile events. Under the adaptive management and monitoring program, non-commercial use would be monitored and reduced or eliminate if such use is determined to result in greater impacts than predicted in the plan/SEIS.

Concern ID: 40250

CONCERN STATEMENT: One commenter asked for clarification that allocations of non-commercially guided snowmobiles allowed for two riders per snowmobile, for a total of 10 people per entrance each day.

Response: Under preferred alternative, the number of visitors on each snowmobile would not be part of the entry requirements. One- or two-passenger snowmobiles would be allowed as long as they meet the necessary BAT requirements. Therefore, a group of 5 snowmobiles that are each two-passenger (for a total of 10 passengers) would be allowed.

Concern ID: 40253

CONCERN STATEMENT: One commenter asked why OSVs are considered “off-road” vehicles.

Response: Snowmobiles are described as off-road vehicles, pursuant to Executive Order 11644 and NPS regulation (36 CFR 2.18).

AL9210 - Alternatives: Non-commercially guided OSV Use: BAT

Concern ID: 40254

CONCERN STATEMENT: Some commenters requested that non-commercially guided trips allow non-BAT machines, while others felt this requirement should be included.

Response: The NPS believes that BAT requirements, as proposed under the preferred alternative, are necessary in order to protect park resources and values and that exempting snowmobiles used for non-commercially guided access would unnecessarily allow greater impacts to park resources than the use of BAT-compliant vehicles. The NPS intends to require all snowmobiles entering the park, including those used for non-commercially guided access, to meet BAT requirements.

AL9350 - Alternatives: Sylvan Pass

Concern ID: 40297

CONCERN STATEMENT: Commenters provided input on the future of Sylvan Pass operations and whether the areas should be opened or closed. Some commenters provided reasons why Sylvan Pass should be closed during the winter, specifically referring to safety of park employees; protecting critical habitat for lynx and wolverine; costs of the avalanche mitigation program; and the low number of visitors who use the pass.

Other commenters provided reasons to keep Sylvan Pass open during the winter, specifically referring to the importance of the pass to the economy of Cody; funding already appropriated by the Wyoming Legislature; the slight impact on the winter operating budget; allowing backcountry skiers to access the area; and the importance of road access through the pass in the spring.

Response: The plan/SEIS assesses the impacts of both maintaining operations at Sylvan Pass (alternatives 2 and 4) and closing Sylvan Pass (alternatives 1 and 3). The preferred alternative would maintain the operation of Sylvan Pass, in accordance with the Sylvan Pass Working Group Agreement. Costs, impacts to park employee health and safety, and the use of explosives are included in the plan/SEIS analysis. As part of this analysis, the findings from two previous Operational Risk Management Assessments (ORMAs) were taken into consideration (conducted in 2007 and 2010). During the August 2010 meeting, a panel of experts evaluated the risks to employee and visitor safety as reflected by the existing operations that were initiated in 2007. The ORMA also reviewed the potential benefits (for visitor access, agency cost, resource protection, and effectiveness of avalanche control) of several new avalanche control options that stress avoiding negative avalanche-human contact. Procedures used by the park, and reviewed in the ORMA process include howitzer training, avalanche forecasting, additional staff for the unique conditions of the area, and additional weather equipment. Based on the result of the ORMA, the NPS believes that the procedures are in place to operate Sylvan Pass safely. In addition, in accordance with the Sylvan Pass Working Group Agreement, the pass is only open when specific safety considerations are met.

Regarding concerns about the use of explosives, the ORMA process evaluated the range of management options available at Sylvan Pass, including the use of helicopters and the use of howitzers (explosives). As stated on page 15 of the ORMA report, both of these methods have their advantages and disadvantages. For the howitzer, access to the platform can be problematic and require travelling below several avalanche chutes. Use of helicopters can be problematic during harsh winter conditions that change frequently; helicopters were used only two times in 2009 due to weather conditions. Each method has limitations, but the ORMA showed that using a combination of methods, rather than relying on one, provides management options that reduce the level of risk to NPS employees.

Although concerns were expressed about the impacts to lynx and wolverine habitat, data indicates that the pass is not frequently used by these species, and the potential for impact is minimal. Furthermore, wolverines feed primarily on winter-killed

ungulates (deer, elk, bison) which are not present in the Sylvan Pass area in winter. Overall, avalanche mitigation in Sylvan Pass affects less than .1 percent of wolverine habitat. Additional discussion of the impacts of avalanche control to lynx and wolverine has been added to the plan/SEIS.

The NPS understands that the public is concerned with the cost of Sylvan Pass operations and the costs of winter operations as a whole. Winter use is a costly operation. If cost were the primary or only concern, the park would not be open to winter visitors.

Concern ID: 40300

CONCERN STATEMENT: One commenter suggested that grooming and maintenance of the East Entrance should be scheduled with equal priority to other entrances, and that Sylvan Pass should be maintained to increase safety issues. Another commenter suggested setting a guaranteed opening date for the East Entrance of Yellowstone, as this would have long-term beneficial economic impacts on Cody's business owners throughout the tourist season.

Response: Management decisions for frequency of road grooming and maintenance are based on traffic volume, road conditions, and administrative need. In recent years, the rate of traffic from the East Entrance has been significantly lower than traffic from the other entrances. Last year the entrance averaged approximately one commercial snowmobile per day. If use patterns change, the park may choose to alter its grooming schedule.

Historically, the park has opened the East Entrance to public wheeled travel the first Friday in May. This date is dependent upon the ability to clear the massive amounts of snow that accumulate in the Sylvan Pass area, which has infrequently delayed opening of this road segment.

Concern ID: 40301

CONCERN STATEMENT: Commenters stated that the draft plan/SEIS does not completely analyze the impacts associated with the avalanche mitigation program at Yellowstone. One commenter disagreed with the cumulative impact analysis for wolverines and lynx under alternatives 3 and 4, with regard to the effects of leaving Sylvan Pass open (alternative 4) versus closing Sylvan Pass (alternative 3).

Response: Although concerns were expressed about the impacts to lynx and wolverine habitat, data indicates that the pass is not frequently used by these species, and the potential for impact is minimal. Furthermore, wolverines feed primarily on winter-killed ungulates (deer, elk, bison) which are not present in the Sylvan Pass area in winter. Overall, Avalanche mitigation in Sylvan Pass affects less than .1 percent of wolverine habitat. Additional discussion of the impacts of avalanche control to lynx and wolverine has been added to the final plan/SEIS.

The cumulative impact analyses for lynx and wolverine are the same under alternatives 3 and 4 because the actions occurring as part of the alternatives make up a small part of the cumulative impacts, and therefore, do not change the overall assessment of impacts. The impact analysis for the Selected Alternative (and all alternatives) does show these differences. As noted above, the analysis for these species has been amended to more specifically discuss the impacts of Sylvan Pass operations.

AL9400 - Alternatives: Best Available Technology (BAT)

Concern ID: 40436

CONCERN STATEMENT: Commenters suggested that under the preferred alternative, BAT requirements should be implemented as soon as possible, as opposed to waiting 5 years, as proposed. Commenters also suggested that snowmobile manufacturers have broken their promise to make their machines cleaner and quieter, while several manufacturers have stopped making Yellowstone-compliant machines altogether.

Response: The NPS recognizes that for several models, snowmobile performance has regressed with respect to certain air and sound metrics over the past several years. The NPS notes, however, that one manufacturer is currently offering a machine that is considerably cleaner (in terms of carbon monoxide emissions) than any previous BAT-compliant snowmobile. The New BAT requirements proposed under the preferred alternative are designed to ensure better environmental performance from both snowmobiles and snowcoaches.

Although the requirement for BAT implementation no later than the 2017/2018 season was retained as part of the preferred alternative, the preferred alternative has been modified so that increases in OSV numbers could not occur until machines meet the New BAT standards.

Concern ID: 40437

CONCERN STATEMENT: One commenter suggested that the plan/SEIS include exceptions for the 6-year life of BAT snowmobiles allowed to operate within the park by employees and full time residents working within the park. Another commenter suggested that the park should implement a phase-in plan for non-current model year snowmobiles so that in 2017-2018, those snowmobiles five years old and newer can be phased into the new requirements.

Response: Under the preferred alternative, employee-owned BAT snowmobiles may be used for up to six model years or 6,000 miles (whichever is later).

Operators have indicated that snowmobiles are typically leased for a two to three year period. A final regulation implementing the preferred alternative is expected to be promulgated in the summer of 2013. Therefore, the NPS believes that commercial tour operators will have sufficient notice in order to plan for the implementation of New BAT for snowmobiles by the 2017/2018 season and to amortize existing vehicles.

Concern ID: 40438

CONCERN STATEMENT: One commenter suggested that the park should simultaneously increase the number of snowmobiles in the park and require stricter BAT standards, while other commenters suggested that the park should not increase the number of daily-use snowmobiles until the New BAT standards are required.

Response: The preferred alternative has been modified so that increases in OSV numbers could not occur until machines meet New BAT standards.

Concern ID: 40439

CONCERN STATEMENT: Commenters suggested that sound and engine emission testing procedures for snowmobiles should be conducted at conditions similar to those found at Yellowstone, as opposed to full-throttle.

Response: Under the preferred alternative, the NPS is proposing that both snowmobiles and snowcoaches would be tested in typical winter conditions seen in the park, at their typical cruising speeds of 35 mph and 25 mph, respectively.

Concern ID: 40440

CONCERN STATEMENT: One commenter stated that the Gross Vehicle Weight Rating and the width requirement in the proposed definition of a snowcoach would prohibit today's best snowcoaches and those that Yellowstone proposes under the Best Available Technology standard included in alternatives 2, 3 and 4.

Response: Neither maximum vehicle weight nor width for snowcoaches is included under the preferred alternative as described above under concern statement 40353.

Concern ID: 40441

CONCERN STATEMENT: Commenters stated that the BAT requirements should be stricter than what is proposed.

Response: The proposed BAT requirements under the preferred alternative are stricter than those that have been in place since the 2004/2005 season. The NPS believes that the New BAT requirements under the preferred alternative will result in better protection of park resources and values, while also ensuring that manufacturers can produce vehicles that will meet the standards. In addition to the required New BAT standards for snowmobiles and snowcoaches, the preferred alternative includes voluntary E-BAT (enhanced) standards that would reward innovations in vehicle technology and would further reduce impacts to air and soundscapes.

Concern ID: 40442

CONCERN STATEMENT: Commenters suggested that the proposed BAT requirements are too strict, and would preclude snowmobiles from entering the park.

Response: The preferred alternative calls for New BAT standards to be implemented no later than the 2017/2018 season. Industry representatives have indicated this is a reasonable timeframe for research and product development. Earlier BAT-compliant snowmobiles nearly met the New BAT standards (model year 2004 to 2007), but more recent offerings have regressed in terms of environmental performance. The NPS believes that the proposed implementation date of December 2017 allows ample time for manufacturers to develop machines that meet the New BAT standards. Currently, one of the two snowmobile manufacturers that build BAT-compliant snowmobiles offers a snowmobile that meets the New BAT air emission standards.

Concern ID: 40443

CONCERN STATEMENT: One commenter suggested implementing a pilot program for testing the success of BAT requirements in the park, such as a cost/benefit analysis of limiting nitrogen oxide emissions from OSVs.

Response: As part of the adaptive management and monitoring program, the NPS will continue to monitor air and sound emissions from OSVs and evaluate their impact on park resources. It is possible that based on new data, the NPS may seek to revise the proposed BAT standards in future years. If this is the case, additional NEPA compliance and changes to the winter use regulation would likely be required.

Concern ID: 40444

CONCERN STATEMENT: One commenter suggested that incentives be given to snowmobile manufacturers to invest in new snowmobile technology. Other commenters suggested that flexibility should be considered regarding the BAT requirements, specifically that machines bought in 2016 should have some time limit where that machine would still be usable in 2017, and that there should be flexibility regarding the two-decibel rating requirement.

Response: Under the preferred alternative, the New BAT requirements for snowmobiles would be implemented no later than the 2017/2018 season. The new winter use regulation is expected to be promulgated prior to the 2013/2014 season. Therefore, the NPS believes that operators will have enough notice to plan accordingly when leasing vehicles for seasons prior to 2017/2018 and will be able to meet the NPS deadlines by turning over vehicles as part of their regular business cycle.

The SAE J1161 test procedures allow for a tolerance of 2 dBA over the noise level limit (New BAT requirement would be 67 dBA) to provide for variations in test sites, temperature gradients, wind velocity gradients, test equipment, and inherent differences in nominally identical vehicles. This means that in order to operate in the park after March 15, 2017, a sample of noise emission measurements for a specific snowmobile make and model may not exceed a mean (average) noise output of 67 dBA at 35 MPH at 50' and no single measurement from the sample may exceed 69 dBA, using the J1161 test procedures at typical cruising speed.

The voluntary E-BAT standards included under the preferred alternative, which would allow operators to increase the number of visitors per transportation event, are designed to provide incentives to operators to invest in cleaner and quieter snowmobile and snowcoach technology.

Concern ID: 40445

CONCERN STATEMENT: One commenter suggested that restrictions on 4-stroke machines should not be included in the BAT requirements, but rather have the requirements based on decibel levels, carbon monoxide levels, particulate matter levels, hydrocarbon emission standards, nitrogen oxide levels, and nitrogen dioxide levels. Further, one commenter suggested that if a 2-stoke machine is compliant with the BAT standards, the NPS should not treat it any different from a 4-stroke machine.

Response: The BAT requirements proposed under any of the action alternatives, including the preferred alternative, are limits on noise and air emissions, not engine design per se. If a 2- stroke snowmobile meets BAT standards, it would be allowed into the park.

Concern ID: 40446

CONCERN STATEMENT: One commenter suggested that the nitrogen oxide emission standards should be dropped since nitrogen oxide was subsequently removed from the EPA through judicial action.

Response: Nitrogen oxide emission standards are not included as part of the preferred alternative.

Concern ID: 40447

CONCERN STATEMENT: One commenter asked for clarification regarding carbon monoxide limitation for the 2014/2015 season.

Response: For the 2014/2015 season, the maximum allowable CO for snowmobiles would remain the same as it has been since the 2014/2005 season, at 120 g/kW-HR. However, in order to take advantage of the increased average group size for snowmobiles allowed under the preferred alternative, operators would need to voluntarily meet the New BAT standard of 90 g/kW-HR. All snowmobiles would be required to meet the New BAT standard of 90 g/kW-HR no later than the 2017/2018 season.

AL9600 - Alternatives: Summer Use

Concern ID: 40255

CONCERN STATEMENT: Commenters felt that the number of vehicles in the summer should be taken into consideration, stating that their impact is more than those in the winter. One commenter requested that the document include numbers related to summer use. Another commenter compared snowmobile use to off-road vehicle use in the summer and questioned why it is permitted.

Response: Oversnow vehicles typically are not allowed in parks. 36 CFR 2.18 prohibits snowmobile use absent a specific regulation authorizing such use. No similar regulation prohibiting summer use exists. The purpose of this plan/SEIS is to establish a management framework that allows the public to experience the unique winter resources and values at Yellowstone National Park. This plan/SEIS is being used to determine whether motorized winter use in the interior of the park is appropriate, and if so, the type, extent, and location of this use.

Issues regarding summer use are beyond the scope of this plan/SEIS.

AL9800 - Alternatives Dismissed: Snowbikes

Concern ID: 40256

CONCERN STATEMENT: Commenters requested that the NPS consider the use of snowbikes in Yellowstone in the winter. They stated that they have similar impacts to other non-motorized uses, such as skiing, and create no pollution. Commenters felt that recent NPS rules for bicycle use in the parks should result in NPS reexamining this issue for the winter use process. Commenters also felt that disallowing snowbikes is contrary to the stated goal of the plan/SEIS.

Response: As stated in chapter 2 of the plan/SEIS, under “Alternatives and Actions Considered but Dismissed from Further Consideration,” the NPS believes that the use of snowbikes could conflict with and/or create safety hazards along routes on which substantial numbers of snowmobiles and snowcoaches operate, such as the groomed roads in Yellowstone, and therefore would not meet the health and safety objectives of this plan/SEIS.

Snowbikes may create conflicts with visitors, would have unknown impacts to park wildlife, and would not meet natural resource objectives. Opportunities for snowbiking and kite skiing do exist in the area, outside of the park.

The NPS may reconsider the use of snowbikes through a separate planning process in the future.

AM1000 - Adaptive Management

Concern ID: 40257

CONCERN STATEMENT: Commenters stated that an adaptive management plan is needed because of the dynamic nature of Yellowstone in the winter. One commenter asked that the plan be further developed before the final plan/SEIS to included resource protection goals and desired environmental conditions.

Response: An adaptive management and monitoring framework is included as appendix D to the plan/SEIS. The long-term adaptive management strategy described in this appendix will provide a structured process, involving the public and interested stakeholders, to continually evaluate the effectiveness of the winter use plan and

seek to provide information to inform uncertainties and improve management over time. One of the stated goals of the framework is to ensure that the impacts of oversnow vehicle use remain within the range predicted for the preferred alternative in this plan/SEIS.

Concern ID: 40258

CONCERN STATEMENT: Commenters asked how stakeholders for the adaptive management process would be selected. One commenter offered technical expertise during this process.

Response: The NPS intends to hold a public meeting in the summer of 2013 to kick off the collaborative adaptive management process. All interested parties are welcome to participate.

AQ2000 - Air Quality: Methodology And Assumptions

Concern ID: 40328

CONCERN STATEMENT: One commenter suggested using three 2011 model snowcoaches (Ford E350, Ford F450, and Ford F550) to define Class II BAT instead of the current model 2008 Chevy Express, noting that the 2008 Chevy Express has significantly increased emissions, especially carbon monoxide, when compared to the 2011 Ford E350, 2011 Ford F450, and 2011 Ford F550. The commenter also suggested consulting the EPA for assistance.

Response: The 2008 Chevy Express van meets the BAT standards for snowcoaches under the preferred alternative, and its performance was measured in the park under normal operating conditions. There is no rational basis to exclude that vehicle from the modeling dataset. The EPA worked closely with NPS on the development of the snowcoach BAT standard and fully supported using the Tier 2 requirements to define snowcoach BAT. The EPA has concurred with the NPS that the Chevy Express van should continue to be included as part of the plan/SEIS analysis.

Concern ID: 40329

CONCERN STATEMENT: One commenter expressed that the “EPA Emissions Standards Table 4-1” did not present actual emission standards and that a footnote be added for clarification to read, “For 2012 and later model year snowmobiles. the snowmobile HC and CO emissions standards are combined in the form of a manufacturer fleet average equation which allows for a trade-off between IIC and CO emissions to account for the use of different control technologies. For the sake of simplicity, the HC and CO values in this table represent nominal values that might be expected under that equation, rather than actual emission standards.”

Response: A footnote has been added to the air quality modeling report to address this comment.

Concern ID: 40330

CONCERN STATEMENT: One commenter stated that under the preferred alternative, air emissions would reach EPA “warning” levels and carbon monoxide would increase greatly from BAT. The commenter also expressed that in 2013, the EPA will revisit making changes to the current NAAQ standard for ozone to 60-70 parts per billion. The park will be close to violating this proposed standard based on current monitoring data.

Response: The impact analysis in chapter 4 demonstrates that all applicable pollutant levels under the preferred alternative would remain well under the National Ambient Air Quality Standards (NAAQS), with CO and $PM_{2.5}$ levels remaining at well less than 50 percent of the NAAQS and NO_2 remaining at less than 70 percent of NAAQS under a worst-case scenario.

The NPS is not in a position to speculate regarding the changes EPA may make in the future to NAAQS standards. The NPS would address any future changes to the NAAQS through the adaptive management and monitoring program, if necessary.

AQ4000 - Air Quality: Impact Of Proposal And Alternatives

Concern ID: 40338

CONCERN STATEMENT: One commenter recommended additional discussion over model inputs for the current snowmobile fleet and including the number of vehicles by model type of the current snowmobile rental fleet in the final plan/SEIS. The commenter suggested the NPS research, with the manufacturer, whether the emission factors for the 2011 Arctic Cat TZ I are representative and why. If not, it was suggested to remodel the alternatives using revised, accurate emission factors. Another option would be to include an explanation of the likely effect that the inaccurate emission estimates have on the original model results and conclusions. The commenter offered assisting in the drafting of the explanation. They also questioned the elevated emission factors for the current fleet, stating that they may not accurately compare the impacts of the alternatives to existing conditions.

Response: NPS staff traveled to Arctic Cat headquarters in Thief River Falls, MN, to discuss the emission performance of the tested Arctic Cat TZ1. Arctic Cat engineers were unable to provide any evidence that the measured emission values were somehow abnormally high.

The NPS has re-evaluated the air quality modeling emission factors and new modeling was conducted for the plan/SEIS to give a higher level of specificity to emission factors by management scenario (alternative). A full discussion of these emission factors can be found in Ray, 2012. The new emissions factors were calculated to provide better estimates of expected emissions from OSV use. Detailed reports concerning the modeling conducted for the plan/SEIS and the emissions factors used for modeling are available on the park's website at <http://www.nps.gov/yell/planyourvisit/winteruse.htm>.

Language has been added to the plan/SEIS to clarify that modeling results are never expected to be 100 percent accurate, however the results are within expected ranges and are reliable for purposes of comparing the impacts of the different alternatives.

Concern ID: 40339

CONCERN STATEMENT: One commenter questioned the "minor" designation of OSV impacts to air quality under the NAAQS for various pollutants under the preferred alternative. Additionally, the commenter questioned the "moderate" reading for 8-hour carbon monoxide and 1-hour nitrous oxide concentrations.

Response: The intensity definitions for air quality impacts are based on guidance from NPS air quality experts. The specific document recommending these definitions is Technical Guidance on Assessing Impacts to Air Quality in NEPA and Planning Documents (NPS 2011a). The values given in chapter 4 are based on air quality modeling conducted specifically for this plan/SEIS. This modeling was revised for the final plan/SEIS, and now predicts that under the preferred alternative, CO and $PM_{2.5}$ emissions would result in a minor impact and NO_2 emissions would result in a

moderate impact. The NPS will continue to monitor air quality and if necessary, will make changes to OSV use as part of the adaptive management and monitoring plan.

Concern ID: 40340

CONCERN STATEMENT: Commenters questioned the air emission analysis stating that data should be presented in the emissions per passenger-mile, not in grams/mile. This failed to account for the number of passengers on a snowmobile versus a snowcoach. One commenter converted air emissions to units of grams per passenger mile for snowmobiles and snowcoaches. The findings showed that per passenger mile, the snowcoach is several multiples cleaner than compared to the snowmobile. The commenter also expressed that studies intentionally or unintentionally masked the severity of pollution produced by snowmobiles.

Response: Impacts to air quality at the "per person" and "per transportation event" levels are discussed in appendix A of the plan/SEIS. The analysis in appendix A reveals that snowmobiles emit less CO at the "per person" and "per transportation event" levels, but that snowcoaches generally emit less hydrocarbons and NO_2. Without making a value judgment as to which pollutants (CO, hydrocarbons, NO_2) warrant more concern relative to others, it is not possible to determine that one mode of transportation is cleaner or more desirable than the other, or more protective of the park's air quality.

Concern ID: 40341

CONCERN STATEMENT: Commenters questioned how the levels of 8-hour CO concentrations under alternative 1 are above background levels as alternative 1 represents current conditions.

Response: Alternative 1 represents the no action alternative, which would still include a minimal amount of administrative OSV use but no public OSV use. This minimal administrative use would result in levels above background.

Concern ID: 40342

CONCERN STATEMENT: One commenter stated that according to a new report by the NPS, snowmobiles used in 2012 have higher emissions than those used in 2006. The report also found that new snowmobile models emitted 20 times more CO and increased levels of nitrous oxides and hydrocarbons than those tested in 2006. The commenter stated that these findings indicate that snowcoaches are a cleaner option than current snowmobile use. They also pointed to past findings in this planning process to support this argument.

Response: The NPS recognizes that for some snowmobile models, performance has regressed with respect to certain air and sound metrics over the past several years. However, for others such as the Ski Doo ACE 600, exhaust emissions have improved over earlier models. The BAT requirements proposed under the preferred alternative are designed to ensure better environmental performance from both snowmobiles and snowcoaches in the future. The analysis in appendix A of the plan/SEIS reveals that snowmobiles emit less CO at the "per person" and "per transportation event" levels, but that snowcoaches generally emit less hydrocarbons and NO_2. Without making a value judgment as to which pollutants (CO, hydrocarbons, NO_2) warrant more concern relative to others, it is not possible to ascertain that one mode of transportation is cleaner or more desirable than the other or more protective of the park's air quality.

CC1000 - Consultation and Coordination: General Comments

Concern ID: 40334

CONCERN STATEMENT: Commenters questioned the shortened 45-day comment period based on the complex proposal involving scientific and technical data and requested an extended comment period. One commenter suggested that if a new final rule could not be implemented by December 15, the Service could extend the 2011/2012 plan with an interim rule for the winter season. One commenter expressed that the late release of air and sound emission reports compromised the public review opportunity and is inconsistent with the policy and requirements of NEPA.

Response: The NPS extended the interim regulation for one additional season (2012/2013 season) and reopened the comment period on the draft plan/SEIS for an additional 30 days. In total, the comment period for the draft plan/SEIS was open 75 days.

Concern ID: 40335

CONCERN STATEMENT: Commenters expressed disappointment that comments submitted during past Winter Use processes were not implemented. They felt that these comments included critical and relevant information describing the present and legal status and assessment of threats to wolverines. One commenter requested that their entire letter and attached comments be incorporated with other public comments in the final plan/SEIS.

Response: Comments submitted on the previous NEPA processes, including the 2011 Draft EIS, were reviewed and considered as part of this SEIS planning process.

Concern ID: 40336

CONCERN STATEMENT: One commenter was concerned that no Endangered Species Act (ESA) Section 7 consultation was mentioned for the draft plan/SEIS process and requested an explanation on how it will comply with the ESA in the final plan/SEIS. The commenter suggested the park publish a notice advising the public how it is complying with the ESA which would provide the public an opportunity to comment on analysis for consideration.

Response: The NPS has held discussions with the USFWS regarding the preferred alternative and, consistent with the guidance found in the Director's Order 12 Handbook, will complete consultation with the USFWS for the alternative that is ultimately selected, prior to signing a Record of Decision.

Concern ID: 40337

CONCERN STATEMENT: One commenter questioned whether EPA had approved a plan for the 2013 season.

Response: Approval authority regarding OSV access to the park rests exclusively with the NPS. The EPA is a Cooperating Agency for purposes of this plan/SEIS and worked closely with the NPS in the development of the BAT standard for snowcoaches and development of emission factors for air quality modeling.

GA1000 - Impact Analysis: Impact Analyses

Concern ID: 40344

CONCERN STATEMENT: Commenters asked that land use issues on adjacent lands be considered such as recognizing restrictions on snowmobile access in adjacent National Forests in the plan/SEIS and the desire for visitors to utilize Yellowstone, not surrounding areas.

Response: The purpose of this plan/SEIS is to establish a management framework that allows the public to experience the unique winter resources and values at Yellowstone National Park. Uses on adjacent lands outside of Yellowstone National Park are outside scope of analysis for this plan/SEIS.

Concern ID: 40345

CONCERN STATEMENT: Commenters suggested that emissions within the park should be monitored on a per person basis comparing (as recommended by the EPA in its March 2012 scoping letter) the emissions of an OSV user to the emissions of other user types within the park. They also felt that noise and pollution produced by OSVs should be compared to other user types. One commenter felt that the analysis should consider the relative extent to which OSV manufacturers have made reductions in noise and pollution compared to other forms of recreation/travel.

Response: Impacts to air quality at the "per person" and "per transportation event" level are discussed in appendix A to the plan/SEIS.

There is no scientific basis to compare emissions from OSVs to wheeled on-road vehicles. OSVs have markedly different emissions characteristics than wheeled on-road vehicles due to the fact that they are typically tracked vehicles running over snow, rather than wheeled vehicles running over pavement. An alternative that would have allowed wheeled vehicles on plowed roads was analyzed in detail in the 2011 Final EIS, but was considered and dismissed from detailed analysis for this plan/SEIS.

Concern ID: 40346

CONCERN STATEMENT: One commenter expressed concerned about what a decision allowing motorized vehicles off-road in Yellowstone will do to future policy decisions.

Response: OSVs are restricted to road corridors and are not allowed "off-road." OSV use has been allowed in the park every season for five decades, and therefore the NPS does not believe that allowing OSV use in the park would set any new precedent for NPS management. Furthermore, allowing OSV use in the context of this plan/SEIS would not commit the NPS to any future policy decisions.

Concern ID: 40347

CONCERN STATEMENT: One commenter noted that the draft plan/SEIS fails to discuss the impact that avalanche control on Sylvan Pass will have on proposed wilderness areas that have been proposed under the Wilderness Act. This commenter cites the failure of the draft plan/SEIS to incorporate any discussion that explosives are being launched into recommended wilderness and that the draft plan/SEIS fails to contain a map of these proposed wilderness boundaries.

Response: The park contains recommended wilderness, not designated wilderness. For all major park roads, there is a buffer area around major roads and activities taking place there are not considered to be within recommended wilderness. The existing boundaries used to designate the recommended wilderness areas are not exact and it is not clear that the Sylvan Pass avalanche chutes are inside the recommended wilderness areas. It is clear, however, that the location of the howitzer is not in recommended wilderness. The NPS has added text to chapter 1 addressing impacts to wilderness from avalanche mitigation activities. This text can be found under the "Wilderness" subsection of the "Issues and Impact Topics Considered but Dismissed From Further Analysis" section.

Concern ID: 40348

CONCERN STATEMENT: One commenter noted that, despite the small contribution that OSVs have to overall greenhouse gas emissions, the NPS has direct control over these emissions and felt this topic should have been evaluated fully in the SEIS.

Response: Greenhouse gas (GHG) emissions are considered in the SEIS under the heading "Natural or Depletable Resource Requirements and Conservation Potential." The SEIS states that impacts from GHG emissions associated with motorized winter use 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 were considered but dismissed from detailed analysis.

Concern ID: 40349

CONCERN STATEMENT: One commenter noted that the intensity definitions in the wildlife section of the draft plan/SEIS do not have metrics associated with them, stating that these definitions are meaningless, including for the purpose of adaptive management. They stated that the NPS must reissue a draft plan/SEIS that includes intensity definitions that are meaningful and measureable.

Response: The intensity definitions for wildlife contain qualitative metrics. The NPS believes that these intensity definitions provide an effective mechanism to distinguish the expected level of impact among alternatives, which is one purpose of including intensity definitions in NPS NEPA documents. Quantitative metrics are not required for intensity definitions. Furthermore, quantitative metrics are not well-suited for analyzing wildlife impacts. It would be extremely difficult to develop quantitative metrics that would be applicable across all wildlife species analyzed, and developing different quantitative metrics for each species would require an unreasonable amount of time, in light of the relatively low level of impacts caused by OSV use.

Concern ID: 40350

CONCERN STATEMENT: Commenters questioned the NPS insistence that OSV use continue in Yellowstone despite evidence demonstrating that such use "harms wildlife, air quality, natural soundscapes, compromises employee and visitor safety, and is a violation of federal law." They also stated that the NPS studies go against their findings and requested that the NPS show the science supporting the use of OSVs prior to making a decision regarding winter use.

Response: The NPS disagrees that allowing OSV use violates federal law. NPS *Management Policies 2006*, Section 1.4.3 states, "NPS managers must always seek ways to avoid, or to minimize to the greatest extent practicable, adverse impacts on park resources and values." This means that NPS managers must take reasonable, affirmative steps toward avoiding or minimizing adverse impacts, but it does not constrain the NPS's discretion to allow impacts that the NPS deems necessary and appropriate to promote the enjoyment or conservation of the park.

If the NPS is to provide for any reasonable visitor access to Yellowstone in the winter, motorized vehicle use is necessary, and the NPS believes that OSV use as proposed under the preferred alternative allows the agency to effectively protect park resources while providing for visitation. Based upon the impact analysis in the SEIS, the NPS believes OSV use, at the levels described in the preferred alternative, including the requirements and restrictions, is an appropriate use of the park.

Pursuant to the NPS Guidance for Non-Impairment Determinations and the NPS NEPA Process (NPS 2010d), a non-impairment determination for the selected alternative will be appended to the Record of Decision (ROD).

GA1500 - General: Methodology and Assumptions

Concern ID: 40302

CONCERN STATEMENT: One commenter asked for clarification regarding the assumptions for administrative use of snowcoaches. Specifically, they wanted to know if they needed to meet BAT standards the same time as the rest of the fleet and if they are subject to the same time restrictions as other snowcoaches.

Response: Administrative use of OSVs would generally be subject to the same BAT and other restrictions as commercial snowcoaches, including hours of operation. Limited exceptions to BAT and other requirements would be made for emergency circumstances and for other administrative purposes on a limited basis.

HS2000 - Health and Safety: Impact Of Proposal And Alternatives

Concern ID: 40303

CONCERN STATEMENT: One commenter noted that the proposed action would result in an increase in visitor conflict incidents if guides are not required.

Response: Under the preferred alternative, OSV use in the park will continue to be 100 percent guided. The NPS considered but dismissed allowing unguided use. While the preferred alternative would allow non-commercially guided use, there is no data to suggest such use would have greater impacts to park resources than commercially guided use or that non-commercially guided use would create additional visitor conflicts. The NPS will develop a non-commercial guide training program and will monitor non-commercially guided groups through its adaptive management and monitoring program. If non-commercially guided groups are determined to have a greater impact to park resources and values than commercially guided groups, non-commercially guided use could be reduced or eliminated.

PN2000 - Purpose And Need: Park Purpose And Significance

Concern ID: 40305

CONCERN STATEMENT: Commenters stated that allowing snowmobile use is against the purpose for which the park was established as well as NPS Management Policies. One commenter stated that the statements of significance in the draft plan/SEIS do not mandate snowmobile use and noted that NPS is not obligated to provide accessibility to all.

Response: The NPS recognizes that OSV use in Yellowstone is not mandated by law or policy. NPS *Management Policies 2006*, Section 1.4.3 states, “NPS managers must always seek ways to avoid, or to minimize to the greatest extent practicable, adverse impacts on park resources and values.” This means that NPS managers must take reasonable, affirmative steps toward avoiding or minimizing adverse impacts, but it does not constrain the NPS’s discretion to allow impacts that the NPS deems necessary and appropriate to promote the enjoyment or conservation of the park.

If the NPS is to provide for any reasonable visitor access to Yellowstone in the winter, motorized vehicle use is necessary, and the NPS believes that OSV use as proposed under the preferred alternative allows the agency to effectively protect park resources while providing for visitation. Based upon the impact analysis in the SEIS, the NPS believes OSV use, at the levels described in the preferred

alternative, including the requirements and restrictions, is an appropriate use of the park.

Concern ID: 40306

CONCERN STATEMENT: Commenters noted that the NPS is to provide for the use and enjoyment of the parks, and asked for access to be maintained because of this mandate.

Response: Most national parks do not allow any motorized oversnow access; some close entirely in winter. The park's enabling legislation and the Organic Act reserve ample discretion to the NPS to determine how best to promote the enjoyment of the park while protecting park resources. The suggestion that the park's enabling legislation or Organic Act mandate some particular level or type of access is incorrect. However, under the preferred alternative, OSV use would be allowed to continue.

PN3000 - Purpose And Need: Scope Of The Analysis

Concern ID: 40307

CONCERN STATEMENT: Commenters stated that the plan should better include non-motorized uses, and that this would be consistent with the purpose of the plan. Commenters asked for more specific details regarding non-motorized uses in the park including enhancements.

Response: During the scoping process, the NPS received a number of comments regarding non-motorized winter use. The alternatives in the SEIS provide for a number of non-motorized uses such as skiing, hiking, and snowshoeing. Under the action alternatives, there are more than 35 miles of secondary park roads available for non-motorized recreation. Specific details regarding non-motorized uses can be found in chapter 2 of the SEIS.

PN4000 - Purpose And Need: Park Legislation/Authority

Concern ID: 40375

CONCERN STATEMENT: Commenters stated that under NPS *Management Policies 2006* a transition to snowcoaches is not only appropriate, it is required as the policies "seek to perpetuate the best possible air quality in the parks." One commenter also questioned the use of snowmobiles in the park as 36 CFR 2.18, 16 USC 1a-1, the 2000 ROD at page 12, the 2003 ROD at page 18, the 2004 EA at page 12, 2011 draft EIS, chapter 2, page 72, 2011 final EIS, chapter 1, page 25, NPS Management Policy 1.4.3; 2000 ROD, at 13; 2004 EA at pages 11-12; 2007 ROD, at page 30; 2011 final EIS, chapter 2, page 76 contain language which suggests snowmobiles would be inconsistent and a conflict between users and policy of the park.

Response: The impact analysis in the SEIS demonstrates that with implementation of transportation event management, BAT for snowcoaches, New BAT for snowmobiles, and voluntary E-BAT for both snowmobiles and snowcoaches, the preferred alternative would result in fewer overall impacts to the park's air quality than the other action alternatives.

In addition, data indicates that impacts for both modes of transportation (snowmobiles and snowcoaches) are low and that no one mode of transportation is clearly better, in terms of limiting environmental impacts and maximizing visitor experiences, than the other.

Based on the analysis in this SEIS, the NPS does not believe OSV use, as proposed under the preferred alternative, would be inconsistent with NPS policies.

Concern ID: 40376

CONCERN STATEMENT: One commenter suggested that the preferred alternative would not comply with the court's order stating, "at the very least, NPS is required to exercise its discretion in a manner that is calculated to protect park resources and genuinely seeks to minimize adverse impacts on park resources," while the snowcoach alternative would comply.

Response: The impact analysis in the SEIS demonstrates that with implementation of transportation event management, BAT for snowcoaches, New BAT for snowmobiles, and voluntary E-BAT for both snowmobiles and snowcoaches, the preferred alternative would result in fewer overall impacts to park resources and values than the other action alternatives, including alternative 3 (snowcoach-only alternative).

Concern ID: 40377

CONCERN STATEMENT: Commenters stated that snowmobiles and OSV use should be banned as they are in violation of park legislation and would have adverse effects on air quality, soil, wildlife and habitat, and cultural or historic resources. Commenter stated that the use of snowmobiles under Executive Order 11644, Use of Off Road Vehicles on the Public Lands, (1972); the 2000 ROD, at page 12; 2003 ROD at page18; 2004 EA at page 11; 2007 ROD, at page 28; 2011 final EIS, chapter 1, pages 26-27, Executive Order 11989 (1978), the 1974 Yellowstone National Park Master Plan and draft SEIS at pages iii and 3 would be in violation of these mandates as off road vehicle use would be in locations that would adversely affect their natural, aesthetic or scenic values.

Response: The NPS considered an alternative that would have banned public OSV use. However, the NPS believes it is important to provide access by the public to the park's unique winter resources. Therefore, the NPS has identified a preferred alternative that would allow the public to use OSVs to access the interior of the park, while minimizing impacts to park resources and values.

The NPS believes that by implementing transportation event management, BAT for snowcoaches, New BAT for snowmobiles, and voluntary E-BAT for both snowmobiles and snowcoaches, the preferred alternative would minimize impacts to park resources and values and can be implemented in a manner consistent with applicable legislation, regulations, and policies.

Concern ID: 40378

CONCERN STATEMENT: One commenter questioned the use of snowcoaches, as they are not currently permitted by regulation. Additionally, the commenter stated that the draft plan/SEIS at 27 states the park units are to, "maintain, as parts of the natural ecosystems of parks, all plants and animals native to the park ecosystems in part by minimizing human impact on native plants, animals, populations, communities, and ecosystems, and the processes that sustain them" and that this is a conflict with NPS regulations as it includes the caveat of "minimizing" when the relevant regulations do not.

Response: Snowcoach use has been authorized by previous winter use regulations, including the interim regulation that is currently in effect through the 2012/2013 season.

NPS *Management Policies 2006*, Section 1.4.3 states, "NPS managers must always seek ways to avoid, or to minimize to the greatest extent practicable, adverse impacts on park resources and values." This means that NPS managers must take reasonable, affirmative steps toward avoiding or minimizing adverse impacts, but it does not constrain the NPS's discretion to allow impacts that the NPS deems necessary and appropriate to promote the enjoyment or conservation of the park.

Concern ID: 40379

CONCERN STATEMENT: One commenter stated that the draft plan/SEIS failed to discuss NPS regulations 36 CFR 2.2(a)(2)which prohibits, "the feeding, touching, teasing, frightening or intentional disturbing of wildlife nesting, breeding, or other activities," and 36 CFR 2.18(c).

Response: The regulations and restrictions on OSV use under the preferred alternative, including the 100 percent guiding requirement, are designed to prevent the situations referred to by the commenter. Under the preferred alternative, law enforcement personnel would issue citations to anyone observed feeding, touching, teasing, frightening, or intentionally disturbing wildlife.

PN8000 - Purpose And Need: Objectives In Taking Action

Concern ID: 40380

CONCERN STATEMENT: Commenters suggested that the Objectives should include non-motorized opportunities as well as throughout the document.

Response: The NPS believes that providing non-motorized opportunities fits under the purpose of the plan/SEIS, which is to establish a management framework that allows the public to experience the unique winter resources and values at Yellowstone National Park.

During the scoping process, the NPS received a number of comments regarding non-motorized winter use. The alternatives in the SEIS provide for a number of non-motorized uses such as skiing, hiking, and snowshoeing. Under the action alternatives, there are more than 35 miles of secondary park roads available for non-motorized recreation. Specific details regarding non-motorized uses can be found in chapter 2 of the SEIS.

Concern ID: 40381

CONCERN STATEMENT: One commenter stated that alternative 1 would not meet the objective to promote advances in vehicle technology. The commenter stated that this objective is preposterous since Yellowstone National Park/NPS has no obligation to promote or achieve any advancements in vehicle technology and must be removed from the document.

Response: The NPS acknowledges that it has no legal duty to promote advances of OSV technology, but has decided that such an objective should be included in the plan/SEIS. While this objective is better met by the action alternatives that would allow public OSV use, this objective could still be met under alternative 1, which would allow limited administrative OSV use.

Concern ID: 40382

CONCERN STATEMENT: One commenter suggested that the park has not appended or made available the Yellowstone National Park strategic plan, 1995 Natural Resource Management Plan, 1974 Master Plan, and other management guidance so the public can determine the veracity of the NPS objectives. The commenter further suggests that the documents do not mandate or suggest that OSVs must be permitted in the park.

Response: The strategic plan is available on the park's website at http://www.nps.gov/yell/planyourvisit/upload/strategicplan.pdf. The other referenced documents are available for review at the park and can be requested by contacting the Superintendent's Office.

Concern ID: 40383

CONCERN STATEMENT: One commenter suggested that an objective of the plan should be to eliminate further addition of particles to the air so the air will become cleaner.

Response: The plan/SEIS contains an objective to manage winter use to minimize impacts on resources that may be affected by air pollution, including visibility and aquatic systems. Under the preferred alternative, the NPS expects the overall amount of pollution to be reduced compared to what has been allowed during past winter seasons.

SE2000 - Socioeconomics: Methodology And Assumptions

Concern ID: 40309

CONCERN STATEMENT: One commenter stated the NPS had said the economic concerns were not considered, and the commenter felt they should be part of the analysis.

Response: The SEIS addresses socioeconomic impacts in “Chapter 3: Affected Environment” and “Chapter 4: Environmental Consequences.”

Concern ID: 40310

CONCERN STATEMENT: The University of Wyoming provided excerpts from an ongoing study regarding snowmobiling in the state for consideration for incorporation into the final plan/SEIS.

Response: The NPS appreciates additional information and studies to consider in the SEIS process. However, the NPS cannot use the information provided because the study has not been completed. As provided, the excerpts are taken out of context of the full report. The NPS looks forward to reviewing these studies once they are completed and provided to the public.

SE4000 - Socioeconomics: Impact Of Proposal And Alternatives

Concern ID: 40311

CONCERN STATEMENT: Commenters questioned how much revenue increasing snowmobiles would generate, and if increasing revenue is a goal of the NPS. One commenter asked what the cost per transportation event would be.

Response: Decisions regarding the appropriate type of winter use and numbers of snowmobiles and snowcoaches are made without regard to revenue. Entrance fees related to winter use are a small part of the park’s overall budget and a small part of fee revenue that Yellowstone receives. Oversnow winter use accounts for ~50,000 of the approximately 3.5 million visits to Yellowstone each year.
Cost per transportation event is difficult to ascertain, but generally it costs approximately $100 to $200 per person to enter the park during winter, depending on the type of OSV used.

Concern ID: 40312

CONCERN STATEMENT: One commenter stated while it agreed with the impacts, it felt that the impact analysis was incomplete because it did not take into consideration other costs, such as ecological values.

Response: Ecological values are difficult to quantify. However, the NPS takes into account ecological and other non-monetized values in its decision making process.

Concern ID: 40313

CONCERN STATEMENT: Commenters felt that the analysis for alternative 2 incorrectly identified it as continuing current management, when current management should be no OSV use.

Response: Text has been changed to refer to what has been allowed in "recent years," (318 snowmobiles and 78 snowcoaches per day) rather than referring to "current management."

Concern ID: 40314

CONCERN STATEMENT: In regard to the analysis of socioeconomic impacts, commenters requested the NPS acknowledge that none of the alternatives would restore previous visitation levels, and therefore have economic impacts. They also requested that NPS consider other aspects of economic impact, such as having to make up lost winter revenue for the rest of the year. One commenter expressed concern with the scope of the analysis, stating that the Big Horn Basin should be considered while another pointed out the market-driven process for manufacturing BAT snowmobiles.

Response: The NPS notes that the higher levels of OSV use allowed prior to the 2009/2010 have not been seen in a number of years. While the commenter is correct that the alternatives considered in the SEIS would not restore previous visitation, alternatives allowing such high levels of use (540 or 720 snowmobiles and 78 snowcoaches per day) were considered but dismissed from detailed analysis. The NPS does not believe it is appropriate to compare the impacts of the four alternatives carried forward in the SEIS against impacts of alternatives that were dismissed.

The economic analysis in the SEIS analysis looks at impacts for five geographic regions: the three state area (Idaho, Montana, and Wyoming), the five county area (Fremont County in Idaho, Gallatin and Park counties in Montana, and Park and Teton counties in Wyoming), and three individual communities (Cody and Jackson, Wyoming, and West Yellowstone, Montana). The community regions are approximated using zip code boundaries.

The impacts of the market-driven process proposed under the preferred alternative are included under the impacts of alternative 4.

Concern ID: 40315

CONCERN STATEMENT: Commenters expressed opinions on the gateway communities, stating that Cody and Jackson should not qualify as gateway communities due to their distance from the park, while another commenter felt that these communities should be less reliant on winter use.

Response: Although located at various distances to the park, the communities of Cody and Jackson are considered gateway communities to Yellowstone. This can be seen at the South Entrance, the entrance with the second-highest winter visitation for OSV use, with many of those visitors using the services in Jackson. Similarly, for those coming in the East Entrance, Cody provides goods and services to those visitors in the winter.

SS1000 - Soundscapes: Methodology And Assumptions

Concern ID: 40316

CONCERN STATEMENT: Commenters questioned the in the soundscapes analysis, with one commenter questioning why data for the 2011 plan is cited in the document. Another commenter noted that the emissions testing conducted was not included in the document, and further stated that Table 18 (page 119 of the draft plan/SEIS) is not consistent with the emissions testing data provided by the NPS.

Response: References to the 2011 plan under the soundscapes section should have read 2012 plan. This editorial error was corrected for the final plan/SEIS.

2012 emissions testing informed the inputs to the air quality modeling of the alternatives. The methodology by which the emissions tests were incorporated in the emissions modeling is explained in greater technical detail in "Yellowstone Over-snow Vehicle Emission Tests" 2012 and the SEIS "Air Quality Modeling Report-Snowmobile and Snowcoach Emissions." Both of these documents are available on the park's website at http://www.nps.gov/yell/planyourvisit/winteruse.htm.
The commenter is correct that the air quality and soundscapes supporting technical documentation was not available at the time of the draft plan/SEIS release. The technical reports were made available on the website on August 8, 2012. To ensure commenters would have time to review the technical documents, the comment period was reopened for an additional 30 days.

Table 18 (now Table 22 in the SEIS) has been replaced with the most up to date information from the National Institute on Deafness and Other Communicative Disorders.

Concern ID: 40317

CONCERN STATEMENT: One commenter stated that, in relation to soundscapes, the SEIS document should focus on the "two park" concept, acknowledging that impacts to soundscapes are different along roads and in developed areas compared to the backcountry.

Response: While the NPS does not believe the commenter's suggestions constitute a "two park" concept, the intensity definitions for soundscapes do acknowledge there are differences between travel corridors and backcountry areas.

SS2000 - Soundscapes: Impact Of Proposal And Alternatives

Concern ID: 40318

CONCERN STATEMENT: Commenters questioned the metrics and data used in the soundscape analysis, stating that perception of sound would be different (either more or less) compared to the sounds data presented in the draft plan/SEIS. They also felt that percent time audible was not an appropriate measure, as it did not account for the intensity of sound when the majority of visitation happens within a certain window of time. One commenter questioned if multiple snowcoaches had less of a sound impact that one snowmobile.

Response: The perception of sound emitted from snowmobiles and snowcoaches depends on specific models, operating conditions, and distance from the vehicles. The NPS used A-weighted decibels to quantify and compare different sources in the SEIS. This is an accepted practice and is based on the frequencies humans are sensitive to. Based on the analysis in appendix A of the SEIS, data indicate that when measured at 50 feet at cruising speed, a group of up to 10 New BAT snowmobiles (each producing 67 dBA), measures 3 dBA lower than a single BAT snowcoach also at cruising speed. The two types of transportation events would have similar noise levels at distant locations.

While percent time audible is provided in chapter 4, the intensity definitions are based on Leq, which better predicts how sound would actually be perceived than does percent time audible alone. A complete discussion of the sound metrics used in the SEIS is included in appendix F.

Depending on the sound energy emitted from each vehicle, it would be possible for multiple snowcoaches to emit less sound energy than one snowmobile, and the opposite is also true. Based on monitoring data, the quietest and noisiest OSVs in

the park were snowcoaches. The quietest snowcoach, a 1994 Dodge Van with Snowbuster Tracks, produced 64 dBA at cruising speed. The loudest snowcoach, a 1988 Prinoth Powder Cat TR, produced 83 dBA at cruising speed. To put this range in perspective, it would take 79 of the 1994 Dodge Van snowcoaches fitted with Snowbuster Tracks to radiate as much noise as a single 1988 Prinoth TR.

Concern ID: 40319

CONCERN STATEMENT: Commenters noted general impacts from noise, including vibration and wildlife disturbance. One commenter noted the emphasis NPS had put on soundscapes in past planning documents, stating that alternative 3 should be implemented to address this and to lessen soundscape impacts to visitors.

Response: The NPS agrees that protection of the natural soundscape is important. Based on the analysis in the SEIS, the NPS believes that with implementation of transportation event management, BAT for snowcoaches, New BAT for snowmobiles, and voluntary E-BAT for both snowmobiles and snowcoaches, the preferred alternative would result in less overall impacts to park resources and values than the other action alternatives, including alternative 3 (snowcoach-only alternative).

VE4000 - Visitor Experience: Impact Of Proposal And Alternatives

Concern ID: 40320

CONCERN STATEMENT: Commenters expressed concern about the cost of snowmobiling, with one commenter stating that the cost of snowcoaches is actually less per person than a snowmobile. They also stated that the SEIS should look at profit, rather than revenue, in the economic impact analysis.

Response: The commenter is correct that the cost of entering the park on a snowcoach is generally less than entering the park on a snowmobile.

The economic analysis in the SEIS is based upon the IMPLAN model, which gives results based on output revenue. For IMPLAN, some of the additional revenue earned in one sector is used to pay for more inputs from other sectors, thus creating a multiplier effect. The IMPLAN results are the total impact (including the multiplier) that is created in the economy. The profit would be the leftover money that the owners of the capital (which may not be the same people as the employees) keep. Whether the NPS looks at revenue or profit the relative impacts would be the same. Figures on revenue (as opposed to profit) can be compared to state or county GDP to get a sense of the size of the impact relative to the overall economy.

Concern ID: 40321

CONCERN STATEMENT: Commenters suggested that snowmobile use should not be permitted in Yellowstone because there are other opportunities in the area for that type of recreation. They also stated that snowmobile use, in the current numbers, conflicts with other visitor uses in the park.

Response: The purpose of this plan/SEIS is to establish a management framework that allows the public to experience the unique winter resources and values at Yellowstone National Park. Therefore, the availability of OSV recreation outside of Yellowstone is outside of the scope of this plan/SEIS.

The NPS does not believe that OSV use, as proposed under the preferred alternative, would conflict with other visitor uses in the park. If OSV use were not allowed, as proposed under alternative 1, access to the park would be limited to the periphery and only a very few number of individuals would be in good enough physical shape to access the interior of the park.

Concern ID: 40323

CONCERN STATEMENT: One commenter cited studies presented in the draft plan/SEIS to note that visitors create disturbance to wildlife, including bison.

Response: The NPs acknowledges that OSV use has some adverse effects on wildlife. The regulations and restrictions on OSV use under the preferred alternative, including the 100 percent guiding requirement, are designed to reduce impacts to wildlife. Under the preferred alternative, law enforcement personnel would issue citations to anyone observed intentionally disturbing wildlife.

Concern ID: 40324

CONCERN STATEMENT: One commenter stated that the analysis of visitor use and experience is biased and that they feel that NPS is allowing visitor use to trump conservation. As part of this, they felt that surveys used in the analysis were biased and deficient.

Response: The NPS does not believe it is allowing use to trump conservation, as the commenter has asserted. With implementation of transportation event management, BAT for snowcoaches, New BAT for snowmobiles, and voluntary E-BAT for both snowmobiles and snowcoaches, the preferred alternative would meet the NPS's conservation mandate, while allowing an appropriate number of visitors to experience the park's unique winter resources.

The surveys cited in the SEIS used appropriate methodologies to help begin to understand the human dimensions of visitor use. The methods and draft instruments were made available for public review as part of the Paperwork Reduction Act process. Although the visitor use surveys were considered in the impact analysis, they were only one of multiple factors the NPS considered.

Concern ID: 40325

CONCERN STATEMENT: One commenter questioned if there was demand for snowmobiling.

Response: The NPS believes there is demand for snowmobiling based on use levels seen in recent years, as well as public comment received during the multiple winter use planning processes.

Concern ID: 40326

CONCERN STATEMENT: Commenters expressed concern with requiring group tours, stating that it is difficult to take different family members with various needs, you are restricted in time and place, and that non-motorized access may be difficult for some family members.

Response: The NPS requirement for guided tours has been effective at reducing impacts to park resources. The NPS believes that while the group/guided tours may create difficulties for some potential visitors, OSV use is only appropriate with certain restrictions.

The NPS recognizes that visitors to Yellowstone in the winter have different abilities as well as different desires for their visitor experience. To address this, the preferred alternative allows for a range of experiences including commercially-guided snowmobile use, non-commercially guided snowmobile use, snowcoach use, and non-motorized uses.

WH2000 - Wildlife And Wildlife Habitat: Methodology And Assumptions

Concern ID: 40243

CONCERN STATEMENT: Commenters expressed concerns over the use of the Borkowski study (2006) instead of the White study, which was used in the 2007 SEIS, asserting that the White study is the definitive report on the impacts of OSVs on wildlife and that the Borkowski study was based on data collected prior to the "managed use era."

One commenter expanded on this concern stating that the 480 snowmobiles a day described in NPS's alternative 4 exceeds the recommendation of biologists and discounts the White study that was referenced by the district court in invalidating the 2007 Winter Use Plan proposal of allowing 540 snowmobiles a day.

Response: The NPS considers both studies to be valid; however, each study looked at wildlife responses under different OSV use conditions, Borkowski looked at higher use levels while White looked at lower use levels. In the end, the conclusions were the same.

As discussed in previous planning processes, there have been some ambiguous and somewhat inconsistent statements in past papers on wildlife impacts. The NPS has determined, however, that the use levels proposed under the preferred alternative are consistent with the biologists' actual recommendations.

The 2008 EA states, "White et al. erred in stating winter use should be limited to 50,000 oversnow visitors [emphasis in original]" (White 2008). White 2008 is a citation to a memo from Dr. White (available at http://www.nps.gov/yell/parkmgmt/upload/correction_2006winuserpt.pdf) which clarifies that the recommendation was to "[c]ontinue to conduct winter recreational activities in a predictable manner with OSV [over-snow vehicle] traffic levels at or below those observed during the last 3 years of our study."

This memo has been interpreted by some to mean that snowmobile use should be limited to no more than approximately 260 per day and snowcoach use to no more than approximately 30 per day (which were the averages those years). Other papers by the same authors, however, discussed a wider time frame (1999-2006) and higher levels of use. The peer-reviewed scientific journal article, "Behavioral Responses of Bison and Elk in Yellowstone to Snowmobiles and Snow Coaches" by John J. Borkowski, P.J. White, Robert A. Garrott, Troy Davis, Amanda R. Hardy and Daniel J. Reinhart, Ecological Applications 16(5) (2006) (pp. 191- 1925) makes it clear that the monitoring period they are referring to is 1999 through 2004. Average daily OSV use ranged from 593 per day during the 2002 winter to 178 per day in 2004.

Maximum daily numbers ranged up to 1168 OSVs during the study. Cumulative OSV entries for the winter season for the West Entrance alone ranged up to 46,885 for the winter season (data are found on page 1915 of the paper). At the conclusion (p. 1924), the authors state:

"This study documented that winter visitors traveling on OSVs were essentially confined to the groomed roads, typically behaved appropriately when viewing wildlife, and rarely approached wildlife except when animals were on or immediately adjacent to the road. These attributes have allowed elk and bison in Yellowstone to habituate somewhat to OSV recreation, commonly demonstrating no observable response, and rarely displaying "fight or flight" responses when animals were off road. Further, available data provide no evidence that levels and patterns of OSV traffic during the past 35 years adversely affected the population dynamics or demography of elk and bison. Thus, we suggest regulations restricting the levels and travel routes of OSVs during our study were effective at reducing disturbance to bison and elk below a level that would cause measurable fitness effects. We acknowledge the potential for fitness effects to develop if OSVs or other stressors become more severe or prolonged. Thus, we recommend park managers consider maintaining OSV

traffic levels at or below those observed during our study [1999-2004]. Regardless, numerous studies have shown that scientific findings rarely persuade people to alter their values or beliefs (e.g., Meadow et al. 2005). Thus, we suspect that varying interpretations of the behavioral and physiological response data will continue to exist because of the diverse values and beliefs of the many constituencies of Yellowstone National Park."

The preferred alternative maintains the restrictive regulations that reduced disturbances and maintains OSV traffic levels well below those observed from the 1999/1999 through 2003/2004 winter seasons (the public use season is from December 15 through March 15), and is thus fully consistent with the recommendations of this peer reviewed article and the biologists' subsequent clarifications.

Concern ID: 40247

CONCERN STATEMENT: One commenter, concerned over science supporting reduced number of snowmobiles due to animal stress and visitor solitude, requested that the NPS provide a comparison of elk and bison populations present in the park prior to restrictions and populations currently in the park.

Response: Population trends for bison and elk in the park are discussed in chapter 3 of the SEIS. Bison and elk numbers in the park have fluctuated over time; however, population trends are attributed to drought, severe winter weather, hunting, and predation. Motorized winter use in the park has not been cited as a major reason for population or demographic trends.

WH4000 - Wildlife And Wildlife Habitat: Impact Of Proposal And Alternatives

Concern ID: 40363

CONCERN STATEMENT: One commenter cited specific issues pertaining to impacts on wildlife and wildlife habitat that they were concerned about in the draft plan/SEIS including that impacts to bison and elk were overstated at moderate, when they should be negligible, minor or insignificant. They also noted that there is substantial habituation of bison and elk to vehicular travel on roads and there is therefore minimal stress caused to wildlife.

Response: NPS agrees that for the most part that the preferred alternative would result in impacts to bison and elk at minor or negligible levels. However, due to the potential for individuals to respond in a negative way to OSV use, the NPS believes the impacts of alternative 4 best fit under the moderate intensity definition.

Concern ID: 40364

CONCERN STATEMENT: Commenters expressed concern over adverse impacts to wildlife from OSV use. In general they stated that there is science demonstrating impacts from sound pollution on wildlife including stress and reduced natality, with one commenter specifically citing impacts to wolverines. One commenter suggested that the NPS look at research by Dr. Bernie Krause pertaining to the effects of manmade loud noise.

One commenter asked how much wildlife is lost from stress-induced death.

Specific impacts that commenters felt should be addressed were impacts to grizzly bears citing indirect impacts from groomed/packed roads as it related to the availability to winter-killed carcasses for emerging bears.

In addition, another commenter was concerned about impacts from compacted snow that would prevent air circulation beneath the surface resulting in the death of burrowing animals, and the effects of hibernation.

One commenter noted the NPS statement that it is difficult to determine how OSV use in Yellowstone would affect lynx and wolverine "habitat use, behavior, or distribution," expressing concern that the NPS made the conclusion that impacts under alternative 4 would be same as the impacts under alternative 3 without evidence to support this finding.

Response: The NPS has reviewed Dr. Krause's papers, as well as hundreds of other articles on the subject of the effects of manmade noise.

The SEIS acknowledges that a number of factors, including noise, may adversely affect bison or elk heart rate, stress levels, habitat use, and foraging time. However, no comprehensive studies have analyzed the energetic effects of bison and elk behavioral responses to OSVs in Yellowstone, due in part to the difficulties associated with separating the energetic costs associated specifically with responses to OSVs from the total daily energy expenditure (Borkowski et al. 2006). Numerous assumptions are required when making energy analyses, and poorly defined parameter estimates can strongly affect research and outcomes. No data is available regarding how much, if any, wildlife is lost from stress-induced death, but available data on physiological responses of wildlife indicates stress-related mortality would be minimal, if at all.

Grizzly bears in Yellowstone generally den far from groomed park roads and areas used by recreationists, and are in hibernation for most of the winter months. Therefore, OSV use in the park as proposed under the preferred alternative has little potential to disturb them. In addition, the NPS designates bear management areas that result in recreation closures further reducing the potential for disturbance. As suggested by the commenter, winter kill is an important post-emergence food source for bears. However, it is not expected that OSV use would increase or decrease the level of winter kill in a meaningful way that could affect the park's grizzly bear population.

In regard to issues related to the grooming and packed snow, all OSV routes take place on snow covered and unplowed roadways in the park. It is extremely unlikely that burrowing or hibernating animals would be using these areas. Burrowing animals may attempt to traverse these areas, though they would not be expected to be seeking food resources or shelter in these areas given the underlying road.

Chapter 4 of the SEIS provides clear distinctions between alternatives 3 and 4 regarding impacts to lynx and wolverines.

Concern ID: 40365

CONCERN STATEMENT: One commenter stated that there is not a comprehensive assessment of bison energetics and noted that such an assessment is critical to providing an analysis of the impacts to bison. They further note that the NPS should not make suggestions about energy expenditures by bison moving through deep snow (draft plan/SEIS 196) being countered due to a lack of active movement responses.

Response: NPS agrees that there has not been a comprehensive assessment of bison energetics at Yellowstone National Park. However, observations of bison, elk, trumpeter swans, and bald eagles, which evince awareness of passing OSVs but typically are not displaced, do not suggest substantial energetic costs. Therefore, NPS scientists have suggested, based on best professional judgment, that for the no-action alternative, although it is difficult to differentiate between the additional movement costs that may be associated with travel through deep snow and the energy savings due to lack of active movement responses, it is likely that costs and benefits would more or less balance out for bison.

Concern ID: 40366

CONCERN STATEMENT: One commenter noted that the explanation of impacts to wolves in the park described in Table 10 (Impact Summaries) under alternative 2 would result in increased, not decreased, wolf encounters compared to current use noting that current use includes a ban on recreational vehicles.

Response: The NPS agrees with the commenter and has changed the text in the table to reflect this.

Concern ID: 40367

CONCERN STATEMENT: Several commenters expressed concern about practices pertaining to Sylvan Pass and asked that the following issues be addressed:

- Impacts of avalanche control on subnivean species such as pikas.

- Impacts of avalanche control on the habitat of lynx and wolverine.

- Explanation for allowing avalanche control in critical wolverine habitat.

- Substantive discussion of environmental consequences on critical wolverine habitat.

- Address the likelihood that USFWS will formally list wolverines for protection under the Endangered Species Act.

Response: The NPS has added text to chapter 1 addressing impacts to pika. This text can be found under the “Subnivian Fauna” subsection of the “Issues and Impact Topics Considered but Dismissed From Further Analysis” section.

Although concerns were expressed about the impacts to lynx and wolverine habitat, data indicates that the pass is not frequently used by these species, and the potential for impact is minimal. Furthermore, wolverines feed primarily on winter-killed ungulates (deer, elk, bison) which are not present in the Sylvan Pass area in winter. Overall, avalanche mitigation in Sylvan Pass affects less than 0.1 percent of wolverine habitat. The impacts of avalanche control on wolverine and lynx habitat have been added to chapter 4.

At this time, wolverines have been proposed for listing under the Endangered Species Act, but are not listed under the Endangered Species Act. That listing process is outside the scope of this SEIS. The SEIS analyzes impacts to wolverines. Should wolverines come under the protection of the Endangered Species Act, the NPS will consult with the USFWS, and if necessary, make adjustments to the winter-use management framework.

Concern ID: 40368

CONCERN STATEMENT: One commenter noted that the winter transportation corridor over Sylvan Pass is at odds with the USFWS interpretation of the NPS Organic Act as a regulatory mechanism to protect wolverine habitat. They felt that since the SEIS did not analyze impacts to wolverine in the context of climate change, the USFWS presumption about the benefits of NPS units in wolverine conservation cannot be met. This commenter also stated that it is “neither prudent nor lawful” of the NPS not to analyze “reasonably predictable” consequences such as the effects to Sylvan Pass as a key habitat connection and the future reduction in habitat area in the Greater Yellowstone Ecosystem predicted by the USFWS.

Response: Avalanche control at Sylvan Pass began in 1973 and its use by OSVs has occurred over various time periods since 1973. Activity in this area of the park during winter has been fairly consistent through the years.

The NPS disagrees that the USFWS presumption of conservation based on the NPS Organic Act is flawed. The USFWS concluded that "Where wolverines occur in National Parks, they and their habitats are protected from large-scale loss or degradation due to the Park Service's mandate." OSV use in Sylvan Pass would not result in the "large-scale loss or degradation" suggested by the commenter. In addition, the USFWS concluded that "Six of seven natal dens documented in the Yellowstone Ecosystem occurred where snowmobiles were not permitted..." and that wolverine den, foraging, and traveling areas have anecdotally been found to be spatially separated from snowmobile activity (Heinemeyer et al. 2001, p. 17) 75 FR 78051. The Sylvan Pass area is not the only area of the park that that provides suitable denning habitat. In fact, the six dens mentioned above were all found in designated wilderness areas.

Concern ID: 40370

CONCERN STATEMENT: One commenter expressed several concerns related to wildlife and groomed roads during the winter. This commenter stated that it is "impossible to determine after the fact, and in the absence of a control population, what precise impact, if any, road grooming and winter use have on bison winter range expansion and population growth." With this in mind, and considering the NPS's conservation mandate, the commenter stated that the NPS must use the precautionary principle and not allow OSVs in the park. Further concerns from this commenter included:

-Whether or not bison preferentially use packed/groomed roads, how bison travel patterns changed once the packed/groomed roads were discovered.

-The assertion that the presence of packed/groomed roads has a clear impact on the ecology and behavior of the bison.

- The assertion that analysis has shown that it is incorrect to stated that road grooming did not change the population growth rates of bison and that more long-term data would result in the NPS having substantially different conclusions.

- Population growth and range expansion would likely have occurred regardless of packed/groomed roads, the commenter noted that since the roads provided bison with an energy efficient means of travel, bison behavior would be both spatially and temporally different.

Response: The NPS agrees that because there is no data available on bison populations and movements prior to OSV use, scientists will not be able to definitively determine the precise level of impact that groomed roads may have on bison and their movements. This does not, however, mean that NPS should close the park to visitors in the winter, as the comment suggests.

The NPS has disclosed the available information and evidence regarding the relationship between groomed roads and bison movements and population levels in the SEIS. Based on the available data, the NPS continues to believe that there is no data to suggest a preferential use of groomed roads by bison, and that other factors play a more integral role in bison populations. Using their best professional judgment, NPS managers have concluded that the NPS is not in conflict with its own management policies or conservation mandate. NPS *Management Policies 2006*, Section 1.4.3 states, "NPS managers must always seek ways to avoid, or to minimize to the greatest extent practicable, adverse impacts on park resources and values." This means that NPS managers must take reasonable, affirmative steps toward avoiding or minimizing adverse impacts, but it does not constrain the NPS's discretion to allow impacts that the NPS deems necessary and appropriate to promote the enjoyment or conservation of the park. The NPS believes that the level of OSV use proposed under the preferred alternative is consistent with its mandate. The NPS will continue to monitor bison and other wildlife and if necessary, will

make changes to road grooming and OSV use as part of the adaptive management and monitoring plan.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 8
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DENVER, CO 80202-1129
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AUG 22 2012

RECEIVED
AUG 24 2012
Superintendent's Office

Ref: 8EPR-N

Dan Wenk, Superintendent
Yellowstone National Park
c/o Winter Use SEIS
P.O. Box 168, Yellowstone National Park
Wyoming 82190

Re: EPA Comments for the
Yellowstone National Park Draft Winter
Use Plan/Supplemental Environmental Impact
Statement; CEQ # 20120214

Dear Superintendent Wenk:

The U.S. Environmental Protection Agency Region 8 (EPA) has reviewed the U.S. Department of Interior, National Park Service's (NPS) Summer 2012 Draft Winter Use Plan (Plan) Supplemental Environmental Impact Statement (SEIS) for Yellowstone National Park (Park). Our review was conducted in accordance with the EPA's responsibilities under section 102 of the National Environmental Policy Act (NEPA), 42 U.S.C. § 4332(2)(c), and Section 309 of the Clean Air Act, 42 U.S.C. § 7609. Section 309 of the Clean Air Act directs the EPA to review and comment in writing on the environmental impacts of any major federal agency action. The EPA's comments include a rating of the environmental impact of the proposed action and the adequacy of the NEPA document.

Summary of SEIS and Alternatives Analyzed

The SEIS evaluated four alternatives including the No Action alternative (Alternative 1). Under all action alternatives, new best available technology (BAT) requirements would be developed and implemented for snowcoaches, and existing BAT requirements for snowmobiles for carbon monoxide (CO) emissions and noise would be strengthened. Alternative 2 is a continuation of snowmobile/snowcoach use at the 2011/2012 interim daily regulation limits of 318 and 78, respectively. Alternative 3 entails a transition to snowcoaches only. Snowmobiles would be completely phased out by the 2020/2021 winter season, and the east Park entrance (Sylvan Pass) would be seasonally closed. The Preferred Alternative, Alternative 4, proposes a new approach to managing oversnow vehicle (OSV) use by setting a maximum number of daily transportation events to access the park. The NPS defines a single transportation event as either a group of seven snowmobiles (on average) or one snowcoach. The transportation event approach is based on the concept that both types of transportation events present a comparable visitor experience and environmental impact. The Preferred Alternative would permit no more than 110 transportation events daily, of which up to 50 of those events could be allocated to groups of snowmobiles. New BAT standards for both snowcoaches and snowmobiles would be implemented in the 2017/2018 winter season, and four non-commercially guided snowmobile groups would be permitted daily. By managing Winter Use through transportation events in the Preferred Alternative, the

We appreciate the opportunity to participate in the review of this project. If we may provide further explanation of our comments during this stage of your planning process, please contact Phil Strobel, Deputy Director of our NEPA Compliance and Review Program at 303-312-6704, or your staff may contact Melanie Wasco, Lead NEPA Reviewer, at 303-312-6540.

Sincerely,

Suzanne J. Bohan
Director, NEPA Compliance and Review Program
Office of Ecosystems Protection and Remediation

Enclosures:

Detailed Comments
Ratings Criteria

Snowcoaches

The EPA notes that the March 2012 emissions testing included the following non-historic snowcoaches: 2008 Chevy Express (gasoline), 2011 Ford E350 (gasoline), 2011 Ford F450 (diesel), and 2011 Ford F550 (diesel). This information is contained in the March 2012 emissions testing report at: http://www.nps.gov/yell/parkmgmt/upload/pem_of_snowcoaches-snowmobiles_3-2012.pdf Emissions from the 2008 Chevy Express significantly increase the BAT emissions for the modeled 2017-2018 winter season as compared to the 2011 vehicles, especially for carbon monoxide.

Recommendations:

- Do not include the 2008 Chevy Express March 2012 test data in the representation of BAT. Instead, only consider emissions from the three 2011 model snowcoaches to represent snowcoach BAT for 2017-2018. Our recommendation is based on the following:
    - This 2008 snowcoach is underpowered, not allowing the snowcoach to operate above second gear, and therefore is not representative of desired BAT emission performance;
    - This 2008 snowcoach will be exiting the allowed snowcoach fleet as of 2018 (ten-year NPS BAT requirement); and
    - The three 2011 snowcoaches with March 2012 in-use measured emissions best represent the potential 2017-2018 snowcoach non-historic fleet for the air quality modeling work.
- The EPA notes that the emissions used in the Air Quality Report and Draft SEIS for modeled 2017-2018 snowcoach BAT would have produced significantly less emissions especially for carbon monoxide if NPS had excluded the 2008 Chevy Express from the emissions averaging for snowcoach BAT. We also note that the emissions data for the 2011 Ford E350 mentioned in the March 2012 testing report are considerably lower than the 2008 Chevy Express, although they are in the same vehicle class. For example, for the "low speed" test, the Chevy Express was 42 grams per mile (g/mile) for CO while the Ford E350 was 12.5 g/mile. For the "cruise speed" test, the Chevy Express was 396 g/mile for CO and the Ford E350 was only 16.1 g/mile. The BAT fleet actually produces more emissions than does the current fleet (see March 2012 emissions report, Table 7, Class II vs. Class IIB) because the modeled BAT Class II snowcoach fleet includes the Chevy Express.

In view of the above, we recommend seeking a way to define Class II BAT to assure that the BAT fleet produces an improvement over the current Class II fleet. The EPA is available to continue to assist with this matter.

EPA Emissions Standards

Table 4-1 (page 11 of the air quality modeling report) includes EPA emission standards for snowmobiles. However the actual emissions standards are not presented. Instead, the table presents equations which allow higher hydrocarbons (HC) in return for lower CO or vice versa.

Recommendation:

- For clarification, the EPA suggests a footnote be added to the 2012 standards line as follows:

recommend this issue be addressed in the description of the Preferred Alternative in Chapter 2 and reflected in the adaptive management plan.

U.S. Environmental Protection Agency Rating System for Draft Environmental Impact Statements

Definitions and Follow-Up Action*

Environmental Impact of the Action

LO - - Lack of Objections: The Environmental Protection Agency (EPA) review has not identified any potential environmental impacts requiring substantive changes to the proposal. The review may have disclosed opportunities for application of mitigation measures that could be accomplished with no more than minor changes to the proposal.

EC - - Environmental Concerns: The EPA review has identified environmental impacts that should be avoided in order to fully protect the environment. Corrective measures may require changes to the preferred alternative or application of mitigation measures that can reduce these impacts.

EO - - Environmental Objections: The EPA review has identified significant environmental impacts that should be avoided in order to provide adequate protection for the environment. Corrective measures may require substantial changes to the preferred alternative or consideration of some other project alternative (including the no-action alternative or a new alternative). EPA intends to work with the lead agency to reduce these impacts.

EU - - Environmentally Unsatisfactory: The EPA review has identified adverse environmental impacts that are of sufficient magnitude that they are unsatisfactory from the standpoint of public health or welfare or environmental quality. EPA intends to work with the lead agency to reduce these impacts. If the potential unsatisfactory impacts are not corrected at the final EIS stage, this proposal will be recommended for referral to the Council on Environmental Quality (CEQ).

Adequacy of the Impact Statement

Category 1 - - Adequate: EPA believes the draft EIS adequately sets forth the environmental impact(s) of the preferred alternative and those of the alternatives reasonably available to the project or action. No further analysis of data collection is necessary, but the reviewer may suggest the addition of clarifying language or information.

Category 2 - - Insufficient Information: The draft EIS does not contain sufficient information for EPA to fully assess environmental impacts that should be avoided in order to fully protect the environment, or the EPA reviewer has identified new, reasonably available alternatives that are within the spectrum of alternatives analyzed in the draft EIS, which could reduce the environmental impacts of the action. The identified additional information, data, analyses or discussion should be included in the final EIS.

Category 3 - - Inadequate: EPA does not believe that the draft EIS adequately assesses potentially significant environmental impacts of the action, or the EPA reviewer has identified new, reasonably available alternatives that are outside of the spectrum of alternatives analyzed in the draft EIS, which should be analyzed in order to reduce the potentially significant environmental impacts. EPA believes that the identified additional information, data, analyses, or discussions are of such a magnitude that they should have full public review at a draft stage. EPA does not believe that the draft EIS is adequate for the purposes of the National Environmental Policy Act and/or Section 309 review, and thus should be formally revised and made available for public comment in a supplemental or revised draft EIS. On the basis of the potential significant impacts involved, this proposal could be a candidate for referral to the CEQ.

* From EPA Manual 1640 Policy and Procedures for the Review of Federal Actions Impacting the Environment. February, 1987.

MATTHEW H. MEAD
GOVERNOR

THE STATE OF WYOMING

STATE CAPITOL
CHEYENNE, WY 82002

Office of the Governor

August 20, 2012

Daniel Wenk, Superintendent
Yellowstone National Park
National Park Service
P.O. Box 168
Yellowstone National Park, WY 82190

Re: Yellowstone National Park Draft Winter Use Plan/
Supplemental Environmental Impact Statement

Dear Superintendent Wenk:

I appreciate the opportunity to comment on the Yellowstone National Park Draft Winter Use Plan/Supplemental Environmental Impact Statement. Yellowstone is "dedicated and set apart" by the Yellowstone Park Act "for the benefit and enjoyment of the people." The Yellowstone Park Act and the Organic Act require the National Park Service to allow public access to Yellowstone as long as public access does not cause unacceptable impact to its resources. Yellowstone's Master Plan mandates management of the Park "for maximum enjoyment of the resources by the visitor" on a year-round basis.

Alternative 4 best advances the purposes of the Act and is the optimum choice for managing over-snow vehicle use in Yellowstone. This Alternative balances protection of Park resources and public access to Yellowstone. I support Alternative 4 as clarified by the attached comments.

Thank you for working with me and all of those interested in Yellowstone winter use management. Please contact me if I can be of assistance.

Sincerely,

Matthew H. Mead
Governor

MHM:mdm

PHONE: (307) 777-7434

FAX: (307) 632-3909

Encl.: Comments on Yellowstone National Park Draft Winter Use Plan/
Supplemental Environmental Impact Statement (pp. 3 – 4)

cc: The Honorable Michael B. Enzi, U.S. Senate
The Honorable John Barrasso, U.S. Senate
The Honorable Cynthia Lummis, U.S. House of Representatives

Governor Mead's Comments on the Yellowstone National Park Draft Winter Use Plan/Supplemental Environmental Impact Statement

Transition Period

I support the two-season transition period outlined in Alternative 4 of the Yellowstone Draft Winter Use Plan/Supplemental Environmental Impact Statement (SEIS).

Non-Commercial Guided

For nearly a decade, winter visitors to Yellowstone National Park (Yellowstone or Park) have not been allowed to enter the Park via snowmobile without a commercial guide. While I do not support unguided snowmobile access, a guided program for non-commercial snowmobile access should be an option. The preferred alternative includes this provision.

Appendix B establishes a framework for non-commercial guided snowmobile access. I am committed to working with the National Park Service (NPS) to build on that framework and develop a non-commercial guided snowmobile access program, including identification of resources required to ensure the program's success. If the NPS requires Wyoming snowmobile registration (similar to the requirement on Forest Service lands in Wyoming) for all over-snow vehicles (OSV) entering Yellowstone, then the Wyoming State Parks and Cultural Resources Department could participate financially in implementing non-commercial guided snowmobile access.

Non-commercial access to Yellowstone is opportunity that comes with responsibility. The Draft Winter Use Plan/SEIS states: "The decision to continue or terminate the noncommercially guided snowmobile access program, or to adjust group size limits, would be based upon predetermined metrics with fixed standards (triggers) to ensure continued protection of Park resources and visitor experiences." (p. 391). I ask the NPS to work with affected groups to develop metrics and an adaptive management, monitoring, and evaluation plan. These metrics should be flexible enough to both increase access in cases of appropriate compliance and to reduce or prohibit noncommercial use in cases of noncompliance.

Sylvan Pass

OSV access through Yellowstone's east gateway is important. In the past, the NPS has received comments that the cost of maintaining access through Sylvan Pass is not justified by current winter use. Approximately two percent of the Yellowstone wintertime operational expenses are related to the operation of the east entrance, and one percent of the snowmobile entries into the Park come through the east entrance. This illustrates that the east entrance does not adversely impact the winter operating budget. The Sleeping Giant Ski Area near the east entrance will attract visitors to Yellowstone. The addition of non-commercial guided access assists Park County in year-round economic development.

The Sylvan Pass Study Group Agreement, as supported in Alternative 4, along with continued road grooming reflects the most thoughtful management alternative. The State of Wyoming is committed along with the City of Cody and Park County to working on safety and access improvements. In 2009, the Wyoming Legislature appropriated $35,000 for a new howitzer and refurbishment of a second howitzer. Additionally, $10,500 per biennium has been appropriated by the Wyoming Legislature to store and maintain both howitzers.

Best Available Technology

NPS standards for best available technology for snowmobiles, implemented in 2002, are more stringent than EPA regulations. Those standards protect Park air quality and soundscapes. These standards should be maintained. However, the standards proposed for the 2017/2018 winter use season may be unattainable and have the potential to eliminate snowmobile use in Yellowstone. Snowmobile emission and sound testing procedures do not reflect Park parameters including: speed limits, throttle restrictions, fuels, snow conditions, elevation, and barometric factors. The NPS should coordinate with industry to revise its test parameters and perform additional testing and implement any new standards on a schedule geared toward achieving compliance within a reasonable time.

Adaptive Management

Wyoming will provide its special expertise through technical assistance and advice in future adaptive management activities undertaken by the NPS consistent with the memorandum of understanding between the State of Wyoming and the National Park Service.

MATTHEW H. MEAD
GOVERNOR

THE STATE OF WYOMING

STATE CAPITOL
CHEYENNE, WY 82002

Office of the Governor

October 4, 2012

Daniel Wenk, Superintendent
Yellowstone National Park
National Park Service
P.O. Box 168
Yellowstone National Park, WY 82190

Re Yellowstone National Park Draft Winter Use Plan/Supplemental Environmental Impact Statement and Proposed Rule for the 2012-2013 Winter Season

Dear Superintendent Wenk:

I appreciate the opportunity to provide additional comment on the Yellowstone National Park Draft Winter Use Plan/Supplemental Environmental Impact Statement (SEIS) and Proposed Rule for the 2012-2013 winter season. The following comments support the comments I made on August 20, 2012.

The National Park Service (NPS) received comments related to its testing and analysis of snowmobiles and snowcoaches. The NPS heard concerns that testing standards for both modes of transportation were not appropriate or reflective of their use in Yellowstone. I encourage the NPS to coordinate with industry, the Environmental Protection Agency, and the State of Wyoming to modify its test parameters and standards and perform additional testing. Visitors to Yellowstone deserve a variety of experiences. Snowmobiles and snowcoaches are reasonable means of transportation. Neither should be reduced in Yellowstone without adequate testing and analysis.

I am disappointed that a decision will not be made prior to the coming winter season. However, I support continued management under the parameters in place last season which have not shown impairment to Park resources. The additional time will give NPS opportunities to conduct

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FAX: (307) 632-3909

adequate testing and analysis for future access of snowmobiles and snowcoaches into Yellowstone.

I remain committed to working with the NPS.

Sincerely,

Matthew H. Mead
Governor

MHM:mdm

cc: The Honorable Michael B. Enzi, U.S. Senate
The Honorable John Barrasso, U.S. Senate
The Honorable Cynthia Lummis, U.S. House of Representatives

WYOMING GAME AND FISH DEPARTMENT

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GOVERNOR
MATTHEW H. MEAD

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T. CARRIE LITTLE
ED MIGNERY
CHARLES PRICE

August 2, 2012

WER 6136.01
National Park Service
Supplemental Draft Environmental Impact Statement
for the Winter Use Plan
Yellowstone National Park

Yellowstone National Park
Winter Use Supplemental Draft EIS
PO Box 168
Yellowstone National Park, WY 82190

Dear Sir/Madam:

The staff of the Wyoming Game and Fish Department has reviewed Draft Environmental Impact Statement for the Winter Use Plan within Yellowstone National Park. We offer the following comments for your consideration. We have no terrestrial wildlife or aquatic concerns pertaining to this Supplemental Draft Environmental Impact Statement.

Thank you for the opportunity to comment. If you have any questions or concerns, please contact Rick Huber, Staff Aquatic Biologist, at 307-777-4558.

Sincerely,

John Emmerich
Deputy Director

JE/mf/gb

cc: USFWS
Tim Fuchs, Jackson Region
Doug Brimeyer, Jackson Region
Rob Gipson, Jackson Region
Tim Woolley, Cody Region
Doug McWhirter, Cody Region
Steve Yekel, Cody Region

PEPC Project ID: 40806, DocumentID: 48306
Correspondence: 11204

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Keep Private: No

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Status: Reviewed

Park Correspondence Log:

Date Sent: 08/20/2012

Date Received: 08/20/2012

Number of Signatures: 1

Form Letter: No

Contains Request(s): No

Type: Web Form

Notes:

Correspondence Text

Dear SEIS Planning Team:

The University of Wyoming Department of Agricultural and Applied Economics is currently finishing an analysis of snowmobiling in Wyoming. Since the final report from this study is not quite complete, we're forwarding a couple of preliminary pieces of information for your consideration in the Yellowstone Winter Use Plan / SEIS process. This information includes excerpts from some of the 2012 survey's sections as well as a preliminary economic impacts analysis report. We will send a final report as soon as it is complete later this summer.

Sincerely,
Domenic

Introduction
This report summarizes the preliminary results of an economic analysis of the snowmobiling program in Wyoming. This analysis was conducted by the Department of Agricultural and Applied Economics at the University of Wyoming for the Wyoming Department of State Parks and Cultural Resources for the 2011-2012 snowmobile season. This report is an update of a previous study conducted for the Department of State Parks and Cultural Resources during the 2000-2001 season. A more detailed report with the final results of the analysis is forthcoming. The analysis is based on three surveys of snowmobilers in Wyoming during the 2011-2012 snowmobiling season including: 1) a survey of resident owners of snowmobiles registered in Wyoming; 2) a survey of nonresident owners of snowmobiles registered in Wyoming; and 3) a survey of snowmobile outfitter clients in Wyoming. The survey of resident and nonresident owners of registered snowmobiles was conducted by the Wyoming Survey and Analysis Center (WYSAC) at the University of Wyoming. These surveys were implemented through a combination of on-line and mail questionnaires with the sample drawn from a list of addresses for registered snowmobiles in Wyoming for

the 2010-2011 season provided by State Parks.

For the resident snowmobile owners, 1,073 valid addresses were sampled which resulted in 361 resident responses for a 33.6 percent response rate. For the nonresident snowmobile owners, 1,099 valid addresses were sampled which resulted in 414 nonresident responses for a 37.7 percent response rate. Eight-six percent of the resident respondents and 80 percent of the nonresident respondents indicated that they had snowmobiled in Wyoming during the 2011-2012 season.

For the snowmobile outfitter clients, outfitters were asked to have a sample of their clients fill out address cards during the 2011- 2012 season. These clients were then sent a mail questionnaire shortly after they returned home from their trip. A total of 180 addresses were collected through this process which resulted in 105 responses for a 58.3 percent response rate. The snowmobile outfitter client survey was conducted by the Department of Agricultural and Applied Economics.

BOARD OF COUNTY COMMISSIONERS:

Tim A. French, Chairman
Loren Grosskopf, Vice Chairman
Joseph E. Tilden, Commissioner
Dave Burke, Commissioner
Bucky Hall, Commissioner

County of Park
Commissioners' Office

PARK COUNTY, WYOMING
ORGANIZED 1911

ORIGINAL PARK COUNTY COURTHOUSE
CODY, WYOMING
COMPLETED 1912

Yellowstone National Park
Winter Use Plan-DEIS
Box 168
Yellowstone Park, WY 82190

RE: ADDITIONAL COMMENTS
Board of County Commissioners for Park County, Wyoming
Draft Winter Use Plan/Supplemental Environmental Impact Statement for Winter Use in Yellowstone National Park
September 17, 2012

Planning Team:

We support the action proposed to extend the existing "one-year rule" regarding the management of snowmobile and snowcoach activity in Yellowstone Park as outlined in the 8/31/2012 news release.

We agree that this proposal is the best and most reasonable option to pursue considering the short time remaining for the public and commercial operators to plan for this snow season.

We do not have additional substantive comments to offer beyond our previous submissions. We certainly iterate our desire for:

- Continued snowmobile use,
- With the addition of reasonable and affordable non-commercial use as quickly as possible hopefully truncating the two year period to one year,
- Changes in the BAT decibel measurement requirements for snowmobiles that can be supported by industry,
- Air and noise restrictions set at reasonable levels that don't significantly impact the natural resources of Yellowstone, and

1002 Sheridan Avenue Cody, Wyoming 82414 (307) 527-8510 Fax: 527-8515

- Support for the preferred alternative that includes keeping all entrances open, including the East entrance and Sylvan Pass.

We support and encourage public participation in this process and if necessary, the additional time necessary for the Park Service to carefully review and consider all comments.

Thank you for this opportunity.

BOARD OF COUNTY COMMISSIONERS
PARK COUNTY, WYOMING

Tim A. French, Chairman

Loren Grosskopf, Vice Chairman

Joseph E. Tilden, Commissioner

Dave Burke, Commissioner

Bucky Hall, Commissioner

1002 Sheridan Avenue Cody, Wyoming 82414 (307) 527-8510 Fax: 527-8515

PEPC Project ID: 40806, DocumentID: 48306
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Status: Reviewed	Park Correspondence Log:
Date Sent: 08/20/2012	Date Received: 08/20/2012
Number of Signatures: 1	Form Letter: No
Contains Request(s): No	Type: Web Form
Notes:	

Correspondence Text

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BOARD_OF COMMISSIONERS
August 20, 2012

Yellowstone National Park
RE: Comments of Teton County Board of County Commissioners
on the Yellowstone National Park Draft Winter Use Plan

The Board of County Commissioners of Teton County, Wyoming submit the following comments on the Yellowstone National Park Draft Winter Use Plan.

The Board thanks the leadership and staff of Yellowstone National Park on the extensive work they have completed to develop the Yellowstone National Park Winter Use Plan.

The Board supports Alternative 4, the preferred alternative. This alternative provides a realistic and reasonable alternative for the public to enjoy Yellowstone's extraordinary natural resources.

We encourage Yellowstone to continue the monitoring of different forms of access including non-guided snowmobile access to insure that different user groups have the opportunity to enjoy Yellowstone's winter wonders.

We thank you for the opportunity to comment on this important issue.

Sincerely,

Benjamin H. Ellis
Chairman

Cody Country Chamber of Commerce

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AUG 01 2012

Superintendent's Office

July 27, 2012

Yellowstone National Park
Winter Use SEIS
PO Box 168
Yellowstone National Park, WY 82190

Dear Superintendent Daniel Wenk,

The Cody Country Chamber of Commerce appreciates the opportunity to provide comments on the recently released draft of the Yellowstone Winter Use Plan/SEIS.

Overall, we support Alternative #4, and are pleased to see that issues that are important to Cody have been favorably addressed.

We support the continuation of avalanche control on Sylvan Pass and the preservation of motorized and non-motorized access via the East Gate during the winter. We are also pleased that Alternative #4 offers the opportunity for increased snowmobiling in Yellowstone National Park.

One area of concern that we have is the process that will be used to determine "transportation events" and hope that we can actively participate in your adaptive management system to make the registration, education, and lottery system as easy and visitor-friendly as it can be. We agree that a certain amount flexibility will be critical to adapt the program to the realities of providing our visitors and residents with the best Park experience possible.

Finally, while it falls outside the scope of the Winter Use Plan/SEIS (yet is still very much related), we strongly believe that having a set opening date for the East Gate each spring is of critical importance to our visitors, business owners and residents.

As always we appreciate the opportunity to provide comments on this important issue. We applaud the Park Service for being willing to listen and incorporate Cody and Park County's concerns into this updated Winter Use Plan. Should you have any questions regarding our comments, please don't hesitate to ask.

Respectfully,

Mike Darby
President
Cody Country Chamber of Commerce

836 Sheridan Avenue • Cody, Wyoming 82414 • 307-587-2777 • www.codychamber.org

PEPC Project ID: 40806, DocumentID: 48306
Correspondence: 1496

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August 7, 2012

Yellowstone National Park
Winter Use SEIS
PO Box 168
Yellowstone National Park, WY 82190

Dear Superintendent Wenk:

On behalf of the Cody City Council, please accept this letter of comment with regard to the Supplemental Environmental Impact Statement. The City of Cody supports the preferred Alternative 4, but would like to offer the following suggestions for modification of the alternative.

With regard to "transportation events", the City of Cody suggests the following:

Commercially Guided Transportation Events regarding snowmobiles:
1. The number of commercially guided snowmobiles should be changed to a higher number such as 7 instead of 5. This would allow for three couples or a family of six to enter along with a guide. The number of paying visitors should be even.
2. If an overnight stay is desired, there are questions that need to be addressed as to how that will affect the number of transportation events. Does this mean that a commercial operator from the East Gate who takes his clients to the West Entrance must use a transportation event from the West Entrance to get his clients back to their starting point at the East entrance?

Non-commercially guided Transportation Events regarding snowmobiles:
1. The number of visitors entering Yellowstone by non-commercially guided snowmobile should be changed from seven (5) snowmobiles to an even number of snowmobiles such as six (6) or eight (8). This would allow for families or couples to pair up in groups of two instead of having an odd number. In addition, the number of non-commercially guided snowmobile transportation events should be increased from only one per day per gate. We would prefer to see this managed so that if there the commercially guided trips into Yellowstone that are not completely booked each day, there is an opportunity for non-commercially guided trips to fill the unallocated trips. In addition, because there is no guarantee that Sylvan Pass will be open on any given day in which a visitor has a reservation, we would like to see additional options and opportunities for rescheduling their trip at a time that is convenient for the visitor and gives preference in the lottery reservation system. In addition, to a plan for weather day cancellations, we would like to see some kind of option for visitors to enter the park if visitors who have reserved a day do not show up on their given day. This would be another way to maximize the opportunity for visitors to enter Yellowstone, especially for the locals.
2. Once again, the question of overnight stays needs to be addressed. If there is only one transportation event allowed per gate per day, do reservations have to be made for two days and will there ever be a situation where this is possible? This situation needs to be further discussed and analyzed so that the public knows what their visitation opportunities are. In both situations of commercially guided and non-commercially guided, overnight stays have a vital economic impact to the gate communities and lodges.

Online and Onsite Training: We believe that there should be a provision that the online training certification program should be good for more than a period of one year. We suggest either a lifetime certification or at the very least a five year certification.

Best Available Technology Requirements (BAT): With regard to BAT requirements, we make the following suggestions for change:
1. Have a phase in plan for non-current model year snowmobiles so that in 2017-2018, those snowmobiles five years old and newer can be phased into the new requirements over time. If it is deemed that 2015 and 2016 snowmobiles are no longer eligible to enter Yellowstone in 2017, it will be very difficult economically for commercial operators to make a successful and viable business of guiding visitors into Yellowstone. If there was a phase in program such as by 2017-2018 that all sleds 2012 or newer may be used in the 2017-2018 winter season, and then all sleds 2013 and newer in 2018 and so on, would ensure a return on commercial operators' investment over the next few years.
2. Snowmobile manufacturers have come a long way with emissions and noise over the years and it is recommended that Yellowstone change the definition of Best Available Technology to remove the term four stroke snowmobile, and include the strict specifications that must be met involving decibel levels, carbon monoxide levels, particulate matter levels, hydrocarbon emission standards, nitrogen oxide levels, and nitrogen dioxide levels. If in the future two stroke snowmobiles meet the set criteria of standards, they should be allowed in Yellowstone as well. This will increase the visitation as it will be much more economical for non-commercially guided visitors.

Other suggestions we offer include setting a guaranteed opening date for the East Entrance of Yellowstone. This has huge long term economic impacts on Cody's business owners throughout the tourist season. It enables business owners to staff their stores, restaurants and lodging facilities adequately and appropriately which results in a better visitor experience. In addition, we would be very supportive if the Administration of Yellowstone included the stakeholders in some of the decision making processes of the unfinished details. It was mentioned in the public meetings that you have the framework of the house, but you need to construct the walls and finishes. There are a lot of knowledgeable and willing people within the Cody community who would be happy to assist in helping Yellowstone build the walls.

Thank you for all of your efforts in this Winter Use Planning Process. Although we cannot bring back everything

that we once knew and enjoyed with regard to winter use in Yellowstone, we are much closer through your efforts. Thank you for the opportunity to comment on this very important issue for the City of Cody and Park County.

Sincerely,

Nancy Tia Brown
Mayor

PEPC Project ID: 40806, DocumentID: 48306
Correspondence: 11115

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The Jackson Hole Chamber of Commerce believes that the Preferred Alternative described in the Yellowstone Winter Use Draft Plan is an encouraging step in the right direction of establishing a balanced approach to resource access and protection. As such, we support the Preferred Alternative identified in this Draft Plan. " Of all the options identified in the Draft Plan, the Preferred Alternative is consistent with our belief that a stable winter economy in Jackson Hole is aided by continued access in Yellowstone by visitors and businesses providing services.

Fremont County
Parks and Recreation Department

125 North Bridge St.
St. Anthony, ID 83445
(208) 624-7266 (p) (208) 624-1320 (f)

Yellowstone National Park
Supplemental Winter Use Plan EIS
PO Box 168
Yellowstone National Park, WY 82190

August 3, 2012

To Whom It May Concern,

I write this letter on behalf of the Fremont County Commissioners and the Fremont County Parks and Recreation Dept. asking for your consideration in the following matters.

Cave Falls – Thank you for including Idaho's corner of Yellowstone in the new plan. Having the opportunity to continue utilizing this area without the BAT machines is appreciated.

Flagg Ranch – Please include the Flagg Ranch trail as it leaves Fremont County and travels into the John D. Rockefeller Corridor. In past alternatives continued access to Flagg Ranch has been clearly defined. Flagg Ranch, by way of Fremont County, continues to be a popular destination site for riders. The trail is regularly groomed by Fremont County at no cost to the State of Wyoming of National Park Service. Due to the distance, it is necessary for snowmobilers and trail grooming equipment, coming from Idaho, to refuel at Flagg Ranch. It would be difficult to continue access to the popular Grassy Lake Reservoir or Jack Ass Loop sites without the opportunity to refuel. Safety for snowmobilers would also come into question without access to the facilities at Flagg Ranch. Again, continued non-BAT snowmobile access to Flagg Ranch should be clearly defined in the finalized Winter Use Plan.

Vendors – NPS is encouraged to **not** use a single vendor for snowmobile rentals/access to YNP. Nor a single vendor for snow coach access to YNP. As per stated in a June, 2012 conference call with the cooperating agencies, NPS is conserving utilizing a single vendor for each of the two user groups. Fremont County believes this move will not be beneficial to user groups and will increase the overall cost of winter access. Please do not restrict users to a single vendor.

Thank you for your time and consideration in the matter.

Sincerely,

Tamra Cikaitoga

Tamra Cikaitoga, Director
Fremont County Parks and Recreation Dept.

PEPC Project ID: 40806, DocumentID: 48306
Correspondence: 63

Author Information

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Correspondence Text

July 30, 2012

Dan Wenk, Superintendent
Yellowstone National Park
P.O Box 168
Yellowstone National Park, WY 82190-0168

RE: Winter Use SEIS

Dear Superintendent Wenk:

The Idaho Department of Parks and Recreation (IDPR) staff reviewed the Yellowstone National Park (YNP) Winter Use Plan Supplement Environmental Impact Statement (SEIS). YNP is preparing this plan to regulate winter use.

The State of Idaho, with IDPR as the lead agency, is a cooperating agency with this plan. The IDPR staff has been involved in this planning process since 1996. Winter use in the YNP has greatly changed since that time. Idaho citizens and business are affected by this plan.

Without a plan decision, winter motorized use (except administrative use) would be prohibited. This would greatly impact winter visitor use.

The SEIS presents four different alternatives. Alternative 4 is identified as the preferred alternative.

Since the winter of 2004/2005, winter use visitation has been exclusively commercially guided. The State of Idaho has consistently advocated for some level of noncommercial use. Alternative 4 does provide for a very limited amount (4 groups per day) of noncommercial use. We believe that limited use will provide for the opportunity for visitors to experience Yellowstone's Winter Wonders with a sense of self discovery.

The IDPR staff has been presenting regional snowmobile operators training over the past year. We also provide online snowmobile safety training in conjunction with Fresh Air Educators. It is essential we work with the National Park Service on the development of the noncommercial guide training program. Each noncommercial visitor needs to know the safe operation along with the rules and regulations in YNP.

We are pleased to see that all action alternatives (2, 3, and 4) allow for non-BAT compliant and noncommercial guided snowmobile use into Cave Falls. This short remote route provides access to wonderful waterfalls that visitors can enjoy.
The preferred alternative 4 manages visitor use by sound events. Alternative 4 allows up 110 sound events a day for the winter use season. A single snowcoach or a group of seven snowmobiles comprises a snow event. This alternative permits a total of 50 events for snowmobiles and 60 events for snowcoaches. It gives commercial operators the choice on how to spit their daily allotments of transportation events.

How snowmobile specific commercial operators and snowcoach specific commercial operators would be able to split their daily allotments? This question should be answered in the proposed regulation.

The IDPR staff concurs that preferred Alternative 4 allows for greater flexibility, a cleaner, quieter park, and could allow for more visitors (still less than historic levels) into the park. We appreciate the National Park Service listening to and addressing our concerns with this Winter Use Planning Process. It is our hope that this planning effort will lead a long term winter use plan for Yellowstone National Park.

Sincerely,

Jeff Cook, Outdoor Recreation Analyst
Recreation Bureau

WEST YELLOWSTONE MONTANA
CHAMBER OF COMMERCE

PO Box 458
West Yellowstone, Montana 59758
destinationyellowstone.com

August 15, 2012

Yellowstone National Park
SEIS Winter Use Plan
PO Box 168
Yellowstone National Park, WY 82190

Dear Superintendent Wenk,

The West Yellowstone Chamber of Commerce, on behalf of its businesses and members, would like to submit the following comments for your consideration in the Supplemental Environmental Impact Statement.

We fully support the continuation of winter access to Yellowstone National Park by means of snowmobile and snowcoach. Alternatives 1, 2 and 3 do not allow for a sustainable and long-term solution. We support Alternative 4 which allows for "transportation events" and we would like to add the following thoughts for your consideration.

There has been growing public support for a non-commercial guide option that would give more flexibility for access while making a Yellowstone visitor more affordable. Five people, however, from each entrance would not be enough fill the need of this otherwise great addition. Please consider adding more "events" through adaptive management for each entrance for the non-guided option to give the public more valid and cost effective options. We would not, however, want this to decrease commercially guided events.

We are also very concerned about including the guide in each "transportation event" for commercially guided snowmobile groups. Reducing the historic group size from ten to an average of seven, means that visitors will pay more for the Yellowstone winter experience.

Please keep the provision for a two-year transition to help in the planning and marketing of the new changes in Alternative 4. This will not only help our community and concessioners adapt to the changes it will also allow some much needed time to educate the general public.

We are very concerned about including the guide in each snowmobile "transportation event". Requiring a guide, then using that guide in the count will mean a virtual doubling of the guide cost to visitors.

Please leave the speed limits as they have been in recent years. There is neither science nor safety reasoning that would suggest that lowering the limits in other areas will have any positive impact. Lowering the speed limit will severely restrict the opportunity for many people to see more of Yellowstone in the winter.

Any and all testing of snowmobiles and snowcoaches for future BAT requirements and "transportation event" increases should be handled in a manner consistent with the use of those vehicles and under comparable conditions. BAT requirements should also be attainable and not result in a de facto elimination of either type of over-the-snow access. Current scientific evidence has shown that the BAT requirements now in place are doing the job of keeping noise and air concerns to acceptable levels.

An idea that has come up and we would like to see addressed is having the opportunity for a shuttle service to different locations within the park and to the gateway communities. Businesses could have the opportunity to provide and market this service without being penalized for using one of their allotted "transportation events." This would offer a more economically feasible and faster way for people to get around the park who may not be looking for a guided snowcoach service.

We appreciate the long hours and honest consideration to all alternatives that you have committed to this process. The public deserves the right to see Yellowstone in what many believe to be its best season and in a way that will also preserve it for future generations. Alternative 4 is the best solution offered in recent years. As a community that supplies the support services required for visitors and employees of Yellowstone National Park, we thank you for your time and consideration of the points we have presented.

Sincerely,

Travis Watt

Travis Watt, President
West Yellowstone Chamber of Commerce

As the nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering wise use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historic places, and providing for the enjoyment of life through outdoor recreation. The department assesses our energy and mineral resources and works to ensure that their development is in the best interests of all our people. The department also promotes the goals of the Take Pride in America campaign by encouraging stewardship and citizen responsibility for the public lands and promoting citizen participation in their care. The department also has a major responsibility for American Indian reservation communities and for people who live in island territories under U.S. administration.

(2013)

United States Department of the Interior · National Park Service