CHAPTER IV: ENVIRONMENTAL CONSEQUENCES

4.1 Introduction

This chapter discusses the environmental impacts of the alternatives. The alternatives are designed to define issues sharply and provide a clear basis of choice. A necessary part of the comparison is to display how each alternative changes the conditions shown in the affected environment, Chapter III. Therefore, the topics of the two chapters, III and IV, are arranged similarly. The description of effects is intended to present that information necessary to provide a basis for understanding and comparing the impacts, both beneficial and adverse, of the alternatives presented in detail in Chapter II. The importance of the impacts shown is reflected largely by their relationship to major issues, as presented in Chapter I.

It is not necessary for an Environmental Impact Statement to repeat the entire volume of detail on a particular subject. Council on Environmental Quality (CEQ) regulations[1] encourage the incorporation (by reference) of pertinent documents and literature that are reasonably available to the public. The reader may refer to documents incorporated by reference in Chapter I, section 1.3. Even though the EIS is not a scientific document, the information it presents is to be supported by the best available scientific methods for data collection and modeling. In order to demonstrate this, Chapter IV contains for each impact topic those methods and assumptions that are critical to understanding the impact analysis and disclosure.[2]

Information in this chapter may be both quantitative and qualitative. Supplementary information or greater detail regarding the topics in this section may be found in an appendix or in a separate document incorporated by reference. Necessary citations about where such materials may be found will be presented with each individual topic.

4.1.1 Methodology and Assumptions for Assessing Impacts

Analysis of the environmental consequences of the alternatives proposed in this document includes an examination of several factors for each resource, including type of impact, duration of impact, and context and intensity of impact. The discussion for each impact topic includes threshold definitions and an analysis of the impacts of each alternative, followed by an assessment of cumulative effects and a conclusion. The NPS assumes that whatever decision is reached upon the conclusion of the process will be a long-range decision lasting more than 10 years with provisions for adaptive management and that the use levels proposed in each of the alternatives will be reached. Thus, the impacts of the alternatives are evaluated and compared to each other and to current conditions and to historic conditions at the proposed use levels.

4.1.2 Type of Impact

Impacts can be beneficial or adverse, direct or indirect, or cumulative. Beneficial impacts are those that involve a positive change in the condition or appearance of a resource or a change that moves the resource toward a desired condition. Adverse impacts involve a change that moves the resource away from a desired condition or detracts from its appearance or

[1] Council on Environmental Quality (CEQ) Regulations, 40 CFR 1500.4(i).

[2] Ibid., 40 CFR 1502.24.

condition. Direct impacts are caused by an action and occur at the same time and place as the action. Indirect impacts are caused by an action and occur later or farther away from the resource but are still reasonably foreseeable. Cumulative effects are the impacts on the environment that result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions.

4.1.3 Context, Intensity, Duration

Impacts are described as to their context, intensity, and duration. Context generally refers to the geographic extent of impact (for example, localized, across the parks (park-wide), or regional). In general, localized impacts have been described by relevant road segment or location within the parks and refer to impacts occurring primarily in a portion of a park (versus impacts across the parks, which affect all three units). Other impacts are stated as park-wide or regional in scale. Impact intensity is the magnitude or degree to which a resource would be beneficially or adversely affected. The thresholds used to assess intensity of impact for each resource topic are defined under each impact topic heading. Impact duration refers to how long an impact would last. For the purposes of this EIS, duration and area of impact may be specified separately for each impact topic. The following definitions apply in general to the effects analysis.

Table 4-1: Types of Effects

Impact Category	Definition
Local	A limited effect likely only on a specific road segment or in a particular developed area.
Park-wide	An effect that may be expected within and throughout any of the three park units.
Regional	An effect that extends beyond the boundaries of the parks and adjacent communities.
Beneficial Effect	A positive change in the condition or nature of the resource, usually with respect to a standard or objective. A change that moves a resource toward its desired condition.
Adverse effect	A negative change in the condition or nature of the resource, usually with respect to a standard or objective. A change that moves a resource away from its desired condition.
Direct effect	An effect that is caused by an action and occurs at the same time and place.
Indirect effect	An effect that is caused by an action but is later in time or farther removed in distance, but is still reasonably foreseeable.
Short-term effect	An effect that in a short time will no longer be detectable as a resource returns to its pre-disturbance condition. The period is generally less than 5 years.
Long-term effect	A change in a resource or its condition that does not return to pre-disturbance levels and for all practical purposes is considered permanent.

4.1.4 Area of Analysis

The area of analysis for impact assessment is generally the parks' boundaries. For some impact topics (such as socioeconomics), however, the area of analysis may be greater than the parks' boundaries, in which case it is consistent with what has been analyzed in the affected environment section. The area of analysis serves as the geographic basis for assessment of impacts resulting from the actions proposed under each alternative, as well as cumulative effects, for the topic discussed.

4.1.5 Cumulative Effects

A cumulative effect or impact is described in CEQ regulations (§1508.7) as "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 non-federal) or person undertakes such other actions." Cumulative effects can result from individually minor, but collectively major, actions taking place over a period of time.

This analysis addressed the cumulative effects of each alternative by considering the effects of the alternative combined with the effects of past, present, and reasonably foreseeable future actions identified in and around the project area. The methodology section for each topic identifies the area of analysis, which also applies to the cumulative analysis. Generally, this includes the developed areas and road corridors of the parks; surrounding public lands are also included for some topics. Projects include any planning or development activity that was currently being implemented or would be implemented in the reasonably foreseeable future that has some relation to winter use and would contribute to cumulative effects within the designated areas of analysis for this EIS. See section 1.9 for a list of such projects, trends, plans, and actions.

4.1.6 Impairment Analysis and Unacceptable Impacts

The NPS Management Policies (2006) require analysis of potential effects to determine whether actions would impair park resources. The fundamental purpose of the NPS, established by the Organic Act and reaffirmed by the General Authorities Act (as amended), begins with a mandate to conserve park resources and values. The NPS managers must always seek ways to avoid, or to minimize to the greatest degree practicable, adversely impacting park resources and values. However, the laws do give the NPS the management discretion to allow impacts to park resources and values, when necessary and appropriate, to fulfill the purposes of a park as long as the impact does not constitute impairment of the affected resources and values. Although Congress has given the NPS management discretion to allow certain impacts within the park, it limits that discretion by the statutory requirement that the NPS must leave park resources and values unimpaired unless a particular law directly and specifically provides otherwise. The prohibited impairment is an impact that, in the professional judgment of the responsible park manager, would harm the integrity of park resources or values. An impact to any park resource or value would constitute impairment, but an impact would be more likely to constitute impairment to the extent that it has a major adverse effect upon a resource or value, for which conservation is:

- Necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the park.
- Key to the natural or cultural integrity of the park.
- Identified as a goal in the park's long-term planning or NPS planning documents.

An impact would be less likely to constitute impairment to the extent that it is an unavoidable result, which cannot be further mitigated, of an action necessary to preserve or restore the integrity of park resources or values. Impairment would result from the NPS activities in managing the park, visitor activities, or activities undertaken by concessioners, contractors, and others operating in the park. This chapter includes a determination on impairment for all natural and cultural resource impact topics defined in Chapter I. Impairment analysis and determinations are not required for visitor use and experience (unless the impact is resource-based), park operations, or socioeconomic environment (including economics, employment, housing, and land use).

Adverse impacts determined to have minor or below (i.e., no impact or negligible) intensities are not analyzed further (relative to the impairment standard) because of their relatively low magnitude. All moderate to major adverse impacts are evaluated using the three-bulleted criteria above. Discussion of impairment is presented in the conclusion section for each impact topic and impairment is summarized at the end of Chapter IV.

The impact threshold at which impairment occurs is not always readily apparent. Therefore, the NPS will also avoid impacts that it determines to be "unacceptable" (NPS Management

Policies 2006). These are impacts that fall short of impairment but are still not acceptable within a particular park's environment. Virtually every form of human activity that takes place within a park has some degree of effect on park resources or values; however, that does not mean the impact is unacceptable or that a particular use must be disallowed. The direction to park managers that they should strive to insure that unacceptable impacts do not harm park resources rests with the NPS Management Policies (1.4.7.1) and 36 CFR 1.5, Closures and Public Use Limits (see Appendix A).

Unacceptable impacts are impacts that, individually or cumulatively, would:

- Be inconsistent with a park's purposes or values.
- Impede the attainment of a park's desired future conditions for natural and cultural resources as identified through the Park's planning process.
- Create an unsafe or unhealthy environment for visitors or employees.
- Diminish opportunities for current or future generations to enjoy, learn about, or be inspired by park resources or values.
- Unreasonably interfere with park programs or activities; an appropriate use of the Park; the atmosphere of peace and tranquility; or the natural soundscape maintained in wilderness and natural, historic, or commemorative locations within the Park.

In its role as steward of park resources, the NPS must ensure that acceptable park uses would not cause impairment of, or unacceptable impacts on, park resources and values. When proposed park uses and the protection of park resources and values come into conflict, the protection of resources and values must be predominant. A new form of park use would be allowed within a park only after a determination has been made in the professional judgment of the park manager that it will not result in unacceptable impacts. The NPS will always consider allowing activities that are appropriate to the park, although conditions could preclude certain activities or require that limitations be placed on them.

4.2 Effects by Impact Topic

See Chapter III, Sections 3.2 and 3.3, for presentation of mandatory impact topics and how those topics are either dismissed, incorporated by reference from other environmental documents, or addressed in Chapter IV of this EIS.

4.2.1 Effects on Winter Operations

The area of analysis is the three parks. This section includes an analysis of the operational needs under each alternative in comparison to current and historic conditions, primarily in Yellowstone. Table 4-2 defines overall impacts to winter operations.

Assumptions and Methods

To assess the level of impact to winter operations for each alternative, the following were considered:

- NPS staffing
- Concessions staffing
- Operating environment and conditions

Definition of Impacts

Table 4-2: Definition of Impacts to Winter Operations

Impact Category	Definition
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 would be markedly different from existing operations. Changes to offset adverse effects would be needed, would be extensive, and their success could not be guaranteed.

Effects by Alternative

Alternative 1

Alternative 1 is similar to the Temporary Management Plan, other than the closure of Sylvan Pass. Throughout most of YNP, NPS and concessions employees, as well as permitted researchers and authorized contractors would continue to conduct similar work and personal activities by oversnow vehicle, in ways virtually identical to their current patterns. While the closure of Sylvan Pass would make travel to the East Entrance difficult for park employees needing to do business there or in Cody, alternate routes are available outside the park and generally, few employees need to undertake such trips. Further, the closure of Sylvan Pass would virtually eliminate the need for avalanche control activities, a substantial and beneficial change to present operations. For these reasons, the effects of implementing this alternative would be minor, beneficial, direct, and long-term for Yellowstone. For Grand Teton and the Parkway, implementation of alternative 1 would result in negligible changes to park operations since there would be little or no change from current practices.

Park operations would be affected by the potential closure of Gibbon Canyon (Madison to Norris Junctions) for management experiments investigating the bison-groomed road relationship. Travel between Mammoth Hot Springs and Old Faithful or West Yellowstone, and between Canyon and West Yellowstone, would become substantially more difficult, as employees would then need to travel around the Lower Loop or via wheeled vehicle through Livingston and Bozeman, Montana. Implementation of the closure would probably also result in a reduced number of such trips, due to the increased time necessary for them. While the Gibbon Canyon closure would produce changes of a moderate adverse nature, the closure of Sylvan Pass would partially compensate for the adverse change in operations. Consequently, if the closure is implemented, the effects of choosing this alternative upon park operations would be minor, adverse, direct, and long-term.

Compared to current conditions and alternative 5, selection of this alternative would result in negligible to minor changes, because the need for additional grooming under this alternative would be balanced by the elimination of avalanche control operations. Compared to alternatives 2, 6, and 7, this alternative would increase effects upon park operations, because it would require more grooming. Compared to historic conditions and alternative 4, this alternative would decrease effects upon park operations, because the need for grooming would drop as would the need for avalanche control on Sylvan Pass. Compared to alternative 3, which would make internal park travel and operations difficult or impossible in YNP, this

alternative would decrease effects upon park operations even though it would require more grooming.

For Grand Teton and the Parkway, selection of this alternative would result in few changes in park operations compared to either current conditions or alternative 5 because these alternatives are similar to one another. Relative to alternatives 2 and 3, selection of this alternative would result in a greater demand on park operations since it would require more grooming and other operational activities to support oversnow vehicle use. Relative to alternative 4, selection of this alternative would have less demand on park operations such as ranger patrols, management of concession contracts and other operations related to higher use levels. Compared to alternatives 6 and 7, selection of this alternative would result in a greater demand on park operations since it would involve operation and maintenance of the CDST.

Mitigation of Effects

In general, mitigation of effects upon park operations is a routine and required part of NPS management of park resources. In the case of closed roads, park employees will find alternate routes and adjust their schedules as needed to arrive at necessary destinations.

Cumulative Effects

Cumulative effects on park operations could include the following: capital equipment costs, such as for grooming and/or plowing equipment; fuel costs, which can affect both travel by park employees and road maintenance; extremes in weather, which can also affect both travel by park employees and road maintenance; construction and renovation costs for facilities, such as the renovation of Old Faithful Inn, construction of a new West Entrance and Old Faithful Visitor Education Center; and cost of howitzer ammunition and changes in Homeland Security procedures (related to avalanche mitigation methods). Most of these changes are included as part of ongoing maintenance and capital improvement budgets, although extreme changes in any of them can affect both budgeting and park operations. Fundamentally, all of these impacts can be either beneficial or adverse, depending on the change. For example, fuel costs, capital equipment costs, weather, and howitzer ammunition costs can all go up or down, depending on economic conditions and other influences. Similarly, while major construction and renovation projects typically draw upon line-item budgeting, the actual costs can exceed or be below budgeted amounts. Clearly, some changes will be beneficial to park operations, while others may adversely effect park operations.

Conclusions

Alternative 1 would result in minor, beneficial, direct, and long-term impacts upon park operations in Yellowstone, primarily because avalanche control operations on Sylvan Pass would no longer be necessary. Experimental closures of the Gibbon Canyon or other road segments could have moderate, adverse, direct, and long-term impacts upon park operations in YNP. For Grand Teton and the Parkway, selection of alternative 1 would result in negligible, adverse, direct, and long-term impacts.

In terms of cumulative effects, the long-term, minor to moderate, beneficial and adverse impacts resulting from direct and indirect actions described in this alternative would contribute a minor, beneficial, long-term impact to past, present, and foreseeable actions and impacts on park operations.

Alternative 2

Effects upon park operations for Yellowstone if this alternative is implemented (with or without the Gibbon Canyon closure) would be the same as those under alternative 1. See that

alternative's discussion of effects above. For Grand Teton and the Parkway, the effects on park operations would result from the elimination of grooming and other activities associated with management of recreational snowmobile use. Support for snowcoach operations at Flagg Ranch would still be required, including road plowing beyond Colter Bay and a reduced level of plowing within the Flagg Ranch developed area. These impacts would be minor to moderate, beneficial, direct, and long-term.

Compared to current and historic conditions and alternatives 1, 3A, 4, 5, and 7, this alternative would decrease (that is, it would have beneficial effects) or have similar effects upon park operations because it would require less grooming than those alternatives and/or because Sylvan Pass would be closed while enabling park resource protections to continue. Compared to alternatives 3B and 6, this alternative would have increased effects on park operations in YNP due to increased road grooming and greater difficulty of travel. For Grand Teton and the Parkway, this alternative would result in less demand on park operations compared to alternatives 1, 3 through 7, and more demand than alternative 3B (which would eliminate all OSV use).

Mitigation of Effects

In general, mitigation of effects upon park operations is a routine and required part of NPS management of park resources. In the case of closed roads, park employees would find alternate routes and adjust their schedules as needed to arrive at necessary destinations.

Cumulative Effects

Past, present, and foreseeable actions occurring within and around the parks which could affect park operations are the same as those for alternative 1. Cumulative effects would be similar to those of alternative 1.

Conclusions

Alternative 2 would result in minor, beneficial, direct, and long-term impacts upon park operations in Yellowstone, primarily because avalanche control operations on Sylvan Pass would no longer be necessary. Experimental closures of the Gibbon Canyon or other road segments could have moderate, adverse, direct, and long-term impacts upon park operations in YNP. For Grand Teton and the Parkway, alternative 2 would result in minor to moderate, beneficial, direct, and long-term impacts on park operations, primarily because of the elimination of grooming and the reduction of other activities.

In terms of cumulative effects, the long-term, minor to moderate, beneficial and adverse impacts resulting from direct and indirect actions described in this alternative would contribute a minor, beneficial, long-term impact to past, present, and foreseeable actions and impacts on park operations.

Alternative 3A

While this alternative would result in considerably less road grooming and no avalanche control activity, the complete closure of most roads in Yellowstone would make travel between northern and southern locations in the park considerably more difficult. Not only would visitor travel throughout most of Yellowstone cease but administrative travel would also. Additionally, maintenance and protection of historic structures in the Canyon, Lake/Fishing Bridge, Norris, and Madison areas would become difficult, because stationing employees at these locations without any provision for motorized vehicle access to the outside world—even in the event of emergency—would be unsafe and consequently not practical. Therefore, the effects of implementing this alternative upon park operations would be adverse, major, direct, and long-term.

Compared to all other alternatives and both historic and current conditions, this alternative would have the greatest effects upon park operations in Yellowstone due to the substantial increase in travel difficulties; there would be no administrative OSV use other than the South Entrance to Old Faithful road segment. This alternative would make most natural and cultural resource protection and/or maintenance activities impossible.

For Grand Teton and the Parkway, the effects of this alternative would be the result of discontinuing grooming and other operations associated with the CDST, as well as a lessening of ranger activities associated with ice fishing on Jackson Lake. Support for both snowmobile and snowcoach operations would continue to be required at Flagg Ranch. Impacts would be minor, beneficial, direct, and long-term. Operational requirements under this alternative would be less than under alternatives 1, 4, 5, and 7, slightly greater than under alternative 6, and greater than under 3B.

Mitigation of Effects

In general, mitigation of effects upon park operations is a routine and required part of NPS management of park resources. However, due to the provisions against motorized travel in much of Yellowstone under this alternative, the only possible mitigation for intra-park travel would be the use of helicopters, which would be limited by severe winter weather conditions and would be considerably more expensive than ground travel. Consequently, many park interior park employees would be forced to move to Mammoth or locations outside the parks where supplies are more readily available. Such moves would be expensive to undertake and housing may not be available in the alternate locations. While park employees would find alternate routes and adjust their schedules as needed to arrive at necessary destinations, travel anywhere within Yellowstone would become much more difficult. In sum, mitigations for the impacts upon park operations would be expensive, not always possible, and therefore not always effective.

Cumulative Effects

Past, present, and foreseeable actions occurring within and around the parks that could affect park operations are the same as those for alternative 1, with some exceptions. The difficulty of protecting Yellowstone's historic buildings in a heavy snow environment without staffing at the building locations means that many buildings would deteriorate, compromising their historic integrity. Additionally, the fact that heavy snow loads would not be removed as winter progresses would mean that some park buildings would completely collapse.

Conclusions

Alternative 3A would result in major, adverse, direct, and long-term impacts upon park operations, primarily because routine natural and cultural resource protection and/or maintenance activities would no longer be possible in much of Yellowstone but also because intra-park ground travel would become impossible. Mitigations would be of doubtful effectiveness. For Grand Teton and the Parkway, the impacts of alternative 3A on park operations would be minor, beneficial, direct, and long-term.

In terms of cumulative effects, the long-term, major, adverse impacts resulting from direct and indirect actions described in this alternative would contribute a major, adverse, and long-term impact to past, present, and foreseeable actions and impacts on park operations.

Alternative 3B

This alternative would close Yellowstone's OSV routes to public use, although administrative OSV use could continue and would require some grooming, such as after winter storms. It

would allow all natural and cultural resource maintenance and protection activities to continue and would terminate avalanche control activities other than for spring opening. Travel for park employees within the park would become more difficult due to the reduced grooming schedule, but would be more possible than under alternative 3A. Consequently, the effects of implementing this alternative upon park operations would be beneficial, moderate, direct, and long-term.

Compared to both current and historic conditions and all other alternatives except 6, this alternative would have the most beneficial effects upon park operations. For Grand Teton and the Parkway, the impacts of alternative 3B would be generally the same as those described for alternative 2 with the difference that operations associated with support of snowcoach activities originating at Flagg Ranch would also be discontinued. The impacts would be moderate, beneficial, direct, and long-term.

Mitigation of Effects

In general, mitigation of effects upon park operations is a routine and required part of NPS management of park resources. In the case of closed roads, park employees would adjust their schedules as needed to arrive at necessary destinations. Additionally, the agency would offer training to its employees in backcountry snowmobile driving conditions.

Cumulative Effects

Past, present, and foreseeable actions occurring within and around the parks which could affect park operations are the same as those for alternative 1. However, all adverse effects would have less cumulative impact because park operating costs in winter would be curtailed under this alternative.

Conclusions

Alternative 3B would result in moderate, beneficial, direct, and long-term impacts upon park operations in Yellowstone because avalanche control operations on Sylvan Pass would no longer be necessary and regular grooming and ranger patrols would not be as frequent, but intra-park travel to protect and maintain cultural and natural resources would still be possible. Similarly, for Grand Teton and the Parkway, alternative 3B would result in moderate, beneficial, direct, and long-term impacts due to elimination of grooming, reductions in plowing, and less frequent ranger patrols in certain areas.

In terms of cumulative effects, the long-term, moderate, beneficial impacts resulting from direct and indirect actions described in this alternative would contribute a minor, beneficial, long-term impact to past, present, and foreseeable actions and impacts on park operations.

Alternative 4

Throughout most of the park, NPS and concessions employees, as well as permitted researchers and authorized contractors would continue to conduct similar work and personal activities by oversnow vehicle, in ways virtually identical to their current patterns. Due to the higher levels of OSV use allowed under this alternative, more grooming and ranger patrols would be necessary. Additionally, Sylvan Pass would remain open, necessitating continued avalanche control activities as discussed in section 2.6.4. For these reasons, the effects of implementing this alternative upon park operations would be minor to moderate, adverse, direct, and long-term.

Park operations would be affected by the potential closure of Gibbon Canyon (Madison to Norris Junctions) for management experiments investigating the bison-groomed road relationship. Travel between Mammoth Hot Springs and Old Faithful or West Yellowstone, and between Canyon and West Yellowstone, would become substantially more difficult, as

employees would then need to travel around the Lower Loop or via wheeled vehicle through Livingston and Bozeman, Montana. Implementation of the closure would probably also result in a reduced number of such trips, due to the increased time necessary for them. With Sylvan Pass remaining open under this alternative, if the Gibbon Canyon closure were implemented the effects of this alternative upon park operations would be moderate, adverse, direct, and long-term.

For Grand Teton and the Parkway, this alternative would result in a continuation of grooming, plowing, ranger patrols, and other winter operations that currently occur. These activities would be expected to occur at an increased level because of the greater intensity of use. Impacts on park operations, therefore, would be minor to moderate, adverse, direct, and long-term.

Compared to current conditions and all other alternatives except 3A, this alternative would have increased and adverse effects upon park operations due to the increased need for road grooming and ranger patrols. Compared to alternative 3A, it would have lesser effects upon park operations because maintenance and protection of historic buildings would continue to be possible under this alternative. Effects of implementing this alternative compared to historic conditions would be approximately equal because the increased numbers of visitors possible under this alternative would be balanced by the reduced need for ranger patrols, since most visitors would be guided under this alternative. For Grand Teton and the Parkway, operational requirements under this alternative would be greater than any of the other alternatives.

Mitigation of Effects

In general, mitigation of effects upon park operations is a routine and required part of NPS management of park resources.

Cumulative Effects

Past, present, and foreseeable actions occurring within and around the parks which could affect park operations are the same as those for alternative 1. Cumulative effects to park operations under this alternative would be greater than the effects stated for alternative 1 due to avalanche hazard mitigation operations at Sylvan Pass.

Conclusions

Alternative 4 would result in minor to moderate, adverse, direct, and long-term impacts upon park operations, due to the continued needs for avalanche control on Sylvan Pass, increased grooming, and increased ranger patrols. Experimental closures of the Gibbon Canyon or other road segments could have moderate, adverse, direct, and long-term impacts upon park operations in Yellowstone. For Grand Teton and the Parkway, the impacts of this alternative would be minor to moderate, adverse, direct, and long-term.

In terms of cumulative effects, the long-term, minor to moderate, adverse impacts resulting from direct and indirect actions described in this alternative would contribute a moderate, adverse, long-term impact to past, present, and foreseeable actions and impacts on park operations.

Alternative 5

The effects upon YNP park operations if this alternative is implemented (with or without the Gibbon Canyon closure) would be about the same as those under alternative 4, with the exception that the need for additional grooming and ranger patrols would be reduced due to this alternative's reduced number of visitors relative to alternative 4. Like Alternative 4, Sylvan Pass would remain open, necessitating continued avalanche control activities as

discussed in section 2.6.5. For these reasons, the effects of implementing this alternative upon park operations would be minor, adverse, long-term, and direct. Should the Gibbon Canyon research closure be implemented, the effects of implementing this alternative would rise to moderate, adverse, long-term, and direct.

For Grand Teton and the Parkway, alternative 5 would result in approximately the same level of operations as in alternative 1. Consequently, the impacts on park operations would be comparable: negligible, adverse, direct, and long-term.

Compared to alternative 1, selection of this alternative would result in approximately equal effects upon park operations, because the reduced need for grooming under this alternative would be balanced by the continued need to provide avalanche control operations. Compared to alternatives 2, 3B, 6, and 7, this alternative would increase effects upon park operations because it would necessitate continued avalanche control operations and additional grooming. Compared to alternative 3A, this alternative would reduce impacts upon park operations because it would allow all natural and cultural resource maintenance and protection activities to continue. Compared to historic conditions and alternative 4, this alternative would reduce impacts upon park operations due to its reduced need for grooming and ranger patrol activities. Compared to current conditions, this alternative would result in approximately equal effects upon park operations due to similar road grooming needs and avalanche control needs.

For Grand Teton and the Parkway, selection of this alternative would result in few changes in park operations compared to current conditions. Relative to alternatives 2 and 3, selection of this alternative would result in a greater demand on park operations since it requires grooming and other operational activities to support OSV use. Relative to alternative 4, selection of this alternative would have less demand on park operations since that alternative would create a greater need for ranger patrols, management of concession contracts, and other operations related to higher use levels. Compared to alternatives 6 and 7, selection of this alternative would result in a greater demand on park operations since it involves operation and maintenance of the CDST.

Mitigation of Effects

In general, mitigation of effects upon park operations is a routine and required part of NPS management of park resources.

Cumulative Effects

Past, present, and foreseeable actions occurring within and around the parks which could affect park operations are the same as those for alternative 1. Cumulative effects to park operations under this alternative would be greater than the effects stated for alternative 1 due to avalanche hazard mitigation operations at Sylvan Pass.

Conclusions

In YNP, alternative 5 would result in minor to moderate, adverse, direct, and long-term impacts upon park operations, due primarily to the continued need for avalanche control on Sylvan Pass. Experimental closures of the Gibbon Canyon or other road segments could have moderate, adverse, direct, and long-term impacts upon park operations. For Grand Teton and the Parkway, the impacts of this alternative on park operations would be negligible, adverse, direct, and long-term.

In terms of cumulative effects, the long-term, minor to moderate, adverse impacts resulting from direct and indirect actions described in this alternative would contribute a moderate,

adverse, long-term impact to past, present, and foreseeable actions and impacts on park operations.

Alternative 6

This alternative would allow all natural and cultural resource maintenance and protection activities to continue. The closure of Sylvan Pass would eliminate the need for avalanche control activities. Grooming would continue at approximately current levels on the roads open to OSV use, while plowing the west-side roads would take a similar amount of work as would grooming those roads. However, because wheeled vehicle travel is, in most instances, easier than OSV travel, park operations requiring travel within the Yellowstone (especially on the west side) would become substantially easier. For these reasons, the effects of implementing this alternative upon park operations would be beneficial, major, long-term, and direct.

Park operations would be affected by the potential closure of Gibbon Canyon (Madison to Norris Junctions) for management experiments investigating the bison-groomed road relationship. Travel between Mammoth Hot Springs and Old Faithful or West Yellowstone, and between Canyon and West Yellowstone, would become substantially more difficult, as employees would then need to travel around the Lower Loop or via wheeled vehicle through Livingston and Bozeman, Montana. Implementation of the closure would probably also result in a reduced number of such trips, due to the increased time necessary for them. While the Gibbon Canyon closure would produce changes of a moderate adverse nature, the closure of Sylvan Pass and greater ease of travel on the remaining plowed road stretches would largely compensate for the adverse change in operations. Consequently, if the closure is implemented, the effects of choosing this alternative upon park operations would be minor, beneficial, direct, and long-term. For Grand Teton and the Parkway, this alternative would eliminate operation of the CDST, resulting in minor, beneficial, direct, and long-term impacts on park operations.

Compared to current and historic conditions and all other alternatives, this alternative would have the most beneficial effects upon park operations due to its reduced need for grooming, increased ease of travel, reduced fuel storage needs, and/or elimination of avalanche control activities. For Grand Teton and the Parkway, operational requirements of this alternative would be less than under alternatives 1, 3A, 4, 5, and 7, and greater than under alternatives 2 and 3B.

Mitigation of Effects

In general, mitigation of effects upon park operations is a routine and required part of NPS management of park resources. In the case of closed roads, park employees would adjust their schedules as needed to arrive at necessary destinations. In the case of plowed roads, employees would be advised of winter driving behaviors.

Cumulative Effects

Past, present, and foreseeable actions occurring within and around the parks which could affect park operations are the same as those for alternative 1. Cumulative effects to park operations under this alternative would be less than the effects stated for alternative 1 due to the closure of Sylvan Pass and conversion to wheeled vehicle travel on some (now plowed) park roads.

Conclusions

Alternative 6 would result in major, beneficial, direct, and long-term impacts upon park operations in YNP, due primarily to the improved ease of intra-park travel with some roads

being plowed and to the elimination of avalanche control on Sylvan Pass. If the experimental closures of the Gibbon Canyon occurred, this alternative would have minor, beneficial, direct, and long-term impacts upon park operations. For Grand Teton and the Parkway, the impacts of this alternative would be minor, beneficial, direct, and long-term.

In terms of cumulative effects, the long-term, minor to major, beneficial impacts resulting from direct and indirect actions described in this alternative would contribute a minor, beneficial, long-term impact to past, present, and foreseeable actions and impacts on park operations.

Alternative 7

Alternative 7 contains elements of alternatives 1, 5, and 6. Throughout most of YNP, NPS and concessions employees as well as permitted researchers and authorized contractors would continue to conduct similar work and personal activities by oversnow vehicle, in ways virtually identical to their current patterns. While the closure of Sylvan Pass would make travel to the East Entrance difficult for park employees needing to do business there or in Cody, alternate routes are available outside the park and generally, few employees need to undertake such trips. Further, the closure of Sylvan Pass would virtually eliminate the need for avalanche control activities, a substantial and beneficial change to present operations. For these reasons, the effects of implementing this alternative would be minor, beneficial, direct, and long-term for Yellowstone.

Park operations would be affected by the potential closure of Gibbon Canyon (Madison to Norris Junctions) for management experiments investigating the bison-groomed road relationship. Travel between Mammoth Hot Springs and Old Faithful or West Yellowstone, and between Canyon and West Yellowstone, would become substantially more difficult, as employees would then need to travel around the Lower Loop or via wheeled vehicle through Livingston and Bozeman, Montana. Implementation of the closure would probably also result in a reduced number of such trips, due to the increased time necessary for them. While the Gibbon Canyon closure would produce changes of a moderate adverse nature, the closure of Sylvan Pass would partially compensate for the adverse change in operations. Consequently, if the Gibbon Canyon closure is implemented, the effects of choosing this alternative upon park operations would be minor, adverse, direct, and long-term.

Compared to current conditions, selection of this alternative would result in negligible to minor beneficial changes from elimination of avalanche control operations. Compared to alternatives 2 and 6, this alternative would increase effects upon park operations, because it would require more grooming. Compared to historic conditions and alternatives 1, 4, and 5, this alternative would decrease effects upon park operations, because the need for grooming would drop as would the need for avalanche control on Sylvan Pass. Compared to alternative 3, which would make internal park travel and operations difficult or impossible in YNP, this alternative would decrease effects upon park operations even though it would require more grooming.

For Grand Teton and the Parkway, the effects of this alternative would be minor, beneficial, direct, and long-term, the result of discontinuing grooming and other operations associated with converting the CDST to a trailered route. Support for both snowmobile and snowcoach operations would continue to be required at Flagg Ranch. Operational requirements under this alternative would be less than under alternatives 1, 4, 5, and 6. Relative to alternatives 2 and 3, selection of this alternative would result in a greater demand on park operations since it requires grooming and other operational activities to support oversnow vehicle use.

Mitigation of Effects

In general, mitigation of effects upon park operations is a routine and required part of NPS management of park resources. In the case of closed roads, park employees will find alternate routes and adjust their schedules as needed to arrive at necessary destinations.

Cumulative Effects

Past, present, and foreseeable actions occurring within and around the parks which could affect park operations are the same as those for alternative 1. Cumulative effects to park operations under this alternative would be similar to those stated for alternative 1.

Conclusions

Alternative 7 would result in minor, beneficial, direct, and long-term impacts upon park operations in Yellowstone, primarily because avalanche control operations on Sylvan Pass would no longer be necessary. Experimental closures of the Gibbon Canyon or other road segments would make this alternative's effects minor, adverse, direct, and long-term impacts upon park operations in YNP. For Grand Teton and the Parkway, selection of alternative 7 would result in minor, beneficial, direct, and long-term impacts.

In terms of cumulative effects, the long-term, minor, beneficial and adverse impacts resulting from direct and indirect actions described in this alternative would contribute a minor, beneficial to adverse, long-term impact to past, present, and foreseeable actions and impacts on park operations.

4.2.2 Effects on the Socioeconomic Environment

Assumptions and Methods

This section analyzes how winter use management alternatives would likely impact recreational use in the Greater Yellowstone Area (GYA) and how impacts to such use would impact economic activity (expenditures and employment) within the area. The economy of the GYA and the estimated socioeconomic impacts associated with the winter use management alternatives are described in an analysis prepared for the National Park Service (NPS) by Duffield and Neher (2006 and 2007). This section summarizes the methodology and data used in the analyses. Readers are encouraged to refer to those documents for technical details.

Duffield and Neher (2006 and 2007) describe the economy of the GYA at three different levels: a state level (Idaho, Montana, and Wyoming), a county level (Fremont County in Idaho, Gallatin and Park Counties in Montana, and Park and Teton Counties in Wyoming), and a community level (Cody, Jackson, and Wapiti, Wyoming, and West Yellowstone, Montana). Recreational use and visitor expenditure levels were estimated for each of the management alternatives considered. Then, the economic impacts associated with each alternative were estimated at the three levels described above.

The economic impacts of each action alternative are estimated relative to the no-action alternative, which is no motorized oversnow access, which would prohibit recreational snowmobile and snowcoach use in the parks and would not allow plowing of interior roads (i.e. the road from Gardiner to Mammoth to Cooke City and U.S. 191 would still be plowed).

Three estimates of socioeconomic impacts are presented in this analysis for each management alternative. The first is a lower bound estimate that is based primarily on the observed changes in visitation resulting from the current winter use management plan. This lower bound estimate describes the impacts that can be expected in the near-term. The next

estimate is an upper bound based on the daily entrance limits incorporated in each management alternative. It is possible that in the distant future these limits could be reached depending on population growth, marketing and advertising efforts, and preferences for winter recreation. The third estimate is based on previous survey-based analyses of winter use management policies that were prepared for previous planning efforts in 2000, 2003, and 2004 (Duffield and Neher 2000; RTI International 2004). These estimates tend to fall between the lower and upper bound estimates described above. The alternatives analyzed in these previous analyses differ to varying degrees from the alternatives considered in the current planning effort and are not further discussed in this summary. The observed changes in visitation resulting from the current winter use management plan suggest somewhat less substitution in snowmobile use between the parks and nearby national forests than was estimated in these previous analyses.

IMPLAN Modeling

The socioeconomic analysis relies on IMPLAN modeling. IMPLAN is an "input/output" economic model designed by the U.S. Forest Service and is commonly used by state and Federal agencies for planning and evaluation purposes. For example, Dean Runyan and Associates used IMPLAN modeling in a report to the State of Wyoming on the economic impact of travel in Wyoming (Dean Runyan 2006). 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 – full and part time) associated with that activity.

There are four 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 parks 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 2003 (Prior analyses (the Winter Use Plans EIS, SEIS, and EA) relied on earlier IMPLAN data sets and that information is available in those documents). Third, IMPLAN information is based on year-round data; winter seasonal information may not be as accurate. Fourth, for small analysis areas (Wapiti, Wyoming, for example) the IMPLAN data may not be an accurate representation of the actual economy due to lack of information. However, as with air quality and soundscapes modeling (both of which also have important caveats), the most powerful use for economic modeling is in the comparisons between alternatives. Again in reference to sound and air, the impacts of the different alternatives on soundscapes and air quality cannot be monitored because the conditions exist only within this document. However, the impacts of the alternatives on these resources can be modeled and compared and the decision maker can understand the effects of the different alternatives. The same is true for economics.

Historic and Current Use Levels

Current Conditions: The impact of the temporary winter use plan on recreational use is observable from recent visitation data. Therefore, for the lower bound impact estimates, use was assumed to be equal to current use levels, as represented by the 2005-2006 winter (a total of 88,718 visits). These are Yellowstone-only numbers because use levels on the CDST, Grassy Lake Road, and Jackson Lake are relatively small, and other types of use (wheeled vehicle travel and skiing) are not altered by any alternatives in Grand Teton.

For the survey-based impact estimate, the level of recreational use under current conditions was assumed to be equal to current use levels, as represented by the 2005-2006 winter. This level of recreational use is consistent with that indicated by Duffield and Neher (2000) and RTI International (2004). See Appendix B in Duffield and Neher 2006 for details of this use level.

Historical Conditions: The recreational use levels during the 1997-1998 winter are fairly typical of use levels prior to the promulgation of the 2001 regulations. Therefore, for the upper bound impact estimates, the level of recreational use was assumed to be equal to the level that existed during that winter (a total of 119,274 visits in Yellowstone). For the survey-based impact estimate, the level of recreational use under historical conditions was assumed to be equal to the level that existed during the 1997-1998 winter (the same as for the lower and upper bound use levels). In addition, for alternative 7, an additional historic baseline was analyzed. Comments on the draft EIS suggested that 1997-1998 represented a low use winter. Therefore, use levels for the winter 2001-2002 (the most recent high winter, and nearly equaling the historic high winters of the early 1990s) were included in the analysis for Alternative 7 for the Final EIS. Winter visitation in 2001-2002 totaled 144,490 visits (Duffield and Neher 2007).

Assumptions for Recreational Use Levels by Alternative

This section presents estimates of recreational use levels and other assumptions necessary in the economic model.

Alternative 1: Continued Temporary Plan. The lower bound level of recreational use under this alternative is generally equivalent to the current (2005-2006) winter use levels in the parks.

Alternative 1's lower bound estimated use is 88,718 visits (current, 2005-2006 visitation), and the upper bound estimated use is 172,316 visits, which assumes full use of daily allocations. Alternative 1 would eliminate 40 daily entries from the East Entrance and allocate them to other entrances. However, currently the East Entrance only averages eight snowmobile entries and one snowcoach entry per day and thus closure of the East Entrance represents only a loss of eight, not 40, snowmobiles per day and one, not three, snowcoaches. For the survey-based impact estimate, RTI International (2004) indicates a 14.6 percent reduction from historical use levels (1997-1998 winter) in winter visits to the GYA by non-GYA residents for this alternative. This indicates a use level of 101,860 visits for this alternative.[3]

A variation of alternative 1 would close the Madison to Norris road segment (Gibbon Canyon), and implement the "road closure experiment." NPS assumed that the number of visitors affected by this road closure is approximated by the number of oversnow visitors entering through the North Entrance. During the 2005-2006 winter season, that number totaled 5,758 visitors. This assumption likely overstates the true impacts of the road closure for two reasons. First, some oversnow visitors that would normally enter through the North

[3] See Appendix B in Duffield and Neher 2006 for details of this use level.

Entrance could be expected to use another entrance such as West Yellowstone, MT. Also, a misclassification of some visitor use by commercial operators may have resulted in an overstatement of the number of oversnow visitors entering through that entrance. Therefore, the estimated impacts associated with this closure are likely overstated.

Alternative 2: Snowcoaches Only. Under this alternative it is estimated that the lower bound visitation level would be equal to 59,885 visits (the sum of current snowcoach and North Entrance auto, RV and bus, plus skiers), and the upper bound use level would be 125,736 visits.

For the survey-based impact estimate, the level of recreational use under this alternative was based on visitor responses in a study by Duffield and Neher (2000). That study indicates a 33.4 percent reduction from historical use levels under this alternative. That indicates a use level of 79,436 visits.

Alternative 3A: Most Road Grooming Eliminated. This alternative calls for the elimination of motorized access to most of the parks, leaving groomed motorized access only available from the South Entrance to Old Faithful and nearby areas. The lower bound use estimate for this alternative assumes a level equal to 2005-2006 winter South Entrance visitation plus North Entrance wheeled visitation or 53,658 visits. Upper bound visitation under this alternative equals 85,361.

No visitor survey has specifically addressed the issue of road closures in the parks. Therefore, for the survey-based impact estimate, the level of recreational use under this alternative assumes a level equal to 2005-2006 South Entrance visitation plus North Entrance wheeled visitation, or 53,658 visits (the same as for the lower bound use level for this alternative).

Alternative 3B: Motorized oversnow use in Yellowstone National Park has historically composed over 70 percent of total winter visitation and nearly all visitation from the west, south, and east 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 parks rather than a direct substitute. For these reasons, for the lower and upper bound impact estimates, the level of recreational use under this no-action alternative was assumed to be equal to the North Entrance wheeled vehicle entries plus park-wide skiing entries during the 2005-2006 winter (a total of 40,029 visits).

No visitor survey has specifically addressed the issue of no motorized oversnow access to the parks. Therefore, for the survey-based impact estimate, the level of recreational use under this no-action alternative was assumed to be equal to the North Entrance wheeled vehicle entries plus park-wide skiing entries during the 2005-2006 winter (the same as for the lower and upper bound use levels for this no-action alternative).

Alternative 4: Expanded Recreational Use. This alternative would expand recreational use and includes several components. One is the proposal to allow approximately 25 percent of daily snowmobile use to be either unguided or non-commercially guided. The second is to substantially increase total allowed snowmobile traffic per day over current temporary winter use management plan levels. Current winter park visitation levels indicate that the combination of BAT requirements and guided entry requirements has significantly reduced demand for snowmobile travel within the park. Current snowmobile entry limits (720 per day) are significantly above current average daily use levels (260 per day). Duffield and Neher (2000) found that approximately 42 percent of 1998-1999 winter visitors to Yellowstone

rented snowmachines and that the businesses who rent the machines generally purchase new inventory annually and thus can make BAT machines available to the public. Given that current use levels are below what might be expected based on historical rental use only, it is assumed that the provision for guided-only access has an impact on demand for winter visitation to the park. However, as noted in the discussion of IMPLAN's limitations, other visitors might choose to take a snowcoach instead of a snowmobile into the parks.

For the lower bound estimate of visitation under this alternative, it is assumed that the guided access requirement is constraining current use and the provision of unguided access would be fully utilized. The lower bound use estimate under this alternative is equal to current (2005-2006 winter) use plus any additional unguided capacity, or 116,896 visits. The upper bound use level under this alternative would be 325,599 visits.

RTI International (2004) provided an analysis of a previous management alternative that was nearly identical to this alternative. That analysis estimated that winter visitation to the GYA by park snowmobilers would decrease by about 19.2 percent below historical levels. Given the share of snowmobiles within Yellowstone, this indicates an estimated 11.4 percent decrease below historical levels in GYA visitation over all Yellowstone winter visitors. That indicates a use level of 105,677 visits for the survey-based impact estimate.

Alternative 5: New Management Tools and Improved BAT. This alternative also provides for a percentage of winter access to be unguided snowmobile use. Also, this analysis assumes all additional unguided access will be utilized in the lower bound use estimate. Under this alternative, it is estimated that the lower bound use level would be 100,652 visits and the upper bound level would be 158,206 visits. Similar to alternative 4 above, RTI International (2004) also provided an analysis of a previous management alternative that was nearly identical to alternative 5. That analysis indicates an estimated 11.4 percent decrease below historical levels in GYA visitation over all Yellowstone winter visitors. That indicates a use level of 105,677 visits for the survey-based impact estimate.

Alternative 6: Mixed Use. There is currently no observed data on the reaction of winter visitors (or would-be visitors) to plowed access to Yellowstone in the winter. Winter access in wheeled busses or vans would likely be substantially cheaper than current snowcoach access; therefore, demand might be substantial. Due to the uncertainty of visitor reactions to winter park road plowing, it is estimated that the lower bound use level for this alternative would be equal to the sum of current South Entrance visitation, North Entrance visitation, and current snowcoach visitation, or 77,892. There is considerable uncertainty regarding this estimate, due to the lack of specific data on the public reaction to this type of management change in the parks.

At the upper bound, visitation to the parks under this alternative would be significantly higher than either current or historic levels. At full entrance limits, and assuming an average of 21 visitors per vehicle, use would be 291,342 visits during the winter. For the survey-based impact estimate, the level of recreational use under this alternative was based on visitor responses in a study by Duffield and Neher (2000). That study indicates an 18.4 percent reduction from historical use levels under this alternative. That indicates a use level of 97,328 visits.

Alternative 7: Revised Preferred Alternative. The lower bound level of recreational use under this alternative is generally equivalent to the current (2005-2006) winter use levels in the parks.

Alternative 7's lower bound estimated use is 88,718 visits (current, 2005-2006 visitation), and the upper bound estimated use is 160,246 visits, which assumes full use of daily allocations.

For the survey-based impact estimate, RTI International (2004) indicates a 14.6 percent reduction from historical use levels (1997-1998 winter) in winter visits to the GYA by non-GYA residents for this alternative. This indicates a use level of 101,860 visits for this alternative.[4]

A variation of alternative 7 would close the Madison to Norris Road segment (Gibbon Canyon), and implement the "road closure experiment." Under this variation, the lower bound would be 82,960 (2005-2006 total winter visitation of 88,718 minus North /Entrance oversnow use of 5,758 visits).

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. In the case of this analysis, the primary driving factor for the IMPLAN model is the changes in the number of visitors from outside an analysis area who decide not to visit the analysis area. For the following analysis, the percentage of visitors to the parks 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).

In addition to the change in visitation, the average spending per visitor is required. As noted in Chapter III, estimates of per-visit expenditures were estimated using a time series model of West Yellowstone resort tax collections and West Entrance visits. 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. This spending does not represent total trip spending for an individual as 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. In the case of alternative 6 (mixed use, including wheeled vehicle access) average spending per visit was assumed to be $106.33. This lower estimate allows for the significantly cheaper cost of visiting the park in a wheeled tour bus as compared to a tracked snowcoach (based on conversations with park staff, it is estimated that adult travel in a wheeled vehicle would cost considerably less than in a snowcoach).

Finally, in order to accurately input the expenditure changes into the IMPLAN model, it is necessary to understand the general distribution of non-resident visitor spending across economic sectors (for instance, lodging, restaurants, rental cars, etc.). The distribution of spending across economic sectors is also drawn from the 1997-1998 winter visitor survey. That survey asked winter park visitors to detail their spending patterns within the GYA. 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 these parameters, total estimated direct changes in non-resident visitor spending due to an action alternative, and relative to one of the no-action alternatives, is input into the IMPLAN program.

The IMPLAN program estimates total output and employment impacts, which include 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 GYA. Indirect impacts reflect the

[4] See Duffield and Neher 2007 for details of this use level.

subsequent spending by businesses for required inputs 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.

The results of this analysis are summarized below.[5] Many of these estimates differ only marginally and the large majority of estimated impacts represent a very small percentage change in total economic activity for the analysis areas.

The resulting output and employment impacts are presented by management alternative below. These impacts represent changes (adverse or beneficial) from the existing economic output and employment levels presented in Table 3-1. The definitions of impact categories in Table 4-3 were used to qualitatively describe these impacts.

Definition of Impacts

Table 4-3: Definitions of Socioeconomic Impact Categories

Impact Category	Definition
Negligible	The impact is at the lower levels of detection (< 5% change in either total output or employment)
Minor	The impact is slight, but detectable (5-10% change in either total output or employment)
Moderate	The impact is readily apparent and has the potential to become major (10-20% change in either total output or employment)
Major	The impact is severe, or if beneficial, has exceptional beneficial effects (>20% change in either total output or employment)

Effects by Alternative

Alternative 1

The economic impact estimates for alternative 1 are presented in absolute terms in Table 4-4, and in relative terms (percentages) in Table 4-6. The absolute impact levels are annual estimates. The impacts are then categorized as to intensity level in Table 4-8.

The economic impact estimates for the version of alternative 1 that includes the Madison to Norris road segment closure are presented in absolute terms in Table 4-5, and in relative terms in Table 4-7. The absolute impact levels are annual estimates. The impacts are then categorized as to intensity level in Table 4-9. The incremental impacts associated with the Madison to Norris road segment closure were not estimated by Duffield and Neher (2006). However, these impacts were subsequently estimated and included in Tables 4-5, 4-7, and 4-9 (Neher, pers. comm. 8/21/2007). These impacts were estimated to affect primarily the 3-state and 5-county areas.

As described in Duffield and Neher (2006), current use levels are well below the use levels called for in this variation of alternative 1; therefore, the limits would not be constraining on winter use. However, the road closure would constrain access from West Yellowstone to Canyon and from Mammoth Hot Springs to Old Faithful, which could limit or reduce visitor access and reduce business opportunities. Some substitution on destinations (Mammoth to Canyon and West to Old Faithful) would occur, but some business opportunities would be

[5] See Appendix A in Duffield and Neher 2006 and Duffield and Neher 2007 for the complete set of IMPLAN results.

forgone. In particular, the overnight Yurt operation at Canyon that originates in West Yellowstone would be adversely affected. Also, Xanterra's access for visitors from Mammoth to Snow Lodge at Old Faithful would be adversely affected if the road segment were closed. The magnitude and type of effects of implementing a "road closure experiment" would be similar under alternatives 2, 4, 5, and 6.

The economic impacts presented in the following tables for alternative 1 are the IMPLAN outputs as compared to the definition of impacts, above. A negligible impact means that the impact is difficult to detect at the state, 5-county, or community level. It does not mean that within any of those three levels, adverse (or beneficial) effects are not occurring. They are. For businesses and their employees who are the companies and people behind reduction in output and employment, the adverse impacts are anything but negligible. The results also mask adverse impacts that may be occurring to types of businesses or businesses in a geographic area that is particularly dependent on park visitors. For example, businesses along the North Fork of the Shoshone River report if the East Entrance is closed under alternative 1, most would close in the winter. Further exacerbating their situation is the recent downturn in visitation that has caused some of the businesses to already curtail operations or close entirely in the winter. To these businesses and others similarly situated near other entrances, the impacts of the current conditions are major, adverse, and long-term, and alternative 1 would continue those impacts into the future.

Table 4-4: Absolute Economic Impact Estimates, Alternative 1

Alternative 1 Absolute Impact Levels		---------- As compared to ----------		
Area/Estimate	Impact (a)	Historical Conditions	Current Conditions	No Motorized Oversnow Access
3-State Area				
Lower Bound	Total Output	-7,207,453	N/A	11,484,623
	Total Employment	-133	N/A	212
Upper Bound	Total Output	12,511,381	N/A	31,203,482
	Total Employment	231	N/A	576
Survey-Based	Total Output	-15,583,320	N/A	55,330,952
	Total Employment	-288	N/A	1,022
5-County Area				
Lower Bound	Total Output	-5,868,601	N/A	9,355,650
	Total Employment	-107	N/A	171
Upper Bound	Total Output	10,187,274	N/A	25,419,106
	Total Employment	186	N/A	465
Survey-Based	Total Output	-12,688,572	N/A	45,073,924
	Total Employment	-232	N/A	824
Cody, WY				
Lower Bound	Total Output	-579,456	N/A	923,366
	Total Employment	-13	N/A	21
Upper Bound	Total Output	1,005,875	N/A	2,508,661
	Total Employment	22	N/A	56
Survey-Based	Total Output	-321,243	N/A	1,140,624
	Total Employment	-7	N/A	26
Jackson, WY				
Lower Bound	Total Output	-1,541,066	N/A	2,455,593
	Total Employment	-27	N/A	43
Upper Bound	Total Output	2,675,129	N/A	6,671,794
	Total Employment	46	N/A	116
Survey-Based	Total Output	-3,203,805	N/A	11,375,601
	Total Employment	-56	N/A	198
West Yellowstone, MT				
Lower Bound	Total Output	-5,825,726	N/A	9,282,929

Alternative 1 Absolute Impact Levels		---------- As compared to ----------		
Area/Estimate	Impact (a)	Historical Conditions	Current Conditions	No Motorized Oversnow Access
	Total Employment	-100	N/A	193
Upper Bound	Total Output	10,112,847	N/A	25,221,525
	Total Employment	173	N/A	524
Survey-Based	Total Output	-6,449,829	N/A	22,901,104
	Total Employment	-110	N/A	476
(a) Total output is in dollars, and total employment is in full and part-time jobs.				

Table 4-5: Absolute Economic Impact Estimates, Alternative 1 with "road closure experiment"

Alternative 1 with "road closure experiment" Absolute Impact Levels		----------As compared to----------		
Area/Estimate	Impact (a)	Historical Conditions	Current Conditions	No Motorized Oversnow Access
3-State Area				
Lower Bound	Total Output	-8,566,181	N/A	11,484,623
	Total Employment	-158	N/A	212
Upper Bound	Total Output	11,152,653	N/A	31,203,482
	Total Employment	206	N/A	576
Survey-Based	Total Output	-16,942,048	N/A	55,330,952
	Total Employment	-313	N/A	1,022
5-County Area				
Lower Bound	Total Output	-6,974,471	N/A	9,355,650
	Total Employment	-127	N/A	171
Upper Bound	Total Output	9,081,404	N/A	25,419,106
	Total Employment	166	N/A	465
Survey-Based	Total Output	-13,794,442	N/A	45,073,924
	Total Employment	-252	N/A	824
Cody, WY				
Lower Bound	Total Output	-579,456	N/A	923,366
	Total Employment	-13	N/A	21
Upper Bound	Total Output	1,005,875	N/A	2,508,661
	Total Employment	22	N/A	56
Survey-Based	Total Output	-321,243	N/A	1,140,624
	Total Employment	-7	N/A	26
Jackson, WY				
Lower Bound	Total Output	-1,541,066	N/A	2,455,593
	Total Employment	-27	N/A	43
Upper Bound	Total Output	2,675,129	N/A	6,671,794
	Total Employment	46	N/A	116
Survey-Based	Total Output	-3,203,805	N/A	11,375,601
	Total Employment	-56	N/A	198
West Yellowstone, MT				
Lower Bound	Total Output	-5,825,726	N/A	9,282,929
	Total Employment	-100	N/A	193
Upper Bound	Total Output	10,112,847	N/A	25,221,525
	Total Employment	173	N/A	524
Survey-Based	Total Output	-6,449,829	N/A	22,901,104
	Total Employment	-110	N/A	476
(a) Total output is in dollars, and total employment is in full and part-time jobs.				

Table 4-6: Relative Economic Impact Estimates, Alternative 1

Alternative 1: Relative Impact Levels		---------- As compared to ----------		
Area/Estimate	Impact (a)	Historical Conditions	Current Conditions	No Motorized Oversnow Access
3-State Area				
Lower Bound	Total Output	0.00% (b)	N/A	0.01%
	Total Employment	-0.01%	N/A	0.01%
Upper Bound	Total Output	0.01%	N/A	0.02%
	Total Employment	0.01%	N/A	0.03%
Survey-Based	Total Output	-0.01%	N/A	0.03%
	Total Employment	-0.02%	N/A	0.06%
5-County Area				
Lower Bound	Total Output	-0.06%	N/A	0.10%
	Total Employment	-0.09%	N/A	0.15%
Upper Bound	Total Output	0.11%	N/A	0.27%
	Total Employment	0.16%	N/A	0.40%
Survey-Based	Total Output	-0.13%	N/A	0.47%
	Total Employment	-0.20%	N/A	0.71%
Cody, WY				
Lower Bound	Total Output	-0.06%	N/A	0.10%
	Total Employment	-0.12%	N/A	0.19%
Upper Bound	Total Output	0.11%	N/A	0.27%
	Total Employment	0.21%	N/A	0.52%
Survey-Based	Total Output	-0.04%	N/A	0.12%
	Total Employment	-0.07%	N/A	0.24%
Jackson, WY				
Lower Bound	Total Output	-0.08%	N/A	0.13%
	Total Employment	-0.13%	N/A	0.21%
Upper Bound	Total Output	0.14%	N/A	0.36%
	Total Employment	0.23%	N/A	0.57%
Survey-Based	Total Output	-0.17%	N/A	0.61%
	Total Employment	-0.27%	N/A	0.98%
West Yellowstone, MT				
Lower Bound	Total Output	-3.49%	N/A	5.56%
	Total Employment	-4.27%	N/A	8.27%
Upper Bound	Total Output	6.06%	N/A	15.10%
	Total Employment	7.41%	N/A	22.46%
Survey-Based	Total Output	-3.86%	N/A	13.72%
	Total Employment	-4.73%	N/A	20.39%

(a) Impacts are expressed as percentage changes from the respective existing economic output and employment levels presented in Table 3-1.
(b) The absolute impact level is adverse, but the relative impact level rounds to zero.

Table 4-7: Relative Economic Impact Estimates, Alternative 1 with "road closure experiment"

Alternative 1 with "road closure experiment" Absolute Impact Levels		----------As compared to----------		
Area/Estimate	Impact (a)	Historical Conditions	Current Conditions	No Motorized Oversnow Access
3-State Area				
Lower Bound	Total Output	-0.01%	N/A	0.01%
	Total Employment	-0.01%	N/A	0.01%
Upper Bound	Total Output	0.01%	N/A	0.02%
	Total Employment	0.01%	N/A	0.03%
Survey-Based	Total Output	-0.01%	N/A	0.03%
	Total Employment	-0.02%	N/A	0.06%
5-County Area				
Lower Bound	Total Output	-0.07%	N/A	0.10%
	Total Employment	-0.11%	N/A	0.15%
Upper Bound	Total Output	0.10%	N/A	0.27%
	Total Employment	0.14%	N/A	0.40%
Survey-Based	Total Output	-0.14%	N/A	0.47%
	Total Employment	-0.22%	N/A	0.71%
Cody, WY				
Lower Bound	Total Output	-0.06%	N/A	0.10%
	Total Employment	-0.12%	N/A	0.19%
Upper Bound	Total Output	0.11%	N/A	0.27%
	Total Employment	0.21%	N/A	0.52%
Survey-Based	Total Output	-0.04%	N/A	0.12%
	Total Employment	-0.07%	N/A	0.24%
Jackson, WY				
Lower Bound	Total Output	-0.08%	N/A	0.13%
	Total Employment	-0.13%	N/A	0.21%
Upper Bound	Total Output	0.14%	N/A	0.36%
	Total Employment	0.23%	N/A	0.57%
Survey-Based	Total Output	-0.17%	N/A	0.61%
	Total Employment	-0.27%	N/A	0.98%
West Yellowstone, MT				
Lower Bound	Total Output	-3.49%	N/A	5.56%
	Total Employment	-4.27%	N/A	8.27%
Upper Bound	Total Output	6.06%	N/A	15.10%
	Total Employment	7.41%	N/A	22.46%
Survey-Based	Total Output	-3.86%	N/A	13.72%
	Total Employment	-4.73%	N/A	20.39%

(a) Total output is in dollars, and total employment is in full and part-time jobs.

Table 4-8: Categorization of Economic Impact Levels for Alternative 1

Alternative 1 Economic Impacts	---------- As compared to ----------		
Area	Historical Conditions	Current Conditions	No Motorized Oversnow Access
3-State Area	Negligible Adverse to Negligible Beneficial	N/A	Negligible Beneficial
5-County Area	Negligible Adverse to Negligible Beneficial	N/A	Negligible Beneficial
Cody, WY	Negligible Adverse to Negligible Beneficial	N/A	Negligible Beneficial
Jackson, WY	Negligible Adverse to Negligible Beneficial	N/A	Negligible Beneficial
West Yellowstone, MT	Negligible Adverse to Minor Beneficial	N/A	Minor Beneficial to Major Beneficial

Table 4-9: Categorization of Economic Impact Levels for Alternative 1 with "road closure experiment"

Alternative 1 with "road closure experiment" Economic Impacts	----------As compared to----------		
Area	Historical Conditions	Current Conditions	No Motorized Oversnow Access
3-State Area	Negligible Adverse to Negligible Beneficial	N/A	Negligible Beneficial
5-County Area	Negligible Adverse to Negligible Beneficial	N/A	Negligible Beneficial
Cody, WY	Negligible Adverse to Negligible Beneficial	N/A	Negligible Beneficial
Jackson, WY	Negligible Adverse to Negligible Beneficial	N/A	Negligible Beneficial
West Yellowstone, MT	Negligible Adverse to Minor Beneficial	N/A	Minor Beneficial to Major Beneficial

Cumulative Effect

In Section 1.9, a variety of trends and actions are listed that directly or indirectly influence socioeconomics. Some of these beneficial trends are population growth and suburban and rural land subdivision in the communities and counties of the Greater Yellowstone Area and oil and gas leasing. Some of these beneficial trends are reflected in the 1999-2003 comparisons found in Section 3.3.3.1.

Specific projects in the parks that have a generally beneficial bearing on socioeconomics include the new Old Faithful and Canyon visitor centers in Yellowstone, the new Craig Thomas Discovery and Visitor Center and Laurance S. Rockefeller Preserve in Grand Teton, road reconstruction in Yellowstone and Grand Teton, and Grand Teton's summer transportation plan. Some of these longer-term beneficial projects may, in their implementation phase, depress visitation. 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 (not to mention the disturbance from construction activities). This may also be discouraging to some visitors.

Elsewhere in the region, some of the specific projects that have affected socioeconomics include the relocation of a substantial number of Marathon Oil Company employees from Cody, highway reconstruction over Togwotee Pass, and replacement of the tram at the Jackson Hole Ski Resort. The first had a substantial adverse impact on output and

employment in Cody and Park County, Wyoming. The latter two, when completed, can be beneficial to visitation and recreation.

An increase in recreation within the parks would be additive to the existing broad trend of economic growth and employment opportunities. A reduction would be somewhat offset by the beneficial regional economic trends. Alternative 1 allows for levels of use that exceed average current use by over 100% and near historic levels of use can be achieved considering the allowable mix of snowmobile and snowcoach use. Therefore, this alternative would likely be additive to all other current and reasonably foreseeable actions contributing to a beneficial multi-regional economy.

Conclusion

The direct impacts of implementing alternative 1 would generally range from beneficial negligible to adverse negligible and would be long-term and regional (as outlined in Table 4-8). The variation of alternative 1 (the closure of the Madison to Norris road segment) would also generally result in direct, negligible, beneficial to negligible, adverse, long-term, and regional impacts. As described earlier, the adverse direct impacts would be most directly felt by communities and businesses near the parks, especially in areas that have a higher proportion of business tied directly to park visitation. The indirect impacts from implementing alternative 1 would be negligible, beneficial to negligible, adverse, long-term, and regional. As individual businesses are adversely affected, they would reduce purchases of other goods and services from suppliers.

In terms of cumulative impacts, some of the communities and areas near the park have already identified adverse impacts, including reduced income and employment, which have occurred over the past few years; implementing alternative 1 may exacerbate these effects. Implementing alternative 1 would contribute a generally negligible, beneficial to negligible, adverse, long-term, regional impact to past, present, and foreseeable actions and impacts on socioeconomics.

Alternative 2

The economic impact estimates for alternative 2 are presented in absolute terms in Table 4-10, and in relative terms (percentages) in Table 4-11. The absolute impact levels are annual estimates. The impacts are then categorized as to intensity level in Table 4-12.

The economic impacts presented in the following tables for alternative 2 are the IMPLAN outputs as compared to the definition of impacts, above. A negligible impact means that the impact is difficult to detect at the state, 5-county, or community level. It does not mean that within any of those three levels adverse (or beneficial) effects are not occurring. They are. For businesses and their employees who are the companies and people behind reduction in output and employment, the adverse impacts are anything but negligible. The results also mask adverse impacts that may be occurring to types of businesses or businesses in a geographic area that is particularly dependent on park visitors. For example, businesses along the North Fork of the Shoshone River state that if the East Entrance is closed under alternative 2, most of them would close in the winter. Further exacerbating their situation is the recent downturn in visitation that has already caused some of the businesses to curtail operations or close entirely in the winter. To these businesses and others similarly situated near other entrances, the impacts of the current conditions are major, adverse, and long-term, and alternative 2 would continue those impacts into the future.

Table 4-10: Absolute Economic Impact Estimates, Alternative 2

Alternative 2 Absolute Impact Levels		---------- As compared to ----------		
Area/Estimate	Impact (a)	Historical Conditions	Current Conditions	No Motorized Oversnow Access
3-State Area				
Lower Bound	Total Output	-14,008,636	-6,801,162	4,683,531
	Total Employment	-259	-126	86
Upper Bound	Total Output	1,524,252	8,731,849	20,216,124
	Total Employment	28	161	373
Survey-Based	Total Output	-35,649,881	-8,305,929	35,264,385
	Total Employment	-658	-153	651
5-County Area				
Lower Bound	Total Output	-11,406,400	-5,537,782	3,815,316
	Total Employment	-208	-101	70
Upper Bound	Total Output	1,241,108	7,109,826	16,468,539
	Total Employment	23	130	301
Survey-Based	Total Output	-29,027,581	-6,763,025	28,727,214
	Total Employment	-530	-124	525
Cody, WY				
Lower Bound	Total Output	-1,126,250	-546,791	376,557
	Total Employment	-25	-12	8
Upper Bound	Total Output	122,545	702,012	1,625,312
	Total Employment	3	16	36
Survey-Based	Total Output	-734,907	-171,223	726,960
	Total Employment	-16	-4	16
Jackson, WY				
Lower Bound	Total Output	-2,995,266	-1,454,195	1,001,412
	Total Employment	-52	-25	17
Upper Bound	Total Output	325,909	1,867,006	4,322,525
	Total Employment	6	32	75
Survey-Based	Total Output	-7,329,330	-1,707,633	7,250,077
	Total Employment	-127	-30	126
West Yellowstone, MT				
Lower Bound	Total Output	-11,323,068	-5,497,324	3,785,661
	Total Employment	-235	-114	79
Upper Bound	Total Output	1,232,041	7,057,883	16,340,532
	Total Employment	26	147	340
Survey-Based	Total Output	-14,755,242	-3,437,767	14,595,690
	Total Employment	-307	-71	304
(a) Total output is in dollars, and total employment is in full and part-time jobs.				

Table 4-11: Relative Economic Impact Estimates, Alternative 2

Alternative 2 Relative Impact Levels		---------- As compared to ----------		
Area/Estimate	Impact (a)	Historical Conditions	Current Conditions	No Motorized Oversnow Access
3-State Area				
Lower Bound	Total Output	-0.01%	0.00% (b)	0.00%
	Total Employment	-0.01%	-0.01%	0.00%
Upper Bound	Total Output	0.00%	0.01%	0.01%
	Total Employment	0.00%	0.01%	0.02%
Survey-Based	Total Output	-0.02%	0.00% (b)	0.02%
	Total Employment	-0.04%	-0.01%	0.04%
5-County Area				
Lower Bound	Total Output	-0.12%	-0.06%	0.04%
	Total Employment	-0.18%	-0.09%	0.06%
Upper Bound	Total Output	0.01%	0.07%	0.17%

Alternative 2 Relative Impact Levels		---------- As compared to ----------		
Area/Estimate	Impact (a)	Historical Conditions	Current Conditions	No Motorized Oversnow Access
	Total Employment	0.02%	0.11%	0.26%
Survey-Based	Total Output	-0.30%	-0.07%	0.30%
	Total Employment	-0.46%	-0.11%	0.45%
Cody, WY				
Lower Bound	Total Output	-0.12%	-0.06%	0.04%
	Total Employment	-0.23%	-0.11%	0.08%
Upper Bound	Total Output	0.01%	0.08%	0.18%
	Total Employment	0.03%	0.15%	0.33%
Survey-Based	Total Output	-0.08%	-0.02%	0.08%
	Total Employment	-0.15%	-0.04%	0.15%
Jackson, WY				
Lower Bound	Total Output	-0.16%	-0.08%	0.05%
	Total Employment	-0.26%	-0.12%	0.09%
Upper Bound	Total Output	0.02%	0.10%	0.23%
	Total Employment	0.03%	0.16%	0.37%
Survey-Based	Total Output	-0.39%	-0.09%	0.39%
	Total Employment	-0.63%	-0.15%	0.62%
West Yellowstone, MT				
Lower Bound	Total Output	-6.78%	-3.29%	2.27%
	Total Employment	-10.09%	-4.90%	3.38%
Upper Bound	Total Output	0.74%	4.23%	9.79%
	Total Employment	1.10%	6.29%	14.57%
Survey-Based	Total Output	-8.84%	-2.06%	8.74%
	Total Employment	-13.15%	-3.06%	13.02%
(a) Impacts are expressed as percentage changes from the respective existing economic output and employment levels presented in Table 3-1. (b) The absolute impact level is adverse, but the relative impact level rounds to zero.				

Table 4-12: Categorization of Economic Impact Levels for Alternative 2

Alternative 2 Economic Impacts	----------As compared to ----------		
Area	Historical Conditions	Current Conditions	No Motorized Oversnow Access
3-State Area	Negligible Adverse to Negligible Beneficial	Negligible Adverse to Negligible Beneficial	Negligible Beneficial
5-County Area	Negligible Adverse to Negligible Beneficial	Negligible Adverse to Negligible Beneficial	Negligible Beneficial
Cody, WY	Negligible Adverse to Negligible Beneficial	Negligible Adverse to Negligible Beneficial	Negligible Beneficial
Jackson, WY	Negligible Adverse to Negligible Beneficial	Negligible Adverse to Negligible Beneficial	Negligible Beneficial
West Yellowstone, MT	Moderate Adverse to Negligible Beneficial	Negligible Adverse to Negligible Beneficial	Negligible Beneficial to Moderate Beneficial

Cumulative Effect

As indicated in Section 1.9 and noted in the alternative 1 Cumulative Effects, above, a number of trends and actions inside and outside the parks have the potential to impact, beneficially or adversely, the economics of the communities or the region. An increase in recreation in the parks would be additive to the existing broad trend of economic growth and employment opportunities. A reduction in 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. Alternative 2 would tend to discourage those out of state visitors who would have desired a snowmobile experience in the parks from coming to the area and contributing to local regional

economies. However, these visitors might consider visiting the parks on snowcoach tours, which would be allowed to increase in this alternative to allow for near historic levels of visitation. Other visitors who have been discouraged from visiting the parks in the winter due to the presence of snowmobiles would be encouraged to utilize snowcoach access. It is likely that this alternative would represent a beneficial impact with other current and reasonably foreseeable actions, or otherwise would be offset by broad regional trends.

Conclusion

The direct impacts of implementing alternative 2 would generally range from beneficial negligible to adverse negligible and would be long-term and regional (as outlined in Table 4-12). As described earlier, the adverse direct impacts would be most directly felt by communities and businesses near the parks, especially in areas that have a higher proportion of business tied directly to park visitation. The indirect impacts from implementing alternative 2 would generally be negligible, beneficial to negligible adverse, long-term, and regional. As individual businesses are adversely affected, they would reduce purchases of other goods and services from suppliers.

In terms of cumulative impacts, some of the communities and areas near the park have already identified adverse impacts, including reduced income and employment, which have occurred over the past few years; implementing alternative 2 may exacerbate these effects. Implementing alternative 2 would contribute a negligible, beneficial to negligible, adverse, long-term, regional impact to past, present, and foreseeable actions and impacts on socioeconomics.

Alternative 3

The economic impact estimates for alternative 3A are presented in absolute terms in Table 4-13, and in relative terms (percentages) in Table 4-14. The absolute impact levels are annual estimates. The impacts are then categorized as to intensity level in Table 4-15. Alternative 3B calls for no motorized access and is the No Action Alternative.

The economic impacts presented in the following tables for alternative 3A are the IMPLAN outputs as compared to the definition of impacts, above. A negligible impact means that the impact is difficult to detect at the state, 5-county, or community level. It does not mean that within any of those three levels adverse (or beneficial) effects are not occurring. They are. For businesses and their employees who are the companies and people behind reduction in output and employment, the adverse impacts are anything but negligible. The results also mask adverse impacts that may be occurring to types of businesses or businesses in a geographic area that is particularly dependent on park visitors. For example, businesses along the North Fork of the Shoshone River state that if the East Entrance is closed under alternatives 3A or 3B, most of them would close in the winter. Further exacerbating their situation is the recent downturn in visitation that has already caused some of the businesses to curtail operations or close entirely in the winter. To these businesses and others similarly situated near other entrances, the impacts of the current conditions are major, adverse, and long-term, and alternatives 3A and 3B would continue those impacts into the future. As another example, both alternatives 3A and 3B would result in the closure of Snowlodge at Old Faithful (and probably the Mammoth Hot Springs Hotel) in the winter. The expected reduction of access in 3A (and elimination of access to Old Faithful in 3B) would result in these overnight lodging facilities no longer being viable to operate in the winter. Also, the yurt camp at Canyon would be closed.

Table 4-13: Absolute Economic Impact Estimates, Alternative 3A

Alternative 3 Absolute Impact Levels		----------As compared to ----------		
Area/Estimate	Impact (a)	Historical Conditions	Current Conditions	No Motorized Oversnow Access
3-State Area				
Lower Bound	Total Output	-15,477,422	-8,270,007	3,214,755
	Total Employment	-286	-153	59
Upper Bound	Total Output	-7,999,357	-791,854	10,692,735
	Total Employment	-148	-15	198
Survey-Based	Total Output	-58,718,457	-31,374,865	12,196,183
	Total Employment	-1,084	-579	225
5-County Area				
Lower Bound	Total Output	-12,602,350	-6,733,776	2,618,817
	Total Employment	-230	-123	48
Upper Bound	Total Output	-6,513,403	-644,760	8,710,560
	Total Employment	-119	-12	159
Survey-Based	Total Output	-47,810,968	-25,546,691	9,935,305
	Total Employment	-873	-467	181
Cody, WY				
Lower Bound	Total Output	-1,244,335	-664,882	258,467
	Total Employment	-28	-15	6
Upper Bound	Total Output	-643,122	-63,663	859,661
	Total Employment	-14	-1	19
Survey-Based	Total Output	-1,210,455	-646,779	251,419
	Total Employment	-27	-14	6
Jackson, WY				
Lower Bound	Total Output	-3,309,316	-1,768,257	687,365
	Total Employment	-57	-31	12
Upper Bound	Total Output	-1,710,388	-169,311	2,286,274
	Total Employment	-30	-3	40
Survey-Based	Total Output	-12,072,047	-6,450,420	2,507,437
	Total Employment	-210	-112	44
West Yellowstone, MT				
Lower Bound	Total Output	-12,510,276	-6,684,580	2,598,461
	Total Employment	-260	-139	54
Upper Bound	Total Output	-6,465,816	-640,050	8,642,851
	Total Employment	-134	-13	180
Survey-Based	Total Output	-24,303,168	-12,985,843	5,047,916
	Total Employment	-505	-270	105

(a) Total output is in dollars, and total employment is in full and part-time jobs.

Table 4-14: Relative Economic Impact Estimates, Alternative 3A

Alternative 3 Relative Impact Levels		---------- As compared to ----------		
Area/Estimate	Impact (a)	Historical Conditions	Current Conditions	No Motorized Oversnow Access
3-State Area				
Lower Bound	Total Output	-0.01%	0.00% (b)	0.00%
	Total Employment	-0.02%	-0.01%	0.00%
Upper Bound	Total Output	0.00% (b)	0.00%	0.01%
	Total Employment	-0.01%	0.00%	0.01%
Survey-Based	Total Output	-0.04%	-0.02%	0.01%
	Total Employment	-0.06%	-0.03%	0.01%
5-County Area				
Lower Bound	Total Output	-0.13%	-0.07%	0.03%
	Total Employment	-0.20%	-0.11%	0.04%
Upper Bound	Total Output	-0.07%	-0.01%	0.09%
	Total Employment	-0.10%	-0.01%	0.14%
Survey-Based	Total Output	-0.50%	-0.27%	0.10%
	Total Employment	-0.75%	-0.40%	0.16%
Cody, WY				
Lower Bound	Total Output	-0.14%	-0.07%	0.03%
	Total Employment	-0.26%	-0.14%	0.05%
Upper Bound	Total Output	-0.07%	-0.01%	0.09%
	Total Employment	-0.13%	-0.01%	0.18%
Survey-Based	Total Output	-0.13%	-0.07%	0.03%
	Total Employment	-0.25%	-0.14%	0.05%
Jackson, WY				
Lower Bound	Total Output	-0.18%	-0.10%	0.04%
	Total Employment	-0.28%	-0.15%	0.06%
Upper Bound	Total Output	-0.09%	-0.01%	0.12%
	Total Employment	-0.15%	-0.01%	0.20%
Survey-Based	Total Output	-0.65%	-0.35%	0.13%
	Total Employment	-1.03%	-0.55%	0.21%
West Yellowstone, MT				
Lower Bound	Total Output	-7.49%	-4.00%	1.56%
	Total Employment	-11.15%	-5.96%	2.32%
Upper Bound	Total Output	-3.87%	-0.38%	5.18%
	Total Employment	-5.76%	-0.57%	7.71%
Survey-Based	Total Output	-14.55%	-7.78%	3.02%
	Total Employment	-21.66%	-11.57%	4.50%

(a) Impacts are expressed as percentage changes from the respective existing economic output and employment levels presented in Table 3-1.
(b) The absolute impact level is adverse, but the relative impact level rounds to zero.

Table 4-15: Categorization of Economic Impact Levels for Alternative 3A

Alternative 3Economic Impacts	---------- As compared to ----------		
Area	Historical Conditions	Current Conditions	No Motorized Oversnow Access
3-State Area	Negligible Adverse	Negligible Adverse to Negligible Beneficial	Negligible Beneficial
5-County Area	Negligible Adverse	Negligible Adverse	Negligible Beneficial
Cody, WY	Negligible Adverse	Negligible Adverse	Negligible Beneficial
Jackson, WY	Negligible Adverse	Negligible Adverse	Negligible Beneficial
West Yellowstone, MT	Negligible Adverse to Major Adverse	Negligible Adverse to Moderate Adverse	Negligible Beneficial

Cumulative Effect

As indicated in Section 1.9 and noted in the alternative 1 Cumulative Effects, above, a number of trends and actions inside and outside the parks have the potential to impact the economics of the communities or the region. An increase in recreation in the parks would be additive to the existing broad trend of economic growth and employment opportunities. On the other hand, 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. Alternative 3, including the "no action" option, would likely discourage out of state visitors from coming to the area and contributing to local regional economies. It is likely that this alternative would represent an adverse impact. However, with other current and reasonably foreseeable actions bolstering general economic well-being, the adverse impact would likely be offset by broad beneficial regional trends.

Conclusion

The direct impacts of implementing alternative 3A would range from beneficial, negligible to major, adverse impacts resulting from direct and indirect actions and would be long-term and regional. As described earlier, the adverse direct impacts would be most directly felt by communities and businesses near the parks, especially in areas that have a higher proportion of business tied directly to park visitation. The indirect impacts from implementing alternative 3A would be negligible, beneficial to major, adverse, long-term, and regional. As individual businesses are adversely affected, they would reduce purchases of other goods and services from suppliers.

In terms of cumulative impacts, some of the communities and areas near the park have already identified adverse impacts, including reduced income and employment, which have occurred over the past few years; implementing alternative 3A may exacerbate these effects. Implementing alternative 3A would contribute a negligible, beneficial to major, adverse, long-term, regional impact to past, present, and foreseeable actions and impacts on socioeconomics.

Alternative 4

The economic impact estimates for alternative 4 are presented in absolute terms in Table 4-16, and in relative terms (percentages) in Table 4-17. The absolute impact levels are annual estimates. The impacts are then categorized as to intensity level in Table 4-18.

The economic impacts presented in the following tables for alternative 4 are the IMPLAN outputs as compared to the definition of impacts, above. A negligible impact means that the impact is difficult to detect at the state, 5-county, or community level. It does not mean that within any of those three levels adverse (or beneficial) effects would not occur. The results also mask adverse or beneficial impacts that may be occurring to types of businesses or businesses in a geographic area that is particularly dependent on park visitors. For example, businesses along the North Fork of the Shoshone River state that under the Temporary Plan, the downturn in use has caused some of them to already curtail operations or close entirely in the winter. To those businesses, the beneficial impacts that may occur as a result of unguided or non-commercial guiding and higher snowmobile numbers are from a lower economic starting point.

Table 4-16: Absolute Economic Impact Estimates, Alternative 4

Alternative 4 Absolute Impact Levels		---------- As compared to ----------		
Area/Estimate	Impact (a)	Historical Conditions	Current Conditions	No Motorized Oversnow Access
3-State Area				
Lower Bound	Total Output	-560,909	6,646,790	21,333,095
	Total Employment	-10	123	333
Upper Bound	Total Output	27,438,085	34,647,141	54,277,042
	Total Employment	507	640	848
Survey-Based	Total Output	-12,167,669	15,176,513	69,120,979
	Total Employment	-225	280	1,080
5-County Area				
Lower Bound	Total Output	-456,715	5,412,087	14,703,798
	Total Employment	-8	99	269
Upper Bound	Total Output	22,341,201	28,211,114	37,410,356
	Total Employment	408	516	683
Survey-Based	Total Output	-9,907,409	12,357,335	47,641,515
	Total Employment	-181	226	870
Cody, WY				
Lower Bound	Total Output	-45,095	534,379	1,451,207
	Total Employment	-1	12	32
Upper Bound	Total Output	2,205,936	2,785,510	3,692,100
	Total Employment	49	63	81
Survey-Based	Total Output	-250,831	312,856	1,205,598
	Total Employment	-6	7	27
Jackson, WY				
Lower Bound	Total Output	-119,931	1,421,189	3,859,330
	Total Employment	-2	25	67
Upper Bound	Total Output	5,866,694	7,408,107	9,819,156
	Total Employment	102	128	170
Survey-Based	Total Output	-2,501,576	3,120,172	12,023,601
	Total Employment	-43	54	209
West Yellowstone, MT				
Lower Bound	Total Output	-453,378	5,372,549	14,589,504
	Total Employment	-9	112	303
Upper Bound	Total Output	22,177,985	28,005,017	37,119,560
	Total Employment	461	583	772
Survey-Based	Total Output	-5,036,115	6,281,458	24,205,638
	Total Employment	-105	131	503

(a) Total output is in dollars, and total employment is in full and part-time jobs.

Table 4-17: Relative Economic Impact Estimates, Alternative 4

Alternative 4 Relative Impact Levels		---------- As compared to ----------		
Area/Estimate	Impact (a)	Historical Conditions	Current Conditions	No Motorized Oversnow Access
3-State Area				
Lower Bound	Total Output	0.00%	0.00%	0.01%
	Total Employment	0.00%	0.01%	0.02%
Upper Bound	Total Output	0.02%	0.02%	0.03%
	Total Employment	0.03%	0.04%	0.05%
Survey-Based	Total Output	-0.01%	0.01%	0.04%
	Total Employment	-0.01%	0.02%	0.06%
5-County Area				
Lower Bound	Total Output	0.00% (b)	0.06%	0.15%
	Total Employment	-0.01%	0.09%	0.23%
Upper Bound	Total Output	0.23%	0.30%	0.39%
	Total Employment	0.35%	0.45%	0.59%
Survey-Based	Total Output	-0.10%	0.13%	0.50%
	Total Employment	-0.16%	0.20%	0.75%
Cody, WY				
Lower Bound	Total Output	0.00% (b)	0.06%	0.16%
	Total Employment	-0.01%	0.11%	0.30%
Upper Bound	Total Output	0.24%	0.30%	0.40%
	Total Employment	0.46%	0.59%	0.76%
Survey-Based	Total Output	-0.03%	0.03%	0.13%
	Total Employment	-0.05%	0.07%	0.25%
Jackson, WY				
Lower Bound	Total Output	-0.01%	0.08%	0.21%
	Total Employment	-0.01%	0.12%	0.33%
Upper Bound	Total Output	0.32%	0.40%	0.53%
	Total Employment	0.50%	0.63%	0.84%
Survey-Based	Total Output	-0.13%	0.17%	0.65%
	Total Employment	-0.21%	0.27%	1.03%
West Yellowstone, MT				
Lower Bound	Total Output	-0.27%	3.22%	8.74%
	Total Employment	-0.40%	4.79%	13.00%
Upper Bound	Total Output	13.28%	16.77%	22.23%
	Total Employment	19.78%	24.99%	33.07%
Survey-Based	Total Output	-3.02%	3.76%	14.50%
	Total Employment	-4.49%	5.60%	21.57%

(a) Impacts are expressed as percentage changes from the respective existing economic output and employment levels presented in Table 3-1.
(b) The absolute impact level is adverse, but the relative impact level rounds to zero.

Table 4-18: Categorization of Economic Impact Levels for Alternative 4

Alternative 4 Economic Impacts	---------- As compared to ----------		
Area	Historical Conditions	Current Conditions	No Motorized Oversnow Access
3-State Area	Negligible Adverse to Negligible Beneficial	Negligible Beneficial	Negligible Beneficial
5-County Area	Negligible Adverse to Negligible Beneficial	Negligible Beneficial	Negligible Beneficial
Cody, WY	Negligible Adverse to Negligible Beneficial	Negligible Beneficial	Negligible Beneficial
Jackson, WY	Negligible Adverse to Negligible Beneficial	Negligible Beneficial	Negligible Beneficial
West Yellowstone, MT	Negligible Adverse to Moderate Beneficial	Negligible Beneficial to Major Beneficial	Minor Beneficial to Major Beneficial

Cumulative Effect

As indicated in Section 1.9 and noted in the Alternative 1 Cumulative Effects, above, a number of trends and actions inside and outside the parks have the potential to impact, beneficially or adversely, the economics of the communities or the region. An increase in park visitation would be additive to the existing broad trend of economic growth and employment opportunities. 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. Alternative 4 allows for snowmobile use that exceeds average historic levels. Such allowable use levels, along with the provision for unguided or non-commercially guided access, would be attractive to some visitors and encourage them to visit the parks. However, such use would likely depress use by those seeking a different kind of visitor experience. On balance, this alternative would likely be additive to all other current and reasonably foreseeable actions contributing to a beneficial multi-regional economy.

Conclusion

The direct impacts of implementing alternative 4 would generally range from negligible, beneficial to negligible, adverse and would be long-term and regional. As described earlier, the adverse direct impacts would be most directly felt by communities and businesses near the parks, especially in areas that have a higher proportion of business tied directly to park visitation. The indirect impacts from implementing alternative 4 would generally be negligible, beneficial to negligible, adverse, long-term, and regional. As individual businesses are adversely affected, they would reduce purchases of other goods and services from suppliers.

In terms of cumulative impacts, some of the communities and areas near the park have already identified adverse impacts, including reduced income and employment, which have occurred over the past few years; implementing alternative 4 may exacerbate these effects. Implementing alternative 4 may reverse this trend through the provision for more snowmobile access, a portion of that use non-commercially guided, and Sylvan Pass remaining open. Thus alternative 4 would probably contribute a negligible, beneficial, long-term, regional impact to past, present, and foreseeable actions and impacts on socioeconomics, especially on the east side of Yellowstone.

Alternative 5

The economic impact estimates for alternative 5 are presented in absolute terms in Table 4-19, and in relative terms (percentages) in Table 4-20. The absolute impact levels are annual estimates. The impacts are then categorized as to intensity level in Table 4-21.

The economic impacts presented in the following tables for alternative 5 are the IMPLAN outputs as compared to the definition of impacts, above. A negligible impact means that the impact is difficult to detect at the state, 5-county, or community level. It does not mean that within any of those three levels adverse (or beneficial) effects would not occur. The results also mask adverse or beneficial impacts that may be occurring to types of businesses or businesses in a geographic area that is particularly dependent on park visitors. For example, businesses along the North Fork of the Shoshone River state that under the Temporary Plan, the downturn in use has already caused some of the businesses to curtail operations or close entirely in the winter. To those businesses, the beneficial impacts that may occur as a result of unguided access are from a lower economic starting point.

Table 4-19: Absolute Economic Impact Estimates, Alternative 5

Alternative 5 Absolute Impact Levels		---------- As compared to ----------		
Area/Estimate	Impact (a)	Historical Conditions	Current Conditions	No Motorized Oversnow Access
3-State Area				
Lower Bound	Total Output	-4,392,452	2,815,061	14,235,403
	Total Employment	-81	52	263
Upper Bound	Total Output	9,183,061	16,391,232	27,750,149
	Total Employment	170	303	512
Survey-Based	Total Output	-12,167,669	15,176,513	58,482,820
	Total Employment	-225	280	1,080
5-County Area				
Lower Bound	Total Output	-3,576,513	2,292,137	11,596,503
	Total Employment	-65	42	212
Upper Bound	Total Output	7,477,220	13,346,409	22,605,940
	Total Employment	137	244	413
Survey-Based	Total Output	-9,907,409	12,357,335	47,641,515
	Total Employment	-181	226	870
Cody, WY				
Lower Bound	Total Output	-353,139	226,321	1,144,529
	Total Employment	-8	5	25
Upper Bound	Total Output	738,289	1,317,798	2,231,024
	Total Employment	16	30	49
Survey-Based	Total Output	-250,831	312,856	1,205,598
	Total Employment	-6	7	27
Jackson, WY				
Lower Bound	Total Output	-939,175	601,905	3,043,753
	Total Employment	-16	10	53
Upper Bound	Total Output	1,963,483	3,504,705	5,933,417
	Total Employment	34	61	103
Survey-Based	Total Output	-2,501,576	3,120,172	12,023,601
	Total Employment	-43	54	209
West Yellowstone, MT				
Lower Bound	Total Output	-3,544,173	2,275,392	11,506,361
	Total Employment	-74	47	239
Upper Bound	Total Output	7,409,608	13,248,907	22,430,221
	Total Employment	154	276	466
Survey-Based	Total Output	-5,027,304	6,281,458	24,205,638
	Total Employment	-105	131	503

(a) Total output is in dollars, and total employment is in full and part-time jobs.

Table 4-20: Relative Economic Impact Estimates, Alternative 5

Alternative 5 Relative Impact Levels		---------- As compared to ----------		
Area/Estimate	Impact (a)	Historical Conditions	Current Conditions	No Motorized Oversnow Access
3-State Area				
Lower Bound	Total Output	0.00%	0.00%	0.01%
	Total Employment	0.00%	0.00%	0.02%
Upper Bound	Total Output	0.01%	0.01%	0.02%
	Total Employment	0.01%	0.02%	0.03%
Survey-Based	Total Output	-0.01%	0.01%	0.04%
	Total Employment	-0.01%	0.02%	0.06%
5-County Area				
Lower Bound	Total Output	-0.04%	0.02%	0.12%
	Total Employment	-0.06%	0.04%	0.18%
Upper Bound	Total Output	0.08%	0.14%	0.24%
	Total Employment	0.12%	0.21%	0.36%
Survey-Based	Total Output	-0.10%	0.13%	0.50%
	Total Employment	-0.16%	0.20%	0.75%
Cody, WY				
Lower Bound	Total Output	-0.04%	0.02%	0.12%
	Total Employment	-0.07%	0.05%	0.24%
Upper Bound	Total Output	0.08%	0.14%	0.24%
	Total Employment	0.15%	0.28%	0.46%
Survey-Based	Total Output	-0.03%	0.03%	0.13%
	Total Employment	-0.05%	0.07%	0.25%
Jackson, WY				
Lower Bound	Total Output	-0.05%	0.03%	0.16%
	Total Employment	-0.08%	0.05%	0.26%
Upper Bound	Total Output	0.11%	0.19%	0.32%
	Total Employment	0.17%	0.30%	0.51%
Survey-Based	Total Output	-0.13%	0.17%	0.65%
	Total Employment	-0.21%	0.27%	1.03%
West Yellowstone, MT				
Lower Bound	Total Output	-2.12%	1.36%	6.89%
	Total Employment	-3.17%	2.03%	10.25%
Upper Bound	Total Output	4.44%	7.93%	13.43%
	Total Employment	6.62%	11.82%	19.99%
Survey-Based	Total Output	-3.01%	3.76%	14.50%
	Total Employment	-4.49%	5.60%	21.57%
(a) Impacts are expressed as percentage changes from the respective existing economic output and employment levels presented in Table 3-1.				

Table 4-21: Categorization of Economic Impact Levels for Alternative 5

Alternative 5 Economic Impacts	---------- As compared to ----------		
Area	Historical Conditions	Current Conditions	No Motorized Oversnow Access
3-State Area	Negligible Adverse to Negligible Beneficial	Negligible Beneficial	Negligible Beneficial
5-County Area	Negligible Adverse to Negligible Beneficial	Negligible Beneficial	Negligible Beneficial
Cody, WY	Negligible Adverse to Negligible Beneficial	Negligible Beneficial	Negligible Beneficial
Jackson, WY	Negligible Adverse to Negligible Beneficial	Negligible Beneficial	Negligible Beneficial
West Yellowstone, MT	Negligible Adverse to Minor Beneficial	Negligible Beneficial to Moderate Beneficial	Minor Beneficial to Major Beneficial

Cumulative Effect

As indicated in Section 1.9 and noted in the alternative 1 Cumulative Effects, above, a number of trends and actions inside and outside the parks have the potential to impact, beneficially or adversely, the economics of the communities or the region. An increase in visitation would be additive to the existing broad trend of economic growth and employment opportunities. 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. Alternative 5 allows for levels of use that exceed average current use, and near historic levels of use can be achieved, considering the allowable mix of snowmobile and snowcoach use. In addition, the provision for unguided snowmobiles in alternative 5 would be attractive to visitors seeking that type of experience. Use levels might be attractive to those seeking a different experience, and thus this alternative might be most attractive for both visitors seeking a snowmobile, snowcoach, or ski/snowshoe experience. Therefore, this alternative would likely be additive to all other current and reasonably foreseeable actions contributing to a beneficial multi-regional economy.

Conclusion

The direct impacts of implementing alternative 5 would generally range from negligible, beneficial to negligible, adverse and would be long-term and regional. As described earlier, the adverse, direct impacts would be most directly felt by communities and businesses near the parks, especially in areas that have a higher proportion of business tied directly to park visitation. The indirect impacts from implementing alternative 5 would be negligible, beneficial to major, adverse, long-term, and regional. As individual businesses are adversely affected, they would reduce purchases of other goods and services from suppliers.

In terms of cumulative impacts, some of the communities and areas near the park have already identified adverse impacts, including reduced income and employment, which have occurred over the past few years; implementing alternative 5 may exacerbate these effects. The provision for unguided access, and Sylvan Pass remaining open under this alternative would contribute a negligible, beneficial, long-term, regional impact to past, present, and foreseeable actions and impacts on socioeconomics, especially on the east side of Yellowstone.

Alternative 6

The economic impact estimates for alternative 6 are presented in absolute terms in Table 4-22, and in relative terms (percentages) in Table 4-23. The absolute impact levels are annual estimates. The impacts are then categorized as to intensity level in Table 4-24.

The economic impacts presented in the following tables for alternative 6 are the IMPLAN outputs as compared to the definition of impacts, above. A negligible impact means that the impact is difficult to detect at the state, 5-county, or community level. It does not mean that within any of those three levels adverse (or beneficial) effects are not occurring. They are. For businesses and their employees who are the companies and people behind reduction in output and employment, the adverse impacts are anything but negligible. The results also mask adverse impacts that may be occurring to types of businesses or businesses in a geographic area that is particularly dependent on park visitors. For example, businesses along the North Fork of the Shoshone River state that if the East Entrance is closed under alternative 6, most of them would close in the winter. Further exacerbating their situation is the recent downturn in visitation that has already caused some of the businesses to curtail operations or close entirely in the winter. To these businesses and others similarly situated

near other entrances, the impacts of the current conditions are major, adverse, and long-term, and alternative 6 would continue those impacts into the future.

Table 4-22: Absolute Economic Impact Estimates, Alternative 6

Alternative 6 Absolute Impact Levels		---------- As compared to ----------		
Area/Estimate	Impact (a)	Historical Conditions	Current Conditions	No Motorized Oversnow Access
3-State Area				
Lower Bound	Total Output	-5,919,530	-1,548,603	5,416,175
	Total Employment	-109	-29	100
Upper Bound	Total Output	24,613,642	28,984,311	35,949,480
	Total Employment	455	535	664
Survey-Based	Total Output	-19,639,210	7,704,402	51,275,062
	Total Employment	-363	142	947
5-County Area				
Lower Bound	Total Output	-4,819,922	-1,260,936	4,412,146
	Total Employment	-88	-23	81
Upper Bound	Total Output	20,041,429	23,600,206	29,285,312
	Total Employment	366	431	535
Survey-Based	Total Output	-15,991,044	6,273,237	41,769,899
	Total Employment	-292	115	763
Cody, WY				
Lower Bound	Total Output	-475,911	-124,502	435,443
	Total Employment	-11	-3	10
Upper Bound	Total Output	1,978,855	2,330,231	2,890,224
	Total Employment	44	52	64
Survey-Based	Total Output	-404,853	158,822	1,057,013
	Total Employment	-9	4	23
Jackson, WY				
Lower Bound	Total Output	-1,265,688	-331,116	1,158,063
	Total Employment	-22	-6	20
Upper Bound	Total Output	5,262,782	6,197,304	7,686,563
	Total Employment	91	107	134
Survey-Based	Total Output	-4,037,664	1,583,964	10,541,743
	Total Employment	-70	27	183
West Yellowstone, MT				
Lower Bound	Total Output	-4,784,709	-1,251,724	4,377,851
	Total Employment	-99	-26	91
Upper Bound	Total Output	19,895,009	23,427,788	29,057,678
	Total Employment	414	487	604
Survey-Based	Total Output	-8,128,535	3,188,799	21,222,399
	Total Employment	-169	66	441
(a) Total output is in dollars, and total employment is in full and part-time jobs.				

Table 4-23: Relative Economic Impact Estimates, Alternative 6

Alternative 6 Relative Impact Levels		---------- As compared to ----------		
Area/Estimate	Impact (a)	Historical Conditions	Current Conditions	No Motorized Oversnow Access
3-State Area				
Lower Bound	Total Output	0.00% (b)	0.00%	0.00%
	Total Employment	-0.01%	0.00%	0.01%
Upper Bound	Total Output	0.01%	0.02%	0.02%
	Total Employment	0.03%	0.03%	0.04%
Survey-Based	Total Output	-0.01%	0.00%	0.03%
	Total Employment	-0.02%	0.01%	0.05%
5-County Area				
Lower Bound	Total Output	-0.05%	-0.01%	0.05%
	Total Employment	-0.08%	-0.02%	0.07%
Upper Bound	Total Output	0.21%	0.25%	0.31%
	Total Employment	0.32%	0.37%	0.46%
Survey-Based	Total Output	-0.17%	0.07%	0.44%
	Total Employment	-0.25%	0.10%	0.66%
Cody, WY				
Lower Bound	Total Output	-0.05%	-0.01%	0.05%
	Total Employment	-0.10%	-0.03%	0.09%
Upper Bound	Total Output	0.22%	0.25%	0.32%
	Total Employment	0.41%	0.48%	0.60%
Survey-Based	Total Output	-0.04%	0.02%	0.12%
	Total Employment	-0.08%	0.03%	0.22%
Jackson, WY				
Lower Bound	Total Output	-0.07%	-0.02%	0.06%
	Total Employment	-0.11%	-0.03%	0.10%
Upper Bound	Total Output	0.28%	0.33%	0.41%
	Total Employment	0.45%	0.53%	0.66%
Survey-Based	Total Output	-0.22%	0.09%	0.57%
	Total Employment	-0.35%	0.14%	0.90%
West Yellowstone, MT				
Lower Bound	Total Output	-2.87%	-0.75%	2.62%
	Total Employment	-4.26%	-1.12%	3.90%
Upper Bound	Total Output	11.91%	14.03%	17.40%
	Total Employment	17.73%	20.87%	25.88%
Survey-Based	Total Output	-4.87%	1.91%	12.71%
	Total Employment	-7.24%	2.84%	18.90%

(a) Impacts are expressed as percentage changes from the respective existing economic output and employment levels presented in Table 3-1.
(b) The absolute impact level is adverse, but the relative impact level rounds to zero.

Table 4-24: Categorization of Economic Impact Levels for Alternative 6

Alternative 6 Economic Impacts	---------- As compared to ----------		
Area	Historical Conditions	Current Conditions	No Motorized Oversnow Access
3-State Area	Negligible Adverse to Negligible Beneficial	Negligible Beneficial	Negligible Beneficial
5-County Area	Negligible Adverse to Negligible Beneficial	Negligible Adverse to Negligible Beneficial	Negligible Beneficial
Cody, WY	Negligible Adverse to Negligible Beneficial	Negligible Beneficial	Negligible Beneficial
Jackson, WY	Negligible Adverse to Negligible Beneficial	Negligible Beneficial	Negligible Beneficial
West Yellowstone, MT	Negligible Adverse to Moderate Beneficial	Negligible Adverse To Major Beneficial	Negligible Beneficial To Major Beneficial

Cumulative Effect

As indicated in Section 1.9 and noted in the Alternative 1 Cumulative Effects, above, a number of trends and actions inside and outside the parks have the potential to impact, beneficially or adversely, the economics of the communities or the region. An increase in park visitation would be additive to the existing broad trend of economic growth and employment opportunities. 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. Alternative 6 allows for levels of use that exceed average current use and historic levels of use can be achieved considering the allowable mix of snowmobile, snowcoach, and commercial wheeled vehicle use. Therefore, this alternative would likely be additive to all other current and reasonably foreseeable actions contributing to a beneficial multi-regional economy.

Conclusion

The direct impacts of implementing alternative 6 would generally range from negligible, beneficial to negligible, adverse and would be long-term and regional. As described earlier, the adverse, direct impacts would be most directly felt by communities and businesses near the parks, especially in areas that have a higher proportion of business tied directly to park visitation. The indirect impacts from implementing alternative 6 would be negligible, beneficial to major, adverse, long-term, and regional. As individual businesses are adversely affected, they would reduce purchases of other goods and services from suppliers.

In terms of cumulative impacts, some of the communities and areas near the park have already identified adverse impacts, including reduced income and employment, which have occurred over the past few years; implementing alternative 6 may exacerbate these effects. Implementing alternative 6 would contribute a generally negligible, beneficial to negligible, adverse, long-term, regional impact to past, present, and foreseeable actions and impacts on socioeconomics.

Alternative 7

The economic impact estimates for alternative 7 are presented in absolute terms in Table 4-25, and in relative terms (percentages) in Table 4-26. The absolute impact levels are annual estimates. The impacts are then categorized as to intensity level in Table 4-27.

As described in Chapter II, section 2.5.5, the variation of alternative 7 including implementation of the “road closure experiment” would have similar economic impacts as for alternative 7. As described in Duffield and Neher (2006) and Duffield and Neher (2007), current use levels are well below the use levels called for in this variation of alternative 7; therefore, the limits would not be constraining on winter use. However, the road closure would constrain access from West Yellowstone to Canyon and from Mammoth Hot Springs to Old Faithful, which could limit or reduce visitor access and reduce business opportunities. Some substitution on destinations (Mammoth to Canyon and West to Old Faithful) would occur, but some business opportunities would be forgone. In particular, the overnight yurt operation at Canyon that originates in West Yellowstone would be adversely affected. Also, Xanterra’s access for visitors from Mammoth to Snow Lodge at Old Faithful would be adversely affected if the road segment were closed. The magnitude and type of effects of implementing a road closure experiment would be similar under alternatives 1, 2, 4, 5, and 6.

The economic impacts presented in the following tables for alternative 7 are the IMPLAN outputs as compared to the definition of impacts, above. A negligible impact means that the impact is difficult to detect at the state, 5-county, or community level. It does not mean that within any of those three levels adverse (or beneficial) effects are not occurring. They are.

For businesses and their employees who are the companies and people behind reduction in output and employment, the adverse impacts are anything but negligible. The results also mask adverse impacts that may be occurring to types of businesses or businesses in a geographic area that is particularly dependent on park visitors. For example, businesses along the North Fork of the Shoshone River report that if the East Entrance is closed under alternative 7, most of them would close in the winter. Further exacerbating their situation is the recent downturn in visitation that has caused some of the businesses to already curtail operations or close entirely in the winter. To these businesses and others similarly situated near other entrances, the impacts of the current conditions are major, adverse, and long-term, and alternative 7 would continue those impacts into the future.

Table 4-25: Absolute Economic Impact Estimates, Alternative 7

Alternative 7 Absolute Impact Levels		---------- As compared to ----------		
Area/Estimate	Impact (a)	Historical Conditions 1997-1998	Historical Conditions 2001-2002	No Motorized Oversnow Access
3-State Area				
Lower Bound	Total Output	-8,569,093	-14,519,368	10,130,521
	Total Employment	-160	-271	189
Upper Bound	Total Output	9,668,252	9,668,252	28,367,867
	Total Employment	180	180	529
5-County Area				
Lower Bound	Total Output	-6,974,396	-11,817,331	8,245,244
	Total Employment	-129	-219	153
Upper Bound	Total Output	7,869,002	7,869,002	23,088,641
	Total Employment	146	146	427
Cody, WY				
Lower Bound	Total Output	-438,926	-549,937	-14,324
	Total Employment	-10	-12	0
Upper Bound	Total Output	-438,926	-549,937	-14,324
	Total Employment	-10	-12	0
Jackson, WY				
Lower Bound	Total Output	-1,566,276	-2,653,879	1,851,677
	Total Employment	-27	-45	32
Upper Bound	Total Output	1,767,182	1,767,182	5,185,134
	Total Employment	30	30	89
West Yellowstone, MT				
Lower Bound	Total Output	-5,245,641	-8,888,151	6,201,482
	Total Employment	-113	-191	134
Upper Bound	Total Output	5,918,500	5,918,500	17,365,624
	Total Employment	128	128	374
Wapiti, WY				
Lower Bound	Total Output	-296,461	-371,441	-9,675
	Total Employment	-9	-11	0
Upper Bound	Total Output	-296,461	-371,441	-9,675

Alternative 7 Absolute Impact Levels		---------- As compared to ----------		
Area/Estimate	Impact (a)	Historical Conditions 1997-1998	Historical Conditions 2001-2002	No Motorized Oversnow Access
	Total Employment	-9	-11	0
(a) Total output is in dollars, and total employment is in full and part-time jobs.				

Table 4-26: Relative Economic Impact Estimates, Alternative 7

Alternative 7: Relative Impact Levels		---------- As compared to ----------		
Area/Estimate	Impact (a)	Historical Conditions 1997-1998	Historical Conditions 2001-2002	No Motorized Oversnow Access
3-State Area				
Lower Bound	Total Output	-0.01%	-0.01%	0.01%
	Total Employment	-0.01%	-0.02%	0.01%
Upper Bound	Total Output	0.01%	0.01%	0.02%
	Total Employment	0.01%	0.01%	0.03%
5-County Area				
Lower Bound	Total Output	-0.07%	-0.12%	0.09%
	Total Employment	-0.11%	-0.19%	0.13%
Upper Bound	Total Output	0.08%	0.08%	0.24%
	Total Employment	0.13%	0.13%	0.37%
Cody, WY				
Lower Bound	Total Output	-0.05%	-0.06%	0.00%
	Total Employment	-0.09%	-.011%	0.00%
Upper Bound	Total Output	0.05%	-0.06%	0.00%
	Total Employment	0.09%	-0.11%	0.00%
Jackson, WY				
Lower Bound	Total Output	-0.08%	-0.14%	0.10%
	Total Employment	-0.13%	-0.22%	0.16%
Upper Bound	Total Output	0.10%	0.10%	0.28%
	Total Employment	0.15%	0.15%	0.44%
West Yellowstone, MT				
Lower Bound	Total Output	-3.14%	-5.32%	3.71%
	Total Employment	-4.84%	-8.21%	5.73%
Upper Bound	Total Output	3.54%	3.54%	10.40%
	Total Employment	5.47%	5.47%	16.04%
Wapiti, WY				
Lower Bound	Total Output	-2.88%	-3.61%	-0.09%
	Total Employment	-7.81%	-9.79%	-0.26%
Upper Bound	Total Output	-2.88%	-3.61%	-0.09%
	Total Employment	-7.81%	-9.79%	-0.26%
(a) Impacts are expressed as percentage changes from the respective existing economic output and employment levels presented in Table 3-1.				

Table 4-27: Categorization of Economic Impact Levels for Alternative 7

Alternative 7 Economic Impacts	---------- As compared to ----------		
Area	Historical Conditions 1997-1998	Historical Conditions 2001-2002	No Motorized Oversnow Access
3-State Area	Negligible Adverse to Negligible Beneficial	Negligible Adverse to Negligible Beneficial	Negligible Beneficial
5-County Area	Negligible Adverse to Negligible Beneficial	Negligible Adverse to Negligible Beneficial	Negligible Beneficial
Cody, WY	Negligible Adverse to Negligible Beneficial	Negligible Adverse	Negligible Beneficial
Jackson, WY	Negligible Adverse to Negligible Beneficial	Negligible Adverse to Negligible Beneficial	Negligible Beneficial
West Yellowstone, MT	Negligible Adverse to Minor Beneficial	Minor Adverse to Minor Beneficial	Minor Beneficial to Moderate Beneficial
Wapiti, WY	Minor Adverse	Minor Adverse	Negligible Adverse

Cumulative Effect

As indicated in Section 1.9 and noted in the Alternative 1 Cumulative Effects, above, a number of trends and actions inside and outside the parks have the potential to impact, beneficially or adversely, the economics of the communities or the region. An increase in park visitation would be additive to the existing broad trend of economic growth and employment opportunities. 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. Alternative 7 would allow for levels of use that exceed average current use and near historic levels of use can be achieved considering the allowable mix of snowmobile and snowcoach use. Therefore, this alternative would likely be additive to all other current and reasonably foreseeable actions contributing to a beneficial multi-regional economy.

Conclusion

The direct impacts of implementing alternative 7 would generally range from negligible, beneficial to negligible, adverse and would be long-term and regional. As described earlier, the adverse, direct impacts would be most directly felt by communities and businesses near the parks, especially in areas that have a higher proportion of business tied directly to park visitation. The indirect impacts from implementing alternative 7 would be negligible, beneficial to major, adverse, long-term, and regional. As individual businesses are adversely affected, they would reduce purchases of other goods and services from suppliers.

In terms of cumulative impacts, some of the communities and areas near the park have already identified adverse impacts, including reduced income and employment, which have occurred over the past few years; implementing alternative 7 may exacerbate these effects. Implementing alternative 7 would contribute a generally negligible, beneficial to negligible, adverse, long-term, regional impact to past, present, and foreseeable actions and impacts on socioeconomics.

Comparison of Results to Other Studies

A number of other studies and documents were evaluated as a basis for alternative estimates or economic parameters for purposes of this analysis. These include: "Snowmobiling in Montana 2002" (Sylvester 2002); "2000-2001 Wyoming Snowmobile Survey" (McManus et al. 2001); "The Economic Impact of Travel & Tourism in Idaho" (Global Insight 2005); "Recreation Participation Patterns by Montana Residents" (Ellard et al. 1999); "Niche News: Winter Outdoor Enthusiasts" (Institute for Tourism and Recreation Research, 2003); "The

Montana Trail Users Study" (McCool and Harris 1994); "Wyoming Travel Industry 2003 Impact Report" (Wyoming Travel and Tourism 2003), "Economic Trends in the Winter Season for Park County, Wyoming" (David T. Taylor 2007), "Wolves and People in Yellowstone: Impacts on the Regional Economy" (John Duffield, Chris Neher, and David Patterson 2006), "Turning On the Off-Season, Opportunities for Progress in the Yellowstone-Teton Region (Yellowstone Business Partnership 2007), and "The Park County Economy – Restructuring and Change in a Growing Region" (Swanson 2006). With the exception of Sylvester (2002) and McManus et al. (2001), the studies are too general to provide parameters or estimates for application in this analysis. Most of the studies are at the state level, for the entire year, and for all types of recreation. These studies are discussed below.

The Bureau of Business and Economic Research at The University of Montana prepared the report "Snowmobiling in Montana 2002" for the Montana Department of Fish, Wildlife, and Parks and the Montana Snowmobile Association (Sylvester 2002). The report updated previous evaluations of the economic contribution of snowmobiling in the State of Montana. This report concentrated on snowmobile expenditures in the West Yellowstone area. The authors estimated that nonresident snowmobilers spend about $225 per activity day, including food, lodging, and often, snowmobile rental costs.

The main focus of the Sylvester (2002) study is on a statewide overview of snowmobiling in Montana. However, Sylvester explored the reaction to the NPS proposal to limit snowmobiles in Yellowstone National Park. The study asked West Yellowstone respondents if they would return to the area even if they could not snowmobile in the park. Over 56% said they would return. Sylvester estimated that about $33 million of the total nonresident expenditures from snowmobiling occur in West Yellowstone. He also estimated that restricting the number of individuals in Yellowstone National Park may result in a decline of nonresident expenditures of between $10 million and $15 million in West Yellowstone. This decline assumed that some of the snowmobilers may be replaced by other winter users. Sylvester estimated that these expenditure estimates translate into losses of between $2 million and $4 million in labor income, affecting winter employment opportunities in West Yellowstone, that some full-time jobs may become part-time jobs, and that some part-time jobs may cease to exist. Based on this study, as many as 150 jobs in West Yellowstone could be affected if the NPS were to limit snowmobiling in the park. These results are comparable to some of the estimates reported above in this EIS. For alternative 2 (snowcoaches only), output losses in West Yellowstone are estimated to range from $11 to $15 million under the lower bound and survey-based estimate scenarios.

The results from the 2000-2001 Wyoming Snowmobile Survey provide information on trail usage, expenditure information and user satisfaction for snowmobiling in the State of Wyoming. The results represent resident, nonresident, and outfitter client snowmobile use of Wyoming State trails during the season of 2000-2001. Trips to Yellowstone and Grand Teton National Parks trails accounted for 3.1% of resident, 4.6% of nonresident, and 33.2% of outfitter client snowmobile trips during the season. Daily per person trip expenditures in Wyoming ranged from $180.27 for outfitter clients to $98.99 for nonresidents and $68.50 for residents. Annual equipment expenditures in Wyoming ranged from $2,306.13 for residents to $329.94 for nonresidents, and $64.11 for outfitter clients (McManus et al. 2001). However, statewide information contained in the Wyoming survey is not directly comparable to survey data specific to the GYA.

In the 2000-2001 Wyoming Snowmobile Survey, the majority of residents (nearly 70%) preferred that there would be no ban on snowmobiles. Half of these preferred a requirement for cleaner and quieter machines and half wanted no additional requirements. About 20% of

resident snowmobilers preferred a solution that limited snowmobile access by day or by season. Over 37% of nonresident respondents preferred no ban and no additional requirements. As a solution, 28% favored cleaner and quieter machines and almost 30% favored either a partial ban in highly sensitive areas or more limited access by day or by season. Half of resident Wyoming snowmobilers did not see a need for cleaner and quieter snowmobiles but 50% also said they would pay more to use them if these vehicles were available. A minority of nonresidents (28.2%) thought there was a need for cleaner and quieter snowmobiles, but 50.5% of all respondents said they would pay more to use them if these vehicles were available. A majority of outfitter clients (56%) thought there was a need for cleaner and quieter snowmobiles and over 64% said they would be willing to pay a higher price to use them (McManus et al. 2001).

The 2000-2001 Wyoming Snowmobile Survey also asked respondents (statewide) about behaviors that would result from a ban on snowmobile use in the parks. The study found that over 78% of outfitter clients, 89% of residents, and 97.3% of nonresidents indicated that snowmobiling was their primary purpose for traveling to Wyoming during their most recent visit. Trips to Yellowstone and Grand Teton national parks accounted for 3.1% of resident, 4.6% of nonresident, and 33.2% of outfitter client snowmobile trips during the 2000-2001 season. Outfitter clients would make the most changes of all Wyoming trail users if the parks were closed to snowmobile access; nonresidents and residents would also be affected but to a lesser degree. Resident, nonresident, and outfitter clients indicated they would decrease their annual overall total number of snowmobiling trips by 2.5%, 11.4%, and 34% respectively. Resident, nonresident, and outfitter clients indicated they would decrease their annual snowmobiling trips to Wyoming trails by 5%, 10.4%, and 52.3% respectively. However, the survey results do indicate some substitution to other trails within the region (Montana, Idaho, Colorado, South Dakota, and Utah) with the number of resident trips increasing by 52.1% and outfitter client trips increasing by 20.6%. Nonresident snowmobilers indicated their use of other regional trails would decrease by 10.4%. The majority of Wyoming snowmobile trail users (84.6% of outfitter clients, 91.2% of residents, and 93.2% of nonresidents) would not consider going to Yellowstone if their only mechanized access were by snowcoach tours (McManus et al. 2001).

The Wyoming study concludes from these data that there could be a loss of up to 938 jobs, $11.8 million in labor income, and $1.3 million in government revenue in the state if the NPS implemented a snowmobile ban in the parks. The estimated job losses in the McManus et al. study just for Wyoming are higher (938 jobs lost) than the estimated job losses for Wyoming, Montana, and Idaho, combined, in the results reported in this EIS (747 jobs). Additionally, the community level analysis in this EIS indicates a much larger loss at West Yellowstone for a snowmobile ban (378 jobs) than at Jackson (144 jobs) and Cody (9 jobs) (McManus et al. 2001). This is consistent with the distribution of snowmobile visitors at the west, east, and south entrances. The Wyoming estimates may be high because snowmobilers were surveyed statewide and not all respondents actually would be reducing their use in the GYA in response to a ban.

The Global Insights (2005) study of the tourism industry in Idaho provides county by county estimates of the annual impacts of tourism for all types of activities. There is no specific analysis of winter use or snowmobiling.

The Ellard, Nickerson, and McMahon (1999) study is an analysis of participation patterns by Montana residents for all recreation activities and on an annual basis. The study shows that relative to other activities, snowmobiling has relatively low participation, at seven percent. However, there is no specific analysis of snowmobiling in any specific area (such as Yellowstone), expenditure analysis, or policy analysis for this sport.

The Niche News document (ITTR 2003) summarizes some facts about winter recreation in Montana. The reported data specific to snowmobiling are that 16 percent of nonresident visitors are attracted to this activity, compared to 59 percent for downhill skiing and 27 percent for Yellowstone.

The Montana Trail Users Study (1994) examines participation in Montana resident trail use for all kinds of activities including walking for pleasure, backpacking, ATV use, etc. Findings specific to snowmobiling are that 15 percent reported going snowmobiling in the fall through winter survey period, and that there is a slight preference for groomed trails.

The Wyoming Travel and Tourism report (2003) includes an overview of the economic impact of all types of tourism on an annual basis in Wyoming. One finding is that hiking creates 32 percent of "marketable trips," compared to 3 percent for snowmobiling.

The Economic Trends for Park County, Wyoming (Taylor 2007) summarized park visitation, lodging sales and lodging tax revenue, and accommodation and food service sector employment for the county. The report applies an inflation factor so that the reader can see the effect of rising lodging rates on tax revenue.

Wolves and People (Duffield, Neher and Patterson 2006) is a specific look at the role of wolf watching in Yellowstone on the economy of the Greater Yellowstone region.

The report "Turning On the Off Season" (Yellowstone Business Partnership 2007) presents the results of a research project to look at some of the characteristics and indicators that are relevant to understanding how the Greater Yellowstone region operates, especially in the fall, winter, and spring seasons.

Finally, the report "The Park County Economy – Restructuring and Change in a Growing Region" (Swanson 2006) is a focused look at the Park County, Wyoming economy and how it has changed in the last 15 years in comparison with similar counties in the West.

Cumulative Effects

The cumulative effects discussion for economics addresses the incremental impacts of the action when added to other past, present, and reasonably foreseeable actions (looking back five years and forward five years). The analysis areas are the three states, five counties, and four communities. The primary question is the contribution of tourism to the economies and employment of the analysis areas and the extent to which the alternatives (and their tourism-related economic effects) contribute to growth and jobs. In addition, the contribution may be looked at in terms of how an alternative adds to the analysis area's economic diversity. Section 1.9 lists a number of trends in the region along with specific projects, inside and outside the parks that may affect socioeconomics.

All three analysis areas are characterized, in a broad overview and in recent years, by general prosperity with economic growth and low unemployment. The growth has been fueled by a variety of factors, depending on the geographic area. For example, in Wyoming, energy-related activities have created tremendous economic growth and employment opportunities in the parts of the state that have oil, gas, and coal resources. As another example, in western Montana, growth has been fueled by desirable residential and quality of life environments, increasing tourism, and the ability of independent entrepreneurs to be located in desirable working environments some distance from their key markets. The recent growth trends have not always been the case and cycles of boom and bust (especially in relation to mineral and energy extraction) are probably a better way of characterizing the longer term economies of the three states.

In the local areas around the parks, a variety of actions affect tourism. Moonlight Basin Ski Area is a new downhill skiing and snowboarding opportunity, which when combined with Big Sky, creates one of the largest downhill ski/snowboard resort complexes in North America. Bozeman, Montana has seen development of a number of new hotels in the area. New developments at Teton Village near Jackson, Wyoming are fueling winter growth there. The expansion of the Buffalo Bill Museum in Cody, Wyoming creates an increased draw for visitors in that community.

Growth has not been universal and across the board, however. In some areas, the decline of traditional resource extraction industries has been offset by residential or quality of life-related growth. In other locations, the decline has not been offset. Although tourism has been an important contributor to economic growth in some areas, annual levels of tourism have been static or declining in other areas for the past several years. Communities or counties that have become more dependent on tourism may have seen corresponding flattening or declines in tourist-related spending. Some specific actions or activities may also reduce tourism.

The recent decline in winter visitation to Yellowstone has certainly adversely affected some businesses in the communities and routes near the park. In West Yellowstone, some businesses have shut down for the winter because of a lack of visitors, while others have curtailed their winter operations. Along the North Fork of the Shoshone River on U.S. Highway 14/16 leading from Cody to Yellowstone's East Entrance, businesses that used to rely on the more modest (as compared to West Yellowstone) entries in the winter have also seen a dramatic reduction in their winter business with the downturn in visitation. Like some businesses in West, businesses along the North Fork have also closed or curtailed their winter operations, reducing staff or laying off employees. Businesses in other communities leading to the parks have also reported a downturn in customers related to the reduced winter visitation over the past few years. These individual business changes may be masked at the county or even community level by the robustness of the broader economies and the type of analysis, but they are real nonetheless. That is, a community may be doing well economically, but individual businesses or geographic areas may bear the brunt of the effects of changes.

To the extent that the alternatives considered in this EIS tend to increase recreational visitation to the parks, this economic growth can be additive to the existing broad trend of such growth and employment opportunities. To the extent that these alternatives tend to reduce recreational visitation to the parks, the adverse impacts are somewhat offset by the beneficial regional economic trend related to resource extraction, residential growth, other recreation opportunities, and wildlife and other natural environment attractions.

Most of the alternatives evaluated would be expected to provide a variety of winter recreational visitation at a level between current and historic use, although modes of access differ. Therefore, the cumulative impact identified would not appear to vary substantially within the economic region by alternatives 1, 2, 4, 5, 6, and 7. Alternatives 3A and 3B would vary because the closure of much if not all of the parks to oversnow motorized vehicle travel in these alternatives would result in the greatest cumulative impact on regional economics.

Conclusions

The socioeconomic impacts associated with economic output and employments were estimated for five geographic areas under the seven action alternatives considered in this EIS. Each action alternative was analyzed with respect to the no-action alternative, current conditions, and historic conditions. For each comparison, three different estimates of output

and employment were calculated to reflect various assumptions of how visitation to the GYA might respond. The primary results of that analysis are summarized below.

In the 3-state, 5-county, Cody and Jackson, Wyoming areas, all estimated socioeconomic impacts were negligible under each of the action alternatives considered. These results reflect the size and diversity of the economies in those areas.

Moderate adverse socioeconomic impacts were estimated for the West Yellowstone, Montana area under two alternatives. Under alternative 2 (snowcoaches only), estimated impacts ranged from moderate adverse (when compared to historical conditions) to moderate beneficial (when compared to the no action alternative of no motorized oversnow access). Under alternative 3A (Most Road Grooming Eliminated), estimated impacts ranged from major adverse (when compared to historical conditions) to negligible beneficial (when compared to the no action alternative of no motorized oversnow access). Estimated impacts were moderate adverse when compared to the current conditions in one analysis scenario.

No significant adverse socioeconomic impacts were estimated for the West Yellowstone, Montana area under four alternatives. Under alternative 1 (Continued Temporary Plan), estimated impacts ranged from negligible adverse (when compared to historical conditions) to major beneficial (when compared to the no action alternative of no motorized oversnow access). Under alternative 4 (Expanded Recreational Use), estimated impacts ranged from negligible adverse (when compared to historical conditions) to major beneficial (when compared to the snowcoaches only, current conditions, and no action (no motorized oversnow access)). Under alternative 5 (New Management Tools and Improved BAT), estimated impacts ranged from negligible adverse (when compared to historical conditions) to major beneficial (when compared to the no action alternative of no motorized oversnow access). Under alternative 6 (mixed use), estimated impacts ranged from negligible adverse (when compared to historical conditions) to major beneficial (when compared to the snowcoaches only, current conditions, and no action (no motorized oversnow access)). Under alternative 7 (Revised Preferred Alternative), estimated impacts ranged from negligible adverse (when compared to 1997-1998 and 2001-2002 historical conditions to moderate beneficial when compared to no action (no motorized oversnow access).

It should be noted that where negligible adverse impacts are indicated, impacts to specific sectors or individual businesses may be substantially larger. The conclusions drawn regarding the general level of impact apply to the area of analysis. Within each of those geographic areas, the actual changes affecting individual businesses, their employees, and their families are anything but negligible when the changes are felt at that level. As noted in Ecosystem Research Group 2006, the changes that have occurred in recent years in winter visitation have adversely affected local businesses and individuals, especially those who depended on snowmobile access to Yellowstone. The discussion in the previous section on Cumulative Effects is an acknowledgement of the adverse effects that have occurred to businesses around the parks due to the recent decline in visitation. The income and employment numbers in the above tables are a reflection of, and an indication of, the changes that might occur to businesses and employees in the communities and region if an alternative is implemented.

4.2.3 Effects on Air Quality and Air Quality-Related Values

Assumptions and Methods

Impacts for each alternative were assessed with respect to the NAAQS and relative to current and historical conditions (Air Resource Specialists, Inc. 2006, 2007—these two reports are the basis for most of the discussion in section 4.2.3). For Wyoming, Montana, and Idaho, the

applicable state standards for CO and particulates are the same as the federal standards, with the exception of the 1-hour CO standard in Montana, which is 23 ppm.

Since Yellowstone and Grand Teton are classified as Federal Class I areas, PM_{10} increment comparisons under Prevention of Significant Deterioration (PSD) were also 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, for the annual and 24-hour averaging periods, respectively. Winter oversnow vehicle emissions were considered increment consuming or contributing sources for this analysis. This study only assessed PSD increments for the 24-hour averaging period, since the sources of concern are only present during the winter season and an applicable annual average cannot be prepared. 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, as 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.

For this air quality study of oversnow motorized vehicle emissions in Yellowstone, Grand Teton, and the Parkway, maximum predicted ambient concentrations of carbon monoxide (CO) and particulate matter (PM_{10} and $PM_{2.5}$) were calculated using U.S. Environmental Protection Agency (EPA) approved air quality models. Impacts for each alternative were assessed with respect to the National Ambient Air Quality Standards (NAAQS) and relative to current and historical conditions. Modeling results were also compared to PSD increments for particulate matter and potential visibility impacts for each alternative were assessed. Winter-season emission estimates for criteria pollutants (CO, PM, and nitrogen oxides (NO_x)), hydrocarbons (HC), and hazardous air pollutants (HAPs) (benzene, 1,3 butadiene, formaldehyde, and acetaldehyde) were calculated.

Dispersion modeling was utilized to predict concentrations of CO and particulates (PM_{10} and $PM_{2.5}$) for a short-term localized basis at specific locations in the parks. These predicted concentrations were assessed with respect to the NAAQS, which are discussed below, to determine the potential for air quality impacts. In addition, an emission inventory was completed for the four pollutants discussed below to assess regional motorized oversnow vehicle emissions during the winter season. Also, as a Class I area, an analysis of potential visibility impacts resulting from oversnow vehicle emissions was conducted for four areas.

Mobile Source Modeling

Estimates of maximum concentrations for pollutant averaging periods were prepared to compare with the national ambient air quality standards (which are based on 1- and 8-hour averages for CO concentrations and 24-hour averages for particulate concentrations). The prediction of CO, PM10 and PM2.5 concentrations generated by over-snow vehicles takes into account emissions data, meteorological phenomena, vehicle traffic/travel conditions, and physical configurations (of roadways and staging areas). The mathematical formulations that comprise the dispersion and emission models attempt to simulate the extremely complex physical phenomenon as closely as possible. Although most dispersion models are typically conservative, especially under adverse meteorological conditions, the results of the modeling below compared with monitored concentrations show predicted concentrations within the reasonable range of possibility, considering that all models must employ approximations of actual conditions.

The analysis employs a modeling approach widely used for evaluating air quality impacts throughout the country. This approach was coupled with a series of conservative assumptions for meteorology, traffic conditions, background concentration levels, etc. This

combination results in conservative, yet realistic, estimates of expected pollutant concentrations and resulting potential impacts to air quality from the winter use vehicle emissions.

Dispersion Modeling

Air dispersion modeling analyses were conducted for emissions of CO, PM_{10}, and $PM_{2.5}$ employing EPA's CAL3QHC and Industrial Source Complex Short-term (ISCST3) models.

At the entrance stations and roadways selected for study, analysis was performed using EPA's CAL3QHC model.[6] Air pollutant concentrations from emissions at the snowmobile staging areas were evaluated with the Industrial Source Complex, Short-term dispersion model, Version 3 (ISCST3), developed by EPA and described in the *User's Guide for the Industrial Source Complex (ISC3) Dispersion Models.*[7] Model inputs specified rural conditions for dispersion coefficients and other variables. Due to the geography of the area, as with prior modeling analyses performed in Yellowstone, terrain data were not used. It was assumed that elevation differences at the staging areas and surrounding areas would not greatly influence the result. As such, the terrain option was omitted.

Modeling Locations

Four locations in the parks were selected for air quality modeling because they were expected to generate the most elevated ambient air quality impacts associated with snowmobile and snowcoach operations, due to expected vehicle traffic levels. These locations are: Yellowstone's West Entrance, West Entrance to Madison Junction, Old Faithful Staging Area, and the Flagg Ranch Staging Area (in the Parkway). At the modeling locations, multiple receptors (computer simulations of roadside locations) were modeled for CAL3QHC along the approach and departure links at spaced intervals, outside of the mixing zone, the area of uniform emissions and turbulence. Ground-level receptors were set at a default height of six feet. The receptor with the highest predicted concentration was used to represent each modeling site for each alternative or scenario.

Vehicle Emissions Data

To predict ambient concentrations of pollutants generated by vehicular traffic, emissions from vehicle exhaust systems must be estimated accurately. This analysis focuses primarily on emissions associated with visitor use of snowmobiles and snowcoaches and does not address other modes of vehicle travel within the park. However, alternative 6 would provide guided visitor access by on-road vehicles by plowing Yellowstone's west-side roadways. Administrative vehicles are not included in any of the modeling, although assumed background levels include administrative vehicles and other facility-based sources.

The data to be employed for this analysis were obtained from past air quality and emissions testing, research studies, and vehicle manufacturers. The snowmobile laboratory test data utilized below may not reflect actual operating conditions in Yellowstone, Grand Teton, and the Parkway, as high altitude and low winter temperatures in the parks are likely to decrease overall snowmobile engine performance and increase relative emissions. However, this data is the best available.

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[6] User's Guide to CAL3QHC, A Modeling Methodology for Predicting Pollutant Concentrations Near Roadway Intersections, Office of Air Quality, Planning Standards, U.S. Environmental Protection Agency, Research Triangle Park, North Carolina.

[7] EPA-454/B-95-003a.

For the 1999 Historical Conditions Scenario (1983 Regulations), the air quality analysis assumed that all snowmobiles were two-stroke engines. Therefore, for this modeling scenario, the analysis assumed no snowmobile BAT requirements, replicating historic, unregulated conditions. For most alternatives, the analysis assumed that all snowmobiles are four-stroke engines meeting NPS BAT requirements (or better, in one alternative, as defined below). Current BAT for snowmobiles operating in Yellowstone, Grand Teton, and the Parkway has been established for CO and HC emissions, at less than 120 and 15 grams per kilowatt hour, respectively. Alternative 5 also considers implementing an "improved" snowmobile BAT requirement which would lower CO and HC emissions below the current BAT. Additional information on "improved" BAT for snowmobiles is provided below. Current and "improved" BAT requirements are shown in Table 4-28.

In addition, the EPA adopted standards for new non-road engines in 2002. For snowmobiles, the new standards took effect with the 2006 model year, with a 50 percent phase-in requirement. These standards and the corresponding implementation years are also provided in Table 4-28. Since they are less stringent than NPS BAT requirements, EPA standards would only be applicable (for modeling purposes) to the analysis of the 1999 Historical Conditions scenario and to some snowmobiles that enter the Parkway from the Targhee National Forest via Grassy Lake Road. For these situations, the two-stroke vs. four-stroke mix was determined based on EPA guidance.[8] See Table 4-43 for possible air quality implications of these EPA regulations on snowmobile emissions (assuming circa 2010 implementation of the EPA regulations).

Table 4-28: Snowmobile BAT Requirements and EPA Standards

Requirement "Source"	Emission Requirement or Standard		% Phase-in*
	Hydrocarbons (HC) (g/KW-hr)	Carbon Monoxide (CO) (g/KW-hr)	
NPS BAT	15	120	NA
Improved BAT**	8	105	NA
EPA Emission Standards by Model Year			
2006	100	275	50
2007-2009	100	275	100
2010	75	275	100
2012	75	200	100

Note:
* Percent of newly manufactured sleds for the model year that must meet the applicable requirement.
**Improved BAT proposal for Alternative 5 is based on recent model year snowmobiles' BAT certification results. The improved BAT emission factors that were modeled were 3.2 g/KW-hr HC and 79 g/KW-hr CO. These came from SwRI's Laboratory Testing of Snowmobile Emissions, Lela and White, July 2002.

Snowmobile Emission Factors

All 2-stroke engine emission factors are based on the average emissions data from snowmobiles tested by the equipment manufacturer or by the Southwest Research Institute (SwRI). Four-stroke engine emission factors are based on manufacturers' EPA certification modal emission testing results. These snowmobile emission factors were previously presented in the *Temporary Winter Use Plans Environmental Assessment,* National Park Service, August 2004, although some minor revisions were made for this study. Composite emission factors for each alternative were calculated by weighting the snowmobile and snowcoach emission factors appropriate for each particular alternative according to usage

[8] Replacement rates and future mix estimates from the Final Regulatory Support Document (EPA420-R-02-022) for EPA's Final Rule for Cleaner Large Industrial Spark-Ignition Engines, Recreational Marine Diesel Engines, and Recreational Vehicles (published November 8, 2002).

levels of each vehicle type. These composite emission factors (weighted averages) were input to the CAL3QHC model.

Snowcoach Emission Factors

Snowcoach emission factors for this analysis were obtained from "In-use Emission Measurements of Snow Coaches and Snowmobiles in Yellowstone National Park" (Bishop et al. 2006). This study included measuring emissions from nine snowcoaches operating in Yellowstone during February of 2005. Preliminary emissions data collected from ten snowcoaches during the winter season of 2006 were also used (Bishop et al. 2007). Together, this data provides the most comprehensive collection of emissions data from in-use snowcoaches to date. These studies, along with others, show that the vehicle operating conditions (altitude, temperature, terrain, vehicle operator, etc.) can greatly affect snowcoach emission factors. For modeling purposes, snowcoach BAT emissions factors were determined by averaging emission factors of the cleanest subgroup of snowcoaches tested in the two Bishop et al. studies (the same snowcoach group chosen to estimate fuel consumption for Park Operations, section 3.2.3). The cleanest were chosen because all alternatives in this EIS would implement a BAT requirement for snowcoaches.

On-road Vehicle Emission Factors

For the analysis of alternative 6, which includes plowing of Yellowstone's west-side roads, on-road (wheeled) vehicular emissions (CO, PM, NO_x, and HC) were necessary. Emission factor estimates were computed using the EPA-developed Mobile Source Emissions Model (MOBILE6) for up to five classes of motor vehicles: light-duty, gasoline-powered trucks; heavy-duty, gasoline-powered trucks; heavy-duty, diesel vehicles; gasoline buses; and diesel buses. The types of on-road vehicles in the fleet for this alternative would be limited since all vehicle entry would be commercially guided. The vehicle mix for this analysis was estimated to be one third of each of the following vehicle types: suburban/large passenger truck or similar; 12-15 person vans/small buses or similar light-duty trucks; and large, heavy-duty buses (30-40 feet in length).

Traffic Activity Data

Traffic data for the air quality analysis were derived from snowmobile and snowcoach entry limits and other information for each alternative (see Appendix C for travel factors). Localized, dispersion modeling was conducted for the peak-hour periods that produce the highest levels of vehicle traffic at each of the four modeling locations and, therefore, have the greatest potential for air quality impacts of concern.

To determine peak-hour vehicle traffic inputs for the West Entrance and West Entrance to Madison line source modeling locations, entrance data collected in February 2006 were used to determine morning peak-hour levels from daily entry limits. These data revealed that, on average, 65.8 percent of all daily snowmobile entries come in between 9 a.m. and 10 a.m., and 39.3 percent of all daily snowcoaches enter between 8 a.m. and 9 a.m. (37.0 percent of snowcoaches enter between 9 a.m. and 10 a.m.). Therefore, a 65.8 percent factor was applied to West Entrance daily entry limits for snowmobiles and the higher 39.3 percent factor was applied to snowcoach daily entry limits. The modeling assumed two lanes open in the morning, with about two-thirds of daily entries going to the southernmost booth and one-third going to the middle (north) booth; the northernmost booth is currently unused in winter.

To determine peak-hour vehicle traffic inputs for the Old Faithful area source modeling location, Yellowstone Old Faithful Visitor Center staff estimated the busiest hour as approximately 11:30 a.m. to 12:30 p.m., when about 75 percent of daily visitors arrive at Old

Faithful. Therefore, peak-hour traffic volumes for this staging area were estimated as 75 percent of all daily inbound traffic between Madison and Old Faithful, and West Thumb and Old Faithful (inbound trips assumed to be half of total trips on each roadway segment). Peak-hour vehicle traffic inputs for the Flagg Ranch staging area were determined using a 75 percent factor, based on peak morning entry data for the South Entrance.

Background Concentrations

Background concentrations are those pollutant concentrations not directly accounted for by the modeling analysis. These concentrations must be added to modeling results to obtain total pollutant concentrations at prediction sites. Background concentrations can typically be attributed to local sources, long-range transport, and natural sources. For this analysis, background levels include smoke (from wood-burning stoves and fireplaces) and other emissions, such as those from administrative vehicles. Background concentrations for this analysis were estimated considering the guidelines provided in *40 CFR Part 51, Appendix W*.

Recent data collected in West Yellowstone provided background concentration estimates of a 1-hour average CO background of 0.17 ppm and an 8-hour average CO background of 0.15 ppm, based on overnight monitoring data.[9]

The 24-hour average PM_{10} and $PM_{2.5}$ background concentrations were determined from the IMPROVE network aerosol data and are 4.2 and 2.4 micrograms per cubic meter, respectively (gravimetric mass average of 2002 to 2004 annual mean values). Consistent with EPA guidance, IMPROVE data provide representative background particulate levels that are not directly affected by winter oversnow vehicle emissions, as the monitoring station is located near Lake Village.

For the 8-hour average CO and 24-hour average $PM_{2.5}$ concentrations, the highest 1-hour average concentrations for each pollutant were converted to either an 8-hour or 24-hour averaging period using persistence factors calculated from the "Data Transmittal Report for the Yellowstone National Park Winter Use Air Quality Study December 1, 2004 - March 15, 2005," Air Resource Specialists, August 2005. As recommended by EPA's *Guideline for Modeling Carbon Monoxide from Roadway Intersections*, November 1992, factors without units, such as these, were determined based on the ratio of actual maximum 8-hour to 1-hour CO measurements collected at the West Entrance or Old Faithful monitoring stations for the latest three seasons of monitoring data and averaged. Persistence factors for calculating 24-hour average $PM_{2.5}$ concentrations were also determined in this manner.

Modeled versus Measured Data

The comparison of monitored versus modeled concentrations for CO at the West Entrance are generally consistent with the typical conservative predictions of dispersion modeling. Modeled concentrations for CO at Old Faithful and $PM_{2.5}$ concentrations at both locations are lower than monitored values. However, given that the modeling approach must employ a series of assumptions and approximations of actual conditions, utilizing the best available emission factors and other input parameters, etc., compared with monitored concentrations, the modeling results are within a reasonable range of possibility and assess the potential for impacts to air quality from the winter use alternatives. Additionally, it is the magnitude of differences between alternatives as shown by modeling that is most useful in comparing one alternative to another.

[9] John D. Ray, NPS Air Resources Division, pers. comm. with EIS writers, July 2006.

Table 4-29: Comparison of Monitored and Modeled CO Concentrations 1-Hour (ppm) 8-Hour (ppm)

Location	Year	1-Hour (ppm)		8-Hour (ppm)	
		Monitored	Modeled*	Monitored	Modeled*
West Entrance	1999	18.2	23.7	8.9	7.4
West Entrance	2005	2.8	3.7	1.0	1.2
Old Faithful	2005	1.7	0.4	0.8	0.3
National Standard		35 (23 in MT)		9	
Note: * Modeled concentrations for 1999 are from 1999 Historical Conditions Scenario results, and modeled concentrations for 2005 are from Current Conditions Scenario results. Monitored 1999 concentrations from Carbon Monoxide Monitoring in West Yellowstone, Montana 1998-2001, John Coefield, Montana DEQ, May 2002. Monitored 2005 concentrations from Data Transmittal Report for the Yellowstone National Park Winter Use Air Quality Study December 1, 2004 - March 15, 2005, Air Resource Specialists, August 2005.					

Table 4-30: Comparison of Monitored and Modeled PM2.5 Concentrations 24-Hour (ug/m3)

Monitoring Location	Year	24-Hour (ug/m3)+	
		Monitored	Modeled*
West Entrance	2005	9.5	6.1
Old Faithful	2005	6.0	2.5
National Standard		35**	
Note: *Modeled concentrations are from Current Conditions Scenario results. Monitored concentrations from Data Transmittal Report for the Yellowstone National Park Winter Use Air Quality Study December 1, 2004 - March 15, 2005, Air Resource Specialists, August 2005. **EPA revised the 98th percentile PM2.5 24-hour standard from 65 to 35 ug/m3 in Sept. 2006.			

Visibility

Yellowstone and Grand Teton are classified as Class I areas under the Federal Clean Air Act. As required by the visibility protection provision of the Clean Air Act, additional requirements apply when a proposed source has the potential to impair visibility in a Class I area.[10] An analysis of anticipated visibility impacts resulting from on-snow vehicle emissions was conducted following procedures in the *Workbook for Plume Visual Impact Screening and Analysis.*[11] The EPA model VISCREEN incorporates the methodology and was used to conduct a Level 1 screening analysis of visibility impacts. Virtual point source methods were applied to adapt procedures originally designed for assessing plume impacts resulting from industrial stacks to the line and area sources modeled at the four locations.

For the visibility analysis, a winter Yellowstone value of 240 kilometers was assumed for the background visual range. This was converted from the reference level light-extinction coefficient for Yellowstone (winter) provided in Appendix 2.B of the *Federal Land Managers' Air Quality Related Values Workgroup (FLAG), Phase I Report* (U.S Forest Service, NPS, and U.S. Fish and Wildlife Service 2000) using the conversion equation 1 in Appendix 2.A of the report.

[10] 40 CFR 52.27 (d).

[11] EPA-450/4-88-015, 1992.

Definition of Impacts

Table 4-31: Definition of Impacts on Air Quality

Impact Category	Definition
Negligible	The impact on air quality is not measurable or perceptible. Predicted emissions increases are less than 50 Tons Per Year (TPY) for CO or PM. No perceptible visibility impacts are likely (no visible smoke, plume, or haze).
Minor	The impact on air quality is measurable, but localized within a relatively small area. Predicted emissions increases are between 50 and 100 TPY for CO or PM. No perceptible visibility impacts are likely (no visible smoke, plume, or haze).
Moderate	The impact on air quality is measurable and perceptible, possibly throughout the parks, but could be reversed and generally localized. Predicted emissions increases are between 100 and 250 TPY for CO or PM. Perceptible visibility impacts occur, but are only visible from a small area of the park, are of short duration (less than one day) and visible to only a few park visitors on the days that they occur.
Major	The impact is substantial and highly noticeable park-wide. Predicted emissions increases are greater than 250 TPY for CO and PM. Perceptible visibility impacts occur and are visible from several areas of the park, occur between one and several days, and many park visitors may observe them on the days that they occur. Class I air sheds, or areas within them, are degraded.

Effects by Alternative

As noted previously, receptors were placed at multiple locations at each of four modeling locations. The receptor with the highest predicted concentration was used to represent each modeling site for each of the alternatives. CO and PM concentrations were calculated for each location, for each alternative.

For all modeling results, the values shown are the highest predicted concentrations for each receptor location and include background levels. CO concentrations under each alternative were determined using the methodology previously described. Tables 4-32 and 4-33 show the maximum predicted 1- and 8-hour average CO concentrations for each of the alternatives at the analysis sites. The modeling results indicate that winter use vehicle emissions would not result in any exceedances of the CO NAAQS, or the Montana or Wyoming ambient air quality standards, under any of the alternatives. Table 4-34 shows predicted 8-hour CO levels for the alternatives as a percent of levels predicted under the 1999 Historical Conditions Scenario. Similarly, Table 4-35 shows predicted 8-hour CO as a percent of levels predicted under the Current Conditions Scenario. These percentages are based on total CO concentrations including the modeling and background values.

Table 4-36 shows the maximum predicted 24-hour $PM_{2.5}$ concentrations for each of the alternatives at the analysis sites. 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, or the Montana or Wyoming ambient air quality standards. The modeling results are consistent with recent (2002 to 2005) monitoring in the park, which does not show any measured CO or $PM_{2.5}$ NAAQS exceedances (Ray 2005).

In addition, it should be noted that all predicted $PM_{2.5}$ concentrations for this analysis are conservative, as most available emission factors utilized for vehicles assumed total particulates, or PM_{10} as all $PM_{2.5}$. In addition, 24-hour $PM_{2.5}$ values were determined from maximum predicted 1-hour modeling results using persistence factors, which do not reflect that winter use vehicle activity occurs primarily during daytime hours, or approximately during only one third of the hours in a day (9 a.m. to 5 p.m.). However, the modeling results

indicate there would not be any exceedances of the 24-hour PM_{10} NAAQS, or the Montana or Wyoming ambient air quality standards, under any of the alternatives.

Table 4-37 shows predicted 24-hour $PM_{2.5}$ levels for the alternatives as a percent of levels predicted under the 1999 Historical Conditions Scenario. These percentages were determined including the appropriate background level. Similarly, Table 4-38 shows predicted 24-hour $PM_{2.5}$ levels for the alternatives as a percent of levels predicted under the Current Conditions Scenario.

Finally, for all modeling results for alternatives 1 and 7, the East Entrance Road and the Madison-Norris Road (Gibbon Canyon) were assumed to be closed, as called for in both alternatives or the actions common to all (in the case of the Gibbon Canyon road). For both of these alternatives, results differed very little if these roads were modeled as open. More specific information is provided at the bottom of tables 4-32, 4-33, 4-36, 4-38, 4-39, 4-40, 4-41, 4-43, and 4-44.

Table 4-32: Maximum Predicted 1-Hour Carbon Monoxide (CO) Concentrations (in ppm)

Alternative	Site 1: West Entrance 1-Hour (ppm)	Site 2: West Entrance to Madison 1-Hour (ppm)	Site 3: Old Faithful Staging Area 1-Hour (ppm)	Site 4: Flagg Ranch Staging Area 1-Hour (ppm)
Alternative 1: Continued Temporary Plan**	6.4	1.1	0.9	5.3
Alternative 2: Snowcoaches Only	0.3	0.3	0.2	0.2
Alternative 3A:* Most Road Grooming Eliminated	0.2	0.2	0.4	4.4
Alternative 4: Expanded Recreational Use	7.7	1.5	0.9	6.4
Alternative 5: New Mgmt Tools & Improved BAT	4.3	0.6	0.5	2.9
Alternative 6: Mixed Use (Plow west-side Roads)	2.0	0.4	0.5	4.4
Alternative 7: Revised Preferred Alternative**	5.7	0.9	0.7	4.0
Current Conditions: Actual Use Scenario	3.7	0.7	0.4	1.8
1999 Historical Unregulated Scenario	23.7	21.0	1.7	8.7

Note:
* Background levels only for Sites 1 and 2, since no West Entrance and Madison oversnow access for Alternative 3. NAAQS for CO are 35 and 9 parts per million (ppm), for the 1-hour and 8-hour averaging periods, respectively. 3B represents the background values for all sites.
**For alternatives 1 and 7, results at sites 1 and 2 were identical with and without the Gibbon and East Entrance roads open; results at sites 3 and 4 were within 0.3 ppm of each other whether those roads were open or closed.

Table 4-33: Maximum Predicted 8-Hour Carbon Monoxide (CO) Concentrations (in ppm)

Alternative	Site 1: West Entrance	Site 2: West Entrance to Madison	Site 3: Old Faithful Staging Area	Site 4: Flagg Ranch Staging Area
Alternative 1: Continued Temporary Plan***	2.1	0.4	0.5	2.4
Alternative 2: Snowcoaches Only	0.2	0.2	0.2	0.2
Alternative 3A:* Most Road Grooming Eliminated	0.2	0.2	0.2	2.0
Alternative 4: Expanded Recreational Use	2.5	0.6	0.5	2.8
Alternative 5: New Mgmt Tools & Improved BAT	1.4	0.3	0.3	1.3
Alternative 6: Mixed Use (Plow west-side Roads)	0.7	0.2	0.3	2.0
Alternative 7: Revised Preferred Alternative***	1.9	0.4	0.4	1.8
Current Conditions: Actual Use Scenario	1.2	0.3	0.3	0.9
1999 Historical Unregulated Scenario	7.4**	6.6	0.8	3.8
NAAQS for CO are 35 and 9 parts per million (ppm), for the 1-hour and 8-hour averaging periods, respectively. *Background levels only for Sites 1 and 2, since no West Entrance and Madison oversnow access for Alternative 3. 3B represents the background values for all sites. **For actual historical unregulated conditions, Yellowstone recorded an 8-hour CO measurement of 8.9 ppm at the West Entrance air quality monitor in 1999. ***For alternatives 1 and 7, results at sites 1 and 2 were identical with and without the Gibbon and East Entrance roads open; results at sites 3 and 4 were within 0.1 ppm of each other whether these roads were open or closed.				

Table 4-34: Percent of 1999 Historic Conditions Concentration - 8-Hour CO

Alternative	Site 1: West Entrance	Site 2: West Entrance to Madison	Site 3: Old Faithful Staging Area	Site 4: Flagg Ranch Staging Area
Alternative 1: Continued Temporary Plan	28%	7%	57%	62%
Alternative 2: Snowcoaches Only	2%	3%	20%	5%
Alternative 3A:* Most Road Grooming Eliminated	2%	2%	31%	52%
Alternative 4: Expanded Recreational Use	33%	8%	58%	74%
Alternative 5: New Mgmt Tools & Improved BAT	19%	4%	36%	35%
Alternative 6: Mixed Use (Plow west-side Roads)	10%	3%	35%	52%
Alternative 7: Revised Preferred Alternative	25%	6%	47%	48%
Current Conditions: Actual Use Scenario	17%	5%	31%	23%
1999 Historical Unregulated Scenario	100%	100%	100%	100%
Percentages determined using modeled concentrations, including background levels (0.15 parts per million for 8-hour CO). * 3B would be assumed to be 0% of historic conditions.				

Table 4-35: Percent of Current Conditions Concentration - 8-Hour CO

Alternative	Site 1: West Entrance	Site 2: West Entrance to Madison	Site 3: Old Faithful Staging Area	Site 4:Flagg Ranch Staging Area
Alternative 1: Continued Temporary Plan	168%	141%	180%	274%
Alternative 2: Snowcoaches Only	15%	59%	63%	21%
Alternative 3A:* Most Road Grooming Eliminated	12%	49%	97%	229%
Alternative 4: Expanded Recreational Use	200%	181%	183%	325%
Alternative 5: New Mgmt Tools & Improved BAT	115%	90%	115%	155%
Alternative 6: Mixed Use (Plow west-side Roads)	57%	70%	111%	228%
Alternative 7: Revised Preferred Alternative	150%	120%	149%	209%
Current Conditions: Actual Use Scenario	100%	100%	100%	100%
1999 Historical Unregulated Scenario	602%	2163%	317%	438%
Note: Percentages determined using modeled concentrations, including background levels (0.15 parts per million for 8-hour CO). *3B would be assumed to be 0% of current conditions.				

Table 4-36: Maximum Predicted 24-Hour PM2.5 Concentrations

Alternative	Site 1: West Entrance 24-Hour (ug/m3)**	Site 2: West Entrance to Madison 24-Hour (ug/m3)	Site 3: Old Faithful Staging Area 24-Hour (ug/m3)	Site 4: Flagg Ranch Staging Area 24-Hour (ug/m3)
Alternative 1: Continued Temporary Plan***	9.4	2.8	2.7	4.7
Alternative 2: Snowcoaches Only	2.4	2.4	2.4	2.5
Alternative 3A:* Most Road Grooming Eliminated	2.4	2.4	2.4	4.6
Alternative 4: Expanded Recreational Use	10.6	3.2	2.8	4.9
Alternative 5: New Mgmt Tools & Improved BAT	9.8	3.2	2.6	4.5
Alternative 6: Mixed Use (Plow west-side Roads)	21.3	26.6	10.3	4.5
Alternative 7: Revised Preferred Alternative***	8.6	2.8	2.6	4.1
Current Conditions: Actual Use Scenario	6.1	2.8	2.5	3.1
1999 Historical Unregulated Scenario	193.9	42.6	6.2	25.1
Note: * Background levels only for Sites 1 and 2, since no West Entrance and Madison oversnow access for Alternative 3. 3B represents the background values for all sites. NAAQS for PM_{10} is 150 µg/m3 and for $PM_{2.5}$ is 65 µg/m3, for the 24-hour averaging period. **units of measure are micrograms per cubic meter (ug/m3) ***For alternatives 1 and 7, results at sites 1,2, and 3 were identical with and without the Gibbon and East Entrance roads open; results at site 4 were within 0.1 ppm whether these roads were open or closed.				

Table 4-37: Percent of Historic Conditions Concentration - Predicted 24-Hour PM2.5

Alternative	Site 1: West Entrance	Site 2: West Entrance to Madison	Site 3: Old Faithful Staging Area	Site 4: Flagg Ranch Staging Area
Alternative 1: Continued Temporary Plan	5%	7%	44%	19%
Alternative 2: Snowcoaches Only	1%	6%	39%	10%
Alternative 3A:* Most Road Grooming Eliminated	1%	6%	39%	18%
Alternative 4: Expanded Recreational Use	5%	8%	45%	20%
Alternative 5: New Mgmt Tools & Improved BAT	5%	8%	43%	18%
Alternative 6: Mixed Use (Plow west-side Roads)	11%	62%	167%	18%
Alternative 7: Revised Preferred Alternative	4%	7%	42%	17%
Current Conditions: Actual Use Scenario	3%	7%	40%	13%
1999 Historical Unregulated Scenario	100%	100%	100%	100%
Note: Percentages determined using modeled concentrations, including background levels (2.4 ug/m3 parts per million for 24-hour $PM_{2.5}$). *3B would be assumed to be 0% of historic conditions.				

Table 4-38: Percent of Current Conditions Concentration - Predicted 24-Hour PM2.5

Alternative	Site 1: West Entrance	Site 2: West Entrance to Madison	Site 3: Old Faithful Staging Area	Site 4: Flagg Ranch Staging Area
Alternative 1: Continued Temporary Plan	154%	100%	109%	149%
Alternative 2: Snowcoaches Only	39%	85%	96%	79%
Alternative 3A:* Most Road Grooming Eliminated	39%	85%	96%	145%
Alternative 4: Expanded Recreational Use	174%	115%	110%	156%
Alternative 5: New Mgmt Tools & Improved BAT	161%	115%	106%	144%
Alternative 6: Mixed Use (Plow west-side Roads)	349%	946%	412%	144%
Alternative 7: Revised Preferred Alternative	140%	100%	104%	134%
Current Conditions: Actual Use Scenario	100%	100%	100%	100%
1999 Historical Unregulated Scenario	3183%	1515%	247%	799%
Percentages determined using modeled concentrations, including background levels (2.4 ug/m3 parts per million for 24-hour $PM_{2.5}$). *3B would be assumed to be similar to 3A, West Entrance/West Entrance to Madison, park-wide.				

Since Yellowstone and Grand Teton are Class I areas, PM_{10} increment consumption was also assessed. For Class I areas, the PM_{10} PSD increment is 8 micrograms per cubic meter for the 24-hour averaging period, which EPA has determined is the smallest "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 2000a) which was used to determine baseline concentrations. This study employed only a screening level approach in comparing predicted PM_{10} increments (no background contribution) with estimated 1979 baseline concentrations to determine the increment for the alternatives.

Although snowmobile (and snowcoach) traffic in the parks has increased since 1979, it was expected that the 4-stroke BAT snowmobiles required by the alternatives would generally result in a net decrease in 24-hour PM_{10} levels compared to the established baseline date. The 1979 baseline levels were estimated from adjusting 1999 Historical Conditions Scenario modeled PM_{10} levels based on the maximum daily snowmobile levels (from Yellowstone entry records) of the two years. As 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" allowable Class I PM_{10} PSD increment.

The predicted 24-hour PM_{10} increment consumption values based on the previously described particulate modeling are shown in Table 4-39 for each of the alternatives. With the exception of alternative 6, there is no 24-hour PM_{10} increment consumption for Sites 1, 2, and 3 compared to the baseline date, and all Site 4 results are lower than the PSD increment of 8 micrograms per cubic meter. For alternative 6, the PSD increment is exceeded for Site 2, and a more detailed modeling assessment may be required for this location (however, as discussed below under Park-Wide Impacts for alternative 6, modeling results probably overestimated PSD). In addition, for 1999 Historical Conditions, the modeling results predict that at Sites 1 and 2, the PM_{10} PSD increment would have been exceeded.

Table 4-39: 24-Hour PM10 PSD Increment Consumption in micrograms per cubic meter (ug/m3)

Alternative/Scenario	Site 1: West Entrance	Site 2: West Entrance to Madison	Site 3: Old Faithful Staging Area	Site 4: Flagg Ranch Staging Area
Alternative 1: Continued Temporary Plan****	7.0	0.4	0.3	2.3
Alternative 2: Snowcoaches Only	0.0	0.0	0.0	0.1
Alternative 3A:* Most Road Grooming Eliminated	0.0	0.0	0.0	2.2
Alternative 4: Expanded Recreational Use	8.2	0.8	0.4	2.5
Alternative 5: New Mgmt Tools & Improved BAT	7.4	0.8	0.2	2.1
Alternative 6: ** Mixed Use (Plow west-side Roads)	18.9	24.2	7.9	2.1
Alternative 7: Revised Preferred Alternative****	6.2	0.4	0.2	1.7
1999 Historical Unregulated Scenario ***	191.5	40.2	3.8	22.7
PSD Baseline Year: 1979 Historical Condition	42.5	8.9	0.7	2.0

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 µg/m3
No modeled increment for Sites 1 and 2, since no West Entrance and Madison oversnow access for Alternative 3; 3B represents the background values for all sites.
** For Site 2, Class I PSD Increment is exceeded.
*** For Sites 1 and 2, Class I PSD Increment is exceeded.
****For alternatives 1 and 7, results at sites 1, 2, and 3 were identical with and without the Gibbon road open; results at site 4 were within 0.1 ppm whether these roads were open or closed.

Emissions Inventory

In addition to the dispersion modeling analysis for determining potential short-term CO and particulate concentrations, an emissions inventory of snowmobiles and snowcoaches operating in the three park units in tons per winter season was completed for each alternative, based on vehicle entry limits and other information provided. Emissions were calculated using travel estimates of oversnow and on-road vehicles used on Yellowstone and Grand Teton roadways, the roadway lengths, and modes of operation of the vehicles. Emission factors were combined with daily vehicle traffic levels for each roadway segment, for each alternative, to determine total park-wide emissions for each pollutant. The winter season was defined as a 90-day period running from about mid-December to early March.

Estimates were prepared for criteria pollutants (CO, PM, and NO_x) and HC. The total maximum potential winter season emissions due to operations of snowmobiles and snowcoaches in the parks in tons per winter season are shown for each alternative in Table 4-40. An emissions inventory for HAPs was also completed for each alternative and is discussed in the next section. Table 4-41 shows the contribution by vehicle type by percentage of the total season emissions for the alternatives. The results of the emission inventory show some

appreciable differences in tons per winter season emissions for each alternative, based on their respective entry limits and BAT requirements. Alternative 2, with only BAT snowcoaches, results in some of the lowest emissions for most pollutants, and alternative 3A, with most road grooming eliminated, also has relatively low emissions. Alternative 3B has no emissions because no recreational oversnow vehicles would be allowed. However, alternative 3A with some snowmobiles (compared to none for alternative 2), with emission factors generally higher than BAT snowcoaches (especially at idle), shows increased winter season emissions in comparison to alternative 2.

Also among lower emitting alternatives, alternative 5 provides for unguided snowmobile access but also requires improved BAT for snowmobiles, which reduces CO and HC emissions compared to current BAT snowmobiles. Alternative 6, by contrast, has higher total snowmobile and overall emissions despite having fewer snowmobiles (based on total entry limits) than alternative 5, due to requiring BAT snowmobiles instead of "improved" BAT and additional emissions from wheeled vehicles traveling on plowed roadways. Alternative 6 also has the highest particulate emissions because of the wheeled vehicle contribution of re-suspended particulate emissions on paved roads under winter conditions.

Alternative 4 results in the highest winter season emissions of CO, HC, and NO_x for all the alternatives, due to more higher-emitting 2-stroke snowmobiles allowed in Grand Teton, and substantially higher entry limits for Yellowstone. Alternative 1 results in comparable emissions, which fall between the lowest and highest alternatives. Alternative 7 emissions would be less than alternatives 1 and 4 but generally higher than alternatives 2, 3, and 5. However, all alternatives' emissions are substantially lower than the 1999 Historical Conditions scenario, which represents 2-stroke snowmobile use in the parks at high traffic levels under unregulated conditions. An exception that should be noted is the NO_x emissions for the 1999 Historical Conditions scenario. Despite resulting in much higher emissions of all other pollutants assessed compared to the alternatives, the 1999 Historical Conditions scenario has the lowest NO_x emissions, due to the tradeoff between two-stroke and four-stroke snowmobile engines that occurs for lower CO emissions.

To help put the emissions inventory in perspective, annual emissions information is presented for both parks in Table 4-40. The annual emissions information was compiled in 2000, and is most directly relevant to the "1999 Historical Unregulated Scenario" emissions information. Since that time, both parks have continued to make progress in a variety of non-winter-related emission areas, including more widespread use of bio-based fuels for both administrative and visitor vehicles, use of more hybrid and alternative fueled administrative vehicles, improvements in underground fuel storage tanks, and increased use of four stroke marine engines. Also, the parks have reduced residential woodstoves (often replaced by propane) and converted some stationery sources that relied on fuel oil to propane. Thus, the non-oversnow vehicle emissions component is most likely lower in 2006 than the 2000 estimate.

Table 4-40: Park-wide Total Winter Season Mobile Source Emissions in Pounds per Day (lb/day) and Tons per Year (tpy)

Alternative/Scenario	Carbon Monoxide (CO)		Hydrocarbon (HC)		Nitrous Oxide (NOx)		Particulates (PM)	
	lb/day	tpy	lb/day	tpy	lb/day	tpy	lb/day	tpy
Alternative 1: Continued Temporary Plan, E. Ent. & Gibbon Roads closed	3,869	174	350	16	963	43	6	0.3
Alternative 1: Continued Temporary Plan, E. Ent. & Gibbon Roads open	4,122	185	377	17	1,024	46	6	0.3
Alternative 2: Snowcoaches Only	827	37	22	1.0	239	11	1.0	0.0
Alternative 3A:* Most Road Grooming Eliminated	1,267	57	126	6.0	301	14	2.0	0.1
Alternative 4: Expanded Recreational Use	5,939	267	640	29	3,379	62	16	0.7
Alternative 5: New Mgmt Tools & Improved BAT	2,115	50	153	3.0	616	14	6.0	0.1
Alternative 6: Mixed Use (Plow west-side Roads)	2,306	104	554	25	600	27	462	20.8
Alternative 7: Revised Preferred Alternative, E. Ent. & Gibbon Roads closed	2,984	134	271	12	741	33	4	0.2
Alternative 7: Revised Preferred Alternative, E. Ent. & Gibbon Roads open	3,199	144	294	13	792	36	5	0.2
Current Conditions: Actual Use Scenario	2,523	114	188	8.0	362	16	2.0	0.1
1999 Historical Unregulated Scenario **	67,662	3,045	20,109	905	203	9.0	277	12.5
Yellowstone Annual Emissions (circa 2000)***		6,662		-------		297		212
Grand Teton Annual Emissions (circa 2000)***		1,594		-------		129		78

Note: All alternatives and scenarios assume current snowmobile BAT, except: - Alternative 5, which assumes Improved BAT and; - Historical Conditions, which assumes all uncontrolled 2-stroke.

* 3B would have no emissions.

* * For comparison, this scenario was also modeled for the year 2010, producing these winter season emissions: CO-124 tpy; HC-341 tpy; NOx -8 tpy; PM-12 tpy. 2010 conditions assume standard snowmobile replacement rates based on EPA's 2006 and 2010 emissions restrictions.

For all alternatives, Grassy Lake Road emissions from snowmobiles originating in Targhee NF assume 2007 engine mix; 20% uncontrolled 2-stroke, 70% modified & direct injection 2-stroke, and 10% 4-stroke.

*** Annual Emissions are from: 2000 Air Emissions Inventory, Yellowstone National Park (final March 2003) and 2000 Air Emissions Inventory, Grand Teton National Park (final February 2003) and includes summer and winter point, area, and mobile sources (excluding wildfire). The reports inventoried VOCs but not HC. The reports are available at http://www2.nature.nps.gov/air/AQBasics/inparkemissions.cfm

Table 4-41: Percent Contribution by Vehicle Type to Total Scenario Emissions

Alternative/ Scenario	(CO)			(HC)			(NOx)			(PM)		
	Snow-mobile	Snow coach	On-road vehicle	Snow-mobile	Snow coach	On-road vehicle	Snow-mobile	Snow coach	On-road vehicle	Snow-mobile	Snow coach	On-road vehicle
Alternative 1: Continued Temporary Plan, E. Ent. & Gibbon Roads closed	82%	18%	NA	95%	5%	NA	79%	21%	NA	84%	16%	NA
Alternative 1: Continued Temporary Plan, E. Ent. & Gibbon Roads open	83%	17%	NA	95%	5%	NA	80%	20%	NA	85%	15%	NA
Alternative 2: Snowcoaches Only	0%	11%	NA	0%	3%	NA	0%	13%	NA	0%	8%	NA
Alternative 3A: Most Road Grooming Eliminated	89%	11%	NA	97%	3%	NA	87%	13%	NA	92%	8%	NA
Alternative 4: Expanded Recreational Use	87%	13%	NA	97%	3%	NA	83%	17%	NA	94%	6%	NA
Alternative 5: New Mgmt Tools & Improved BAT	68%	32%	NA	88%	1%	NA	68%	32%	NA	1%	0%	NA
Alternative 6: Mixed Use (Plow west-side Roads)	78%	10%	NA	96%	1%	3%	70%	15%	NA	1%	0%	NA
Alternative 7: Revised Preferred Alternative, E. Ent. & Gibbon Roads closed	82%	18%	NA	95%	5%	NA	79%	21%	NA	84%	16%	NA
Alternative 7: Revised Preferred Alternative, E. Ent. & Gibbon Roads open	82%	18%	NA	95%	5%	NA	79%	21%	NA	85%	15%	NA
Current Conditions	47%	53%	NA	70%	30%	NA	77%	23%	NA	86%	14%	NA
1999 Historical	96%	4%	NA	99%	1%	NA	30%	70%	NA	100%	0%	NA

Hazardous Air Pollutant (HAP) Emissions

Emissions of HAPs (benzene, 1,3 butadiene, formaldehyde, and acetaldehyde) occur in snowmobile and snowcoach emissions and are associated with incomplete fuel combustion. An emission inventory for these HAPs was completed based on HC speciation estimates and the total winter season HC emissions previously determined. For snowmobiles, HAPs emissions were estimated as a fraction of measured HC emissions from 2-stroke and 4-stroke snowmobiles. HAPs classified as air toxics are presented in Table 4-42 as a percentage of the total HC mass, for snowmobiles.

HAPs emissions from on-road vehicles were determined using MOBILE6. HAPs emissions from snowcoaches were calculated using the percentages of the total HC mass derived from MOBILE6, based on the on-road vehicle types that are converted to snowcoaches and the snowcoach HC emissions data from the University of Denver testing. The snowcoach vehicle mix was approximated by the following MOBILE6 vehicle mix fractions: 50 percent light-duty trucks (LDT4), 17 percent CLASS 2b heavy-duty vehicles (HDV), 17 percent CLASS 3 HDV, and 16 percent CLASS 4 HDV. A diesel fraction of five (5) percent for all vehicle classes was assumed. HAP emissions as a percentage of total HC mass, for snowcoaches and on-road vehicles are also presented in Table 4-42. Using the methodology described, total winter season mobile source emissions of HAPs were estimated and are summarized in Table 4-43.

Table 4-42: Vehicular HC Speciation Data

Hazardous Air Pollutants (HAPs)	Vehicle Types and Emissions as a Percent of the Total HC Load			
	2-Stroke Snowmobile	4-Stroke Snowmobile	Snowcoach	On-road Vehicles
Benzene	0.64%	2.60%	3.55%	3.20%
1-3 Butadiene	0.11%	0.00%	0.55%	0.65%
Formaldehyde	0.67%	2.81%	1.66%	3.35%
Acetaldehyde	0.47%	1.08%	0.49%	1.21%

Table 4-43: Park-wide Total Winter Season Mobile Sources HAPs Emissions (Tons per Year)

Alternative/Scenario	Benzene (tpy)	1-3 Butadiene (tpy)	Formaldehyde (tpy)	Acetaldehyde (tpy)
Alternative 1: Continued Temporary Plan**	0.42	0.00	0.43	0.17
Alternative 2: Snowcoaches Only	0.03	0.01	0.02	0.00
Alternative 3A:* Most Road Grooming Eliminated	0.15	0.00	0.16	0.06
Alternative 4: Expanded Recreational Use	0.76	0.01	0.80	0.31
Alternative 5: New Mgmt Tools & Improved BAT	0.19	0.00	0.18	0.07
Alternative 6: Mixed Use (Plow west-side Roads)	0.66	0.01	0.70	0.27
Alternative 7: Revised Preferred Alternative**	0.32	0.00	0.34	0.13
Current Conditions: Actual Use Scenario	0.24	0.01	0.21	0.08
1999 Historical Unregulated Scenario	5.95	1.02	6.12	4.25

Notes:
2-stroke and 4-stroke snowmobile HAPs estimated as a fraction of measured HC emissions based on data reported in SwRI's Laboratory Testing of Snowmobile Emissions, Lela and White, July 2002.
Snowcoach and on-road vehicle HAPs estimated as a fraction of HC emissions based on MOBILE6 modeling of HC and air toxics emission factors for light- and heavy-duty vehicles.
* 3B has no HAP emissions.
**For alternatives 1 and 7, results for benzene were 0.03 tpy with both roads open; for 1-3 Butadiene were the same with both roads open; for formaldehyde, were 0.04 tpy and 0.02 tpy greater with both roads open, respectively; and for acetaldehyde, 0.01 tpy greater.

Visibility

The results of the VISCREEN modeling are shown in Table 4-44. There were no potential localized, perceptible, visibility impairments predicted for alternatives 1 through 5 and 7 at the screening locations. For alternative 6, there would be potential localized, perceptible, visibility impairment near the West Entrance and Old Faithful locations, due to modeled re-suspended particulate emissions from wheeled vehicles. For the 1999 Historical Conditions Scenario, higher pollutant emissions from 2-stroke snowmobiles would potentially cause localized, perceptible, visibility impairment near the West Entrance and Flagg Ranch locations.

Table 4-44: Visibility Impairment

Alternative/Scenario	Screening Criteria Exceedance			
	Site 1: West Entrance	Site 2: West Entrance to Madison	Site 3: Old Faithful Staging Area	Site 4: Flagg Ranch Staging Area
Alternative 1: Continued Temporary Plan**	No	No	No	No
Alternative 2: Snowcoaches Only	No	No	No	No
Alternative 3A:* Most Road Grooming Eliminated	No	No	No	No
Alternative 4: Expanded Recreational Use	No	No	No	No
Alternative 5: New Mgmt Tools & Improved BAT	No	No	No	No
Alternative 6: Mixed Use (Plow west-side Roads)	Yes	No	Yes	No
Alternative 7: Revised Preferred Alternative**	No	No	No	No
Current Conditions: Actual Use Scenario	No	No	No	No
1999 Historical Unregulated Scenario	Yes	No	No	Yes
*3B would have no visibility impacts, since there would be no emissions. ** Results with the East Entrance and Gibbon Roads open for alternatives 1 and 7 were the same as for those roads closed.				

Summary of Impacts

The preceding tables show results of modeling all the alternatives, as well as the current and historic conditions, in a way that allows ready comparison for parameters of interest. The largest reductions in pollutant concentrations and emissions are seen under alternatives that allow only snowcoaches, greatly limit oversnow vehicle entry, or implement “improved” BAT for snowmobiles. The analysis shows that any impacts exceeding the negligible impact level, for any alternative, are associated with carbon monoxide emissions, except for alternative 4 nitrous oxide emissions, at 62 tons per year (tpy). Alternatives 2 and 5 would produce negligible to minor CO emissions, alternative 3 would produce a minor amount of CO emissions, alternatives 1, 6, and 7 would produce moderate CO emissions, and alternative 4 would produce the most CO, constituting a major amount (although still considerably less than historic conditions produced). With the exception of nitrogen oxide emissions under Alternative 4 (which would be 62 tons per year), all other park-wide emission values for each alternative for NOx, HC, and particulates would be less than 44 tons per year, and their cumulative values (by alternative) generally are less than 50 tpy. This compares to the impact threshold for negligible impacts at 50 tpy for each pollutant. All impacts are localized, and, for the most part, impacts on visibility are not of concern due to the limited area or short duration with which they may occur. The impacts can be considered long-term (because they will occur for the life of this plan) but occurring only in winter.

The results of the air quality modeling revealed that none of the alternatives would be likely to exceed the CO and $PM_{2.5}$ NAAQS, or the Montana or Wyoming ambient air quality standards. With respect to both predicted pollutant concentrations and total winter season emissions, compared to the 1999 Historical Conditions scenario, all of the alternatives were projected to greatly improve CO and HC concentrations as a result of BAT requirements and entry limits. However, NO_x emissions are increased for all alternatives compared to the 1999 Historical Conditions scenario, due to an inverse relationship with CO emissions, a tradeoff that occurs between 2-stroke and 4-stroke snowmobile engines for lower CO emissions.

$PM_{2.5}$ emissions for all the alternatives are also greatly reduced compared to the 1999 Historical Conditions scenario, with the exception of alternative 6, which results in higher predicted particulate emissions from the modeled wheeled vehicle travel contribution of resuspended particulate emissions under winter conditions (although those emissions are still negligible overall). In addition, the results of the Class I PSD assessment show that 24-hour PM_{10} increment consumption for each of the alternatives at all modeling locations would be lower than the PSD increment of 8 micrograms per cubic meter, with the exception of Site 2 for alternative 6, which experiences higher predicted particulate emissions from modeled wheeled vehicle travel. 1999 Historical Conditions also exceeds the 24-hour PM_{10} PSD increment for both Sites 1 and 2. Modeling results from this study are compared with data collected at the West Entrance and Old Faithful sites for historical conditions (1999, with 1983 regulations) and current conditions.

Cumulative Effects

The area of concern includes the airshed described by all three park units and by adjacent Class I areas on national forests. Although ambient air pollution generated at great distances beyond the park boundaries is of concern compared to air quality in the parks, it is unreasonable to consider all of the western United States as an area of concern.

Levels of nitrates found in YNP's snowpack can be related to regional industry (Ingersoll et al. 1997) confirming the fact that additional air pollution in the parks comes from regional industry located within 150 km of the park (including oil and gas drilling and processing, power plants, and industrial combustion), urban uses, and recreational uses outside the parks. In addition to these known sources, other trends, plans, and actions which may affect air quality in the parks include population growth (such as that in Big Sky and Jackson) and the construction of a natural gas pipeline in Hoback Canyon, both of which may further degrade air quality, although to an unknown extent. Countering these effects (or improving air quality) may be the forest plan and/or travel plan revisions being undertaken by the national forests in the GYA and the Teton Pathways & Grand Teton Summer Transportation Plan, which may promote alternative transportation.

Background concentrations are those pollutant concentrations not directly accounted for by the modeling analysis. As described earlier, background concentrations have been added to modeling results to obtain total pollutant concentrations at prediction sites. Background concentrations can typically be attributed to local sources, long-range transport, and natural sources. For this analysis, background levels included emissions from other OSVs (including administrative use and use outside of the parks) and other motorized wheeled vehicles or internal combustion engines that operate on roads within the parks, as well as wood-burning stoves (background concentrations for this analysis were estimated considering the guidelines provided in *40 CFR Part 51, Appendix W;* see complete discussion regarding the determination of background concentrations in the assumptions and methods section, above, and in the air resource modeling report). Although these modeling procedures do not account for long-range transport (such as pollutants from oil and gas drilling or power

plants), the modeled background values were identical to those actually measured in the parks.

Because background concentrations are already included in the modeled results, they are cumulative, enabling a very good comparison of the cumulative effects of implementing each alternative.

Conclusions

Under all the alternatives, all measures of air quality pollutants, particulates and visibility are predicted to meet Federal, Montana, and Wyoming ambient air quality standards. No alternatives would see impairment of park air quality.

Table 4-45 summarizes the air quality impacts of each alternative, compares the alternatives to both current and historic conditions, and demonstrates that no alternative would result in impairment of park resources.

Alternative 1

Emissions in this alternative would be a moderate, adverse, long-term (but occurring only in winter), direct, park-wide impact, more adverse compared to current use levels, and greatly beneficial compared to historic conditions. No perceptible visibility impacts would be likely. If the Madison-Norris road is closed for bison-road research or the East Entrance remains open, impacts would be the same (moderate, adverse, long-term, direct, and park-wide). Impairment of park resources would not occur; the level of air pollution under alternative 1 would not harm the integrity of park resources and values.

In terms of cumulative effects, the moderate, long-term, and adverse impacts resulting from direct and indirect actions described in this alternative would contribute a moderate, adverse, long-term impact to past, present, and foreseeable actions and impacts on air quality.

Alternative 2

Emissions in this alternative would be a negligible, adverse, long-term (but occurring only in winter), direct, park-wide impact, greater only than emissions that would be produced under the no action alternative, 3B. As such, the impact on air quality in this alternative would be beneficial compared to all the other alternatives, as well as current and historic levels of use. It would be adverse compared only to no action. No perceptible visibility impacts would be likely. Impairment of park resources would not occur; the level of air pollution under alternative 2 would not harm the integrity of park resources and values.

In terms of cumulative effects, the negligible, long-term, and adverse impacts resulting from direct and indirect actions described in this alternative would contribute a negligible, adverse, long-term impact to past, present, and foreseeable actions and impacts on air quality.

Alternative 3

Emissions under alternative 3A would be a minor, adverse, long-term (but occurring only in winter), direct, park-wide impact, greater than those that would be produced by recreational oversnow vehicles in alternatives 2 and 5. The impacts on air quality in this alternative would be beneficial compared to impacts of both current and historic levels of use. It would be adverse compared to the no action alternative (3B), which would clearly have the greatest benefit for air quality, in that there would be no emissions produced by oversnow recreation vehicles. In either case (3A or 3B), no perceptible visibility impacts would be likely.

Impairment of park resources would not occur; the level of air pollution under alternative 3, either option, would not harm the integrity of park resources and values.

In terms of cumulative effects, the minor, long-term, and adverse impacts resulting from direct and indirect actions described in this alternative would contribute a minor, adverse, long-term impact to past, present, and foreseeable actions and impacts on air quality.

Alternative 4

This alternative would result in an adverse impact compared to current conditions but would be a beneficial impact relative to historic use conditions. Overall, this alternative's impact on air quality would be major, adverse, long-term (but occurring only in winter), and direct. Compared to the no action alternative and all other alternatives, this alternative's impacts would be greater and adverse. No perceptible visibility impacts would be likely. Impairment of park resources would not occur; the level of air pollution under alternative 4 would not harm the integrity of park resources and values.

In terms of cumulative effects, the major, long-term, and adverse impacts resulting from direct and indirect actions described in this alternative would contribute a moderate, adverse, long-term impact to past, present, and foreseeable actions and impacts on air quality.

Alternative 5

Emissions would be a negligible to minor, adverse, long-term (but occurring only in winter), direct, park-wide impact, with the second-lowest total in the range of alternatives (after alternative 2). The impacts on air quality in this alternative would be beneficial compared to impacts of both current and historic levels of use, but adverse compared to the no action alternative. No perceptible visibility impacts would be likely. Impairment of park resources would not occur; the level of air pollution under alternative 5 would not harm the integrity of park resources and values.

In terms of cumulative effects, the negligible to minor, long-term, and adverse impacts resulting from direct and indirect actions described in this alternative would contribute a minor, adverse, long-term impact to past, present, and foreseeable actions and impacts on air quality.

Alternative 6

Alternative 6 is the only alternative in which the criteria for exceedance of visibility impacts would occur. Using very conservative assumptions about sand, dust, and dry roads, the modeling indicated that visibility would be adversely affected at both the West Entrance and at Old Faithful staging areas. This compares to visibility impacts experienced under historic use conditions at Yellowstone's West Entrance, but actually exceeds the historic impact at Old Faithful. However, this modeling does not take into account Yellowstone's typically snow-covered or damp road surfaces which would in reality substantially reduce dust and visibility issues. In addition, the modeling assumed sanding on all miles of plowed roads, when only portions of the roads (in most cases, less than half the mileage) would be sanded regularly. This would be a moderate local impact.

Emissions would be an adverse, moderate, direct, long-term (but occurring only in winter), park-wide impact, with the third-highest total in the range of alternatives after alternatives 4 and 1. The impact on air quality in this alternative would be beneficial compared to impacts of current use and beneficial compared to historic conditions. It would be adverse compared to the no action alternative. Visibility impairment would be local, perceptible, and moderate.

Impairment of park resources would not occur; the level of air pollution under alternative 6 would not harm the integrity of park resources and values.

In terms of cumulative effects, the moderate, long-term, and adverse impacts resulting from direct and indirect actions described in this alternative would contribute a moderate, adverse, long-term impact to past, present, and foreseeable actions and impacts on air quality.

Alternative 7

Emissions in this alternative would be a moderate, adverse, long-term (but occurring only in winter), direct, park-wide impact, more adverse compared to current use levels, and greatly beneficial compared to historic conditions. No perceptible visibility impacts would be likely. If the Madison-Norris road is closed for bison-road research or the East Entrance remains open, impacts would be the same (moderate, adverse, long-term, direct, and park-wide). Impairment of park resources would not occur; the level of air pollution under alternative 7 would not harm the integrity of park resources and values.

In terms of cumulative effects, the moderate, long-term, and adverse impacts resulting from direct and indirect actions described in this alternative would contribute a moderate, adverse, long-term impact to past, present, and foreseeable actions and impacts on air quality.

Table 4-45 Air Quality Impacts Conclusions

Alternative	Level of Adverse Impact[1]		Relative Comparison to Current Conditions	Relative Comparison to Historic Condition	Impairment
	Emissions	Visibility	(%)[2]	(%)[3]	
1	Moderate	Negligible	Adverse (157%)	Beneficial (6%)	No
2	Negligible	Negligible	Beneficial (33%)	Beneficial (1.2%)	No
3A[4]	None to Minor	Negligible	Beneficial (50%)	Beneficial (1.9%)	No
4	Major	Negligible	Adverse (234%)	Beneficial (8.9%)	No
5	Negligible to Minor	Negligible	Beneficial (44%)	Beneficial (1.6%)	No
6	Moderate	Moderate	Beneficial (91%)	Beneficial (3.4%)	No
7	Moderate	Negligible	Adverse (117%)	Beneficial (4.4%)	No

[1] See Table 4-28 for definitions
[2] Alternative's CO emissions as a percent of the current annual CO emissions - from actual use levels (114 tons per year)
[3] Alternative's CO emissions as a percent of the annual CO emissions produced historically (3,045 tons per year)
[4] 3B, the "No Action" option, would produce no emissions so there would be no impacts.

4.2.4 Effects on Public and Employee Health and Safety

Assumptions and Methods

The area of analysis is the parks. To assess the level of impact to employee and public health and safety for each alternative, the following types of information were used:

- Safety policies and guidelines (see section 3.5.1)
- Results of air monitoring near the West Entrance in YNP
- Results of personal exposure and sound monitoring
- Results of air quality and sound modeling
- Reports from employees and commercial guides

- Past and current avalanche analyses.

Table 4-46 defines overall impacts to health and safety, including impacts for avalanche control in the Sylvan Pass area of YNP. Note that while personal and occupational exposure to air quality and noise contaminants has been monitored in Yellowstone (as described in Section 3.5.3), it was not modeled for the various alternatives and is therefore compared qualitatively, using monitored data (See Jensen and Meyer, 2006; Spear et al., 2006).

Table 4-46: Definition of Impacts to Employee and Public Health and Safety

Impact Category	Definition
Negligible	No noticeable or perceptible impact; no mitigation needed. 8-hour average noise exposure levels (Leq) are below 55 dBA; peak sound pressure levels (SPL) are below 75 dBA.
Minor	Measurable or perceptible impact if ATSDR Minimum Risk Levels (MRLs)* or other established limits are rarely exceeded. If mitigation were needed, it would be relatively simple and would likely be successful. 8-hour time-weighted noise exposure levels are below 60 dBA; peak noise levels are below 75 dBA.
Moderate	Impact could cause a permanent change; ATSDR MRLs or other established limits are exceeded daily. Mitigation measures would probably be necessary and would likely be successful. 8-hour time-weighted noise exposure levels are below 70 dBA; peak noise levels are below 80 dBA.
Major	Substantial impact to employee or public health and safety; ATSDR MRLs or other established limits are exceeded more than once per day. Extensive mitigation measures would be needed, and their success would not be guaranteed. High potential exists for serious accidents or hazards. 8-hour time-weighted noise exposure levels exceed 85 dBA; peak noise levels routinely exceed 90 dBA. Maximum one second Leq levels exceed 130 dBA.
*From the Agency for Toxic Substances & Disease Registry at http://www.atsdr.cdc.gov/mrls/index.html	

Effects by Alternative

This section analyzes the effects of personal and occupational exposure to air and noise contaminants and avalanche control operations in comparison to the no-action alternative and current and historic conditions.

Alternative 1

As with the Temporary Plan, all snowmobiles in the parks would meet BAT requirements and all would be commercially guided. Continuation of these guiding and BAT requirements, and extension of BAT requirements to snowcoaches, would contribute to a park environment characterized by orderly, clean and quiet conditions, similar to current conditions for snowmobiling and snowcoach operations. Current conditions include occupational exposure to air contaminants and noise that is well below established limits, with average entrance station noise exposure levels well below 80 dBA. Although the number of snowmobiles could increase above current levels under this alternative, it is unlikely that toxic pollutant emissions or noise levels would increase significantly, particularly given the fact that peak days have seen between 400 and 500 snowmobiles in the last three years.

Minimal impacts to employee and public health and safety would be generated by the potential closure of Gibbon Canyon (Madison to Norris Junctions) for management experiments investigating the bison-groomed road relationship. Travel between Mammoth Hot Springs and Old Faithful or West Yellowstone, and between Canyon and West Yellowstone, would become substantially more difficult (with greater exposure to rough roads), as visitors and employees would then need to travel around the Lower Loop or via wheeled vehicle through Livingston and Bozeman, Montana. Implementation of the closure

would probably also result in a reduced number of such trips, due to the increased time necessary for them.

Seasonal avalanche control operations for spring opening would pose minor, short-term, direct adverse effects to employee safety.

Under this alternative, Sylvan Pass would be closed to OSV travel but remain open to non-motorized travel. Further,

- No avalanche control operations would occur at the pass, other than those necessary for search and rescue operations and spring opening procedures.
- The howitzer platform would be dismantled. Howitzers, ammunition and associated equipment would be removed from the park.
- Homeland security issues currently associated with the howitzer operation would not exist once the equipment is removed from the park.

Under this alternative, the NPS would continue to construct and maintain the CDST alongside of and partially upon the plowed roadway between the east park boundary of Grand Teton and Flagg Ranch. The presence of this snowmobile route and its configuration relative to the road would result in minor to moderate, direct and long-term adverse impacts to public health and safety.

Under this alternative, impacts to employee and public health and safety in the parks would be moderate, direct, short-term, and adverse as a result of this action.

Comparison to current conditions, historic conditions, and the No Action Alternative

Even though the use levels set by this alternative were in effect for the Temporary Plan, they were not reached under current conditions, so this alternative could see increased OSV traffic as compared to current conditions. Therefore, its safety impacts, relative to the current conditions, could increase. Regarding the avalanche hazards, selection of this alternative would have major beneficial effects upon visitor and employee health and safety.

Historically, all snowmobiles were two-stroke machines, which produced objectionable levels of noise and air emissions. Because this alternative would continue the temporary plan's restriction to BAT machines and would limit the number of such machines in the park, and because it would implement BAT requirements for snowcoaches, this alternative would result in beneficial effects upon visitor and employee health and safety. Furthermore, the closure of Sylvan Pass, with its substantial avalanche hazards, would have significant beneficial effects upon the exposure to avalanche hazards for visitors and employees.

The no-action alternative disallows recreational OSV use in the parks; minimal administrative travel could continue. Compared to this restricted use, this alternative would incur adverse effects upon visitor and employee health and safety. Both alternatives would close Sylvan Pass to OSV travel, so the exposures to avalanche hazards would be similar.

Mitigation of Effects

Current mitigation measures such as the wearing of appropriate winter clothing, helmets and earplugs would continue as needed. Other personal protective equipment would be made available for employee use as appropriate.

Guiding is an effective mitigation for visitor and employee health and safety because guides are effective at enforcing proper touring behaviors, such as staying within speed limits and on the groomed road surfaces. Requirements for BAT on both snowcoaches and snowmobiles would mitigate exposure to both air toxics and noise. Snowcoach size and numerical limits will mitigate the effects of large vehicles upon the road surfaces. The use of hearing

protection, recommended by the NPS for all OSV users, is an effective mitigation against excessive noise levels.

Cumulative Effects

The area of concern is the parks. Few if any actions or trends from outside the parks would influence public and employee health and safety in the parks. For example, the trend toward increasing guide and outfitter activity extends to the parks, but the NPS strictly regulates the provision of guided services within the parks. As well, while changing demographics means an increasing interest in outdoor activities, all snowmobiling in Yellowstone is guided, reducing the occurrence of unsafe snowmobile behaviors.

For employees exposed to air toxics, noise, and rough roads, health effects may accumulate over the course of a season. Additionally, there is the potential for synergistic effects. However, under this alternative, the provisions for BAT, limited entries, and guided groups substantially mitigate these effects. A variety of other hazards associated with winter travel may also be experienced while traveling in the parks during the winter, all of which are common to winter travel in the intermountain west. These hazards may include avalanches, rock fall, hypothermia, blowing snow, traffic accidents and poor driving conditions. To some extent these hazards are mitigated by management action such as the cold weather advisory system and temporary road closures.

Conclusion

Because Sylvan Pass would be closed to OSV travel under this alternative, because BAT and guiding requirements would be in effect, and because snowcoach BAT requirements would be implemented, the effects of this alternative upon visitor and employee health and safety would be minor to moderate, direct, short-term, and adverse.

In terms of cumulative effects, the minor to moderate, short-term, and adverse impacts resulting from direct and indirect actions described in this alternative would contribute a minor to moderate, adverse, short-term impact to past, present, and foreseeable actions and impacts on employee health and safety.

Alternative 2

Under this alternative, a BAT requirement would be implemented for snowcoaches, snowmobiles would be banned, and Sylvan Pass would be closed to OSV travel. These policies would contribute to an orderly, cleaner and quieter environment in the park. Occupational exposure to air contaminants and noise would likely be well below established limits because all snowcoaches would meet BAT requirements.

Seasonal avalanche control operations for spring opening would pose minor, short-term, direct, adverse effects to employee safety.

Under this alternative, Sylvan Pass would be closed to OSV travel but remain open to non-motorized travel. Further,

- No avalanche control operations would occur at the pass, other than those necessary for search and rescue operations and spring opening procedures.
- The howitzer platform would be dismantled. Howitzers, ammunition and associated equipment would be removed from the park.
- Homeland security issues currently associated with the howitzer operation would not exist once the equipment is removed from the park.

Impacts to employee and public health and safety in the parks would be minor to moderate, direct, short-term, and adverse as a result of this action.

Comparison to current conditions, historic conditions, and the No Action Alternative

Relative to current conditions, fewer vehicles would be allowed on Yellowstone's roads, although all would be snowcoaches, which may disturb the groomed road surface more than snowmobiles. However, the implementation of a size limit and numerical limit on snowcoaches would mitigate this effect. All coaches would be driven by professional drivers, so traffic violations would be minimal. Also, Sylvan Pass would be closed to OSV travel, greatly reducing exposure to avalanche dangers. Therefore, this alternative's safety impacts, relative to the current conditions, would decrease.

Historically, all snowmobiles were two-stroke machines, with objectionable levels of noise and air emissions. By contrast, this alternative would implement BAT requirements for snowcoaches and eliminate all snowmobiles. It would also close Sylvan Pass, greatly reducing exposure to avalanche hazards. Consequently, this alternative would substantially reduce impacts upon visitor and employee health and safety relative to historic conditions.

The no-action alternative disallows recreational OSV use in the parks; minimal administrative travel could continue. Compared to this restricted use, this alternative would have increased effects upon visitor and employee health and safety. Both alternatives would close Sylvan Pass to OSV travel, so exposure to avalanche hazards would be similar.

Mitigation of Effects

Current mitigation measures such as the wearing of appropriate winter clothing, helmets and earplugs would continue as needed for employees using snowmobiles (all visitors would be in snowcoaches with similar mitigation measures recommended). Other personal protective equipment would be made available for employee use as appropriate. Impacts historically associated with snowmobiles would no longer be of concern. Snowcoach BAT requirements would mitigate air quality and sound impacts.

Cumulative Effects

Cumulative effects under this alternative would be similar to those under alternative 1.

Conclusion

Because Sylvan Pass would be closed to OSV travel under this alternative and snowmobiles would be banned, and because snowcoaches would have BAT requirements implemented, the effects of this alternative upon visitor and employee health and safety would be minor to moderate, direct, short-term, and adverse.

In terms of cumulative effects, the minor to moderate, short-term, and adverse impacts resulting from direct and indirect actions described in this alternative would contribute a minor, adverse, short-term impact to past, present, and foreseeable actions and impacts on employee health and safety.

Alternative 3

This alternative has two variations: 3A – Snowmobile use would continue with access limited to the South Entrance to Old Faithful road corridor only; and 3B – Same as 3A except that in Yellowstone all roads, including the South Entrance to Old Faithful road segments, would be closed to recreational oversnow vehicle travel. In Grand Teton, the CDST, Grassy Lake Road and Jackson Lake would all be closed to oversnow vehicle travel. Highway 89/191/287 could remain open to wheeled vehicle travel as far north as Flagg Ranch.

Overall OSV numbers would decrease substantially under alternative 3A, with guiding and BAT requirements in place. Consequently, exposure to noise and contaminants would be minimal.

Seasonal avalanche control operations under either variation of this alternative for spring opening would pose minor, short-term, direct, and adverse effects to employee safety.

As with alternatives 1 and 2, Sylvan Pass would be closed to OSV travel under either variation of this alternative. Under 3A, it would also be closed to non-motorized travel, but it would remain open for such under 3B. Further, under either variation:

- No avalanche control operations would occur at the pass, other than those necessary for search and rescue operations and spring opening procedures.
- The howitzer platform would be dismantled. Howitzers, ammunition and associated equipment would be removed from the park.
- Homeland security issues currently associated with the howitzer operation would not exist once the equipment is removed from the park.

Therefore, the effects of implementing either of these alternatives would be minor, adverse, short-term, and direct upon employee and public health and safety.

Comparison to current conditions, historic conditions, and the No Action Alternative

Compared to current conditions, snowcoach and snowmobile numbers would either decrease moderately (3A) or be eliminated (3B), and all use would occur in a smaller percentage of the park (3A). Further, under 3A, snowcoach BAT requirements would contribute to a cleaner and quieter environment in the park as compared to current conditions. Both variations would close Sylvan Pass and the East Entrance road to OSV travel. In comparison to current conditions, both variations of alternative 3 would result in a reduction of personal and occupational exposure to noise and contaminants, and a reduced exposure to avalanche hazards.

Relative to historic conditions, both variations would result in substantially less use and closure of Sylvan Pass to OSVs. Requirements for commercially guided BAT snowmobiles and snowcoaches would contribute to a cleaner and quieter environment in the park as compared to historic conditions. Consequently, personal and occupational exposure to noise and contaminants would drop dramatically relative to historic conditions, as would exposure to avalanche hazards.

Relative to the no-action alternative, 3A would result in more OSV use, although all of it would be BAT, guided, and would be concentrated on the South Entrance to Old Faithful stretch of road. Also, minimal administrative travel would continue on the closed roads because some employees would likely be duty stationed at interior locations in Yellowstone to provide necessary facility maintenance under alternative 3A. Still, 3A would result in more health and safety impacts than 3B, the no-action alternative.

Mitigation of Effects

For 3A and 3B, current mitigation measures such as the wearing of appropriate winter clothing, helmets and earplugs would continue as needed. Other personal protective equipment would be made available for employee use as appropriate.

For 3A, other mitigations would be the same as those listed under alternative 1.

Cumulative Effects

Cumulative effects under alternative 3A would be similar to those under alternative 1. Cumulative effects under alternative 3B would be limited to those incurred from administrative travel upon rough roads, which may be more common under this alternative due to reduced grooming.

Conclusion

Because Sylvan Pass would be closed to OSV travel under this alternative while BAT and guiding requirements stay in place and because snowcoaches would have BAT requirements implemented, the effects of alternative 3A upon public and employee health and safety would be minor, adverse, short-term, and direct. Because employee travel could occur on ungroomed or infrequently groomed roads if variation 3B is implemented, the effects on employee health and safety would be minor to moderate, adverse, short to long-term, and direct.

In terms of cumulative effects, the minor, short-term, and adverse impacts resulting from direct and indirect actions described in this alternative would contribute a minor (3A) to moderate (3B), adverse, short-term (3A) or long-term (3B) impact to past, present, and foreseeable actions and impacts on public and employee health and safety.

Alternative 4

This alternative would allow up to 1,025 snowmobiles per day into Yellowstone and 250 into Grand Teton National Park. All machines in Yellowstone would be BAT; 75% would have to be led by commercial guides. In Grand Teton, most snowmobiles would be BAT, but a small number of two-stroke machines (model year 2006 or newer) would be allowed on the CDST, and all snowmobiles (up to 75) on the Grassy Lake Road could be two-stroke. Snowcoach use would be allowed to increase as well.

The higher levels of use allowed in this alternative, relative to the monitored conditions of the past few winters, would be more likely to produce exceedances of occupational exposure limits and increased sound levels. Exposure to toxics and noise extremes would become more likely, especially in Grand Teton where two-stroke machines would once again be used.

Sylvan Pass and the East Entrance road beyond Lake Butte Overlook would remain open to OSV travel, as discussed in section 2.6.4. This would impact employee and public health and safety for the following reasons:

- Routine avalanche control operations would occur, in addition to those necessary for search and rescue operations and spring opening procedures.
- The howitzer platform could remain in place, subject to rock-fall and avalanche dangers. Howitzers, ammunition and associated equipment could remain in the park.
- Homeland security issues currently associated with the howitzer operation would remain a concern as long as howitzers, ammunition and associated equipment remain in the park.

For these reasons, the employee and visitor health and safety impacts under this alternative would likely be major, direct, long-term, and adverse. 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 this alternative, the NPS would continue to construct and maintain the CDST alongside of and partially upon the plowed roadway between the east park boundary of Grand Teton and Flagg Ranch. The presence of this snowmobile route and its configuration relative to the road would result in minor to moderate, direct and long-term adverse impacts to public health and safety.

Comparison to current conditions, historic conditions, and the No Action Alternative

This alternative sets daily snowmobile entry limits at historic use levels, which are substantially higher than the use levels currently seen in the parks. BAT would remain in effect for Yellowstone, but some visitors would be unguided. BAT and guiding requirements for Jackson Lake and the Grassy Lake Road would be substantially unchanged from current conditions. Some BAT and guiding requirements would be implemented for the CDST. In comparison to current conditions, the implementation of this alternative would result in adverse impacts upon visitor and employee health and safety.

OSV use would approximate peak historic levels, which were found to impair park resources. Under this alternative, however, BAT requirements plus the requirement for some commercial guiding would mitigate most of those impacts. Relative to historic conditions, this alternative would result in some improvements to visitor and employee health and safety. Because this alternative would utilize multiple methods of avalanche hazard mitigation at Sylvan Pass, it would result in some improvements to avalanche hazard exposure and risk relative to historic conditions.

The no-action alternative disallows recreational OSV use in the parks; minimal administrative travel could continue. Therefore, the adverse effects of implementing this alternative would be significantly greater than the no-action alternative.

Mitigation of Effects

Current mitigation measures such as the wearing of appropriate winter clothing, helmets and earplugs would continue as needed. Other personal protective equipment would be made available for employee use as appropriate.

Commercial guiding is an effective mitigation for visitor and employee health and safety, because guides are effective at enforcing proper touring behaviors, such as staying within speed limits and on the groomed road surfaces. The provision for some non-commercial use under this alternative would make this mitigation less effective than in other alternatives requiring 100% guiding. Non-commercial users would however, be required to meet certain safety and training requirements (for example those described in Section 2.6.4). Requirements for BAT technologies on both snowcoaches and snowmobiles would mitigate exposure to both air toxics and excessive noise, although the provision for some two-stroke snowmobile use in Grand Teton and the Parkway would reduce the effectiveness of this mitigation there, and the increased numbers of snowmobiles possible in the parks would further limit its effectiveness. Snowcoach size limits and numerical limits would mitigate the effects of large vehicles upon the road surfaces. The use of hearing protection, recommended by the NPS for all OSV users, is an effective mitigation against noise exposure.

Avalanche risks would be mitigated by area-specific forecasting, control methods such as helicopter dispensed explosives, howitzer operations, grooming and/or other appropriate control methods and mitigation measures. Other mitigation includes closure of the pass when necessary to protect human health and safety (as determined by NPS personnel). Closures may occur frequently for unlimited periods of time and are likely to inconvenience planned employee and visitor travel.

Cumulative Effects

Cumulative effects under this alternative would be similar to those under alternative 1, although the potential for adverse cumulative effects would be enhanced under this alternative due to the increased number of snowmobiles allowed under this alternative, the fact that some would be unguided, and the fact that some snowmobiles used in Grand Teton would be two-stroke machines.

Conclusion

Because Sylvan Pass would remain open to OSV travel under this alternative, because snowmobile numbers would increase and some would be unguided, and because some two-stroke machines would be allowed in Grand Teton and the Parkway, the effects of this alternative upon visitor and employee health and safety would be major, direct, long-term, and adverse.

In terms of cumulative effects, the major, long-term, and adverse impacts resulting from direct and indirect actions described in this alternative would contribute a major, adverse, long-term impact to past, present, and foreseeable actions and impacts on employee health and safety.

Alternative 5

Snowmobiling would continue in this alternative, although all snowmobiles would meet improved BAT requirements, making them even cleaner and quieter than most snowmobiles currently available. Eighty percent of snowmobiles in YNP would be led by commercial guides, which would contribute to a safer park environment for employees and visitors. However, approximately 20% of YNP visitors would be allowed to travel in self-guided groups in which all members of the group have received training in how to appropriately and safely travel through the park. There would be less assurance that these visitors would heed speed limits, pass others safely, or operate snowmobiles that meet BAT requirements, etc. . Peak days of snowmobile and snowcoach use would occur because of flexible daily entry limits; BAT snowcoach use could occur at levels higher than current conditions. Overall, employee and visitor exposure to high noise levels and airborne toxics would be less than under current conditions. Avalanche control efforts (both those in spring and those on Sylvan Pass) would continue as described in section 2.6.5, with similar impacts to those described for alternative 4. 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. For these reasons, this alternative would incur major, adverse, direct, and long-term impacts upon visitor and employee health and safety.

Under this alternative, the NPS would continue to construct and maintain the CDST alongside of and partially upon the plowed roadway between the east park boundary of Grand Teton and Flagg Ranch. The presence of this snowmobile route and its configuration relative to the road would result in minor to moderate, direct and long-term adverse impacts to public health and safety.

Comparison to current conditions, historic conditions, and the No Action Alternative

Use of improved BAT would serve to reduce exposure of employees and visitors to noise and airborne toxics, although the somewhat increased use under this alternative relative to current conditions could diminish any benefits accrued from to the use of improved BAT. Further, the allowance for 20% of visitors to be unguided could result in behaviors that diminish visitor and employee health and safety. Consequently, the effects of implementing

this alternative would be both beneficial and adverse in comparison to current conditions. Because avalanche control efforts would continue, exposure to avalanche risk would be unchanged relative to current conditions.

Other than on holiday weekends, OSV use would generally be lower than peak historic levels, which were found to impair park resources. BAT and commercial guiding requirements would contribute to improvements to visitor and employee health and safety relative to historical conditions. Because this alternative would continue the use of appropriate avalanche control methods, it would result in some improvements to avalanche hazards and associated risks relative to historic conditions.

The no-action alternative disallows recreational OSV use in the parks; minimal administrative travel could continue. Therefore, the adverse effects of implementing this alternative would be greater the no-action alternative.

Mitigation of Effects

Current mitigation measures such as the wearing of appropriate winter clothing, helmets and earplugs would continue as needed. Other personal protective equipment would be made available for employee use as appropriate.

Guiding is an effective mitigation for visitor and employee health and safety, because guides are effective at enforcing proper touring behaviors, such as staying within speed limits and on the groomed road surfaces. However, the provision for some unguided use under this alternative would make this mitigation less effective than in other alternatives requiring 100% guiding. Requirements for improved BAT on snowmobiles and snowcoaches would mitigate exposure to both air toxics and noise. Snowcoach size limits would mitigate the effects of large vehicles upon the road surfaces. The use of hearing protection, recommended by the NPS for all OSV users, is an effective mitigation against noise exposure.

Exposure to avalanche hazards would be mitigated by area-specific forecasting, control methods such as helicopter dispensed explosives, howitzer operations, grooming and/or other appropriate control methods and mitigation measures. Other mitigation includes closure of the pass when necessary to protect human health and safety (as determined by NPS personnel). Closures may occur frequently for unlimited periods of time and are likely to inconvenience planned employee and visitor travel.

Cumulative Effects

Cumulative effects under this alternative would be similar to those under alternative 1, although the potential for adverse cumulative effects would be somewhat enhanced under this alternative due to the fact that some use would be unguided.

Conclusion

Because Sylvan Pass would remain open to OSV travel under this alternative and because some snowmobiles would be unguided, the effects of this alternative upon visitor and employee health and safety would be major, direct, long-term, and adverse.

In terms of cumulative effects, the major, long-term, and adverse impacts resulting from direct and indirect actions described in this alternative would contribute a major, adverse, long-term impact to past, present, and foreseeable actions and impacts on employee health and safety.

Alternative 6

All snowmobiles allowed under this alternative would be BAT and guided. All wheeled vehicles permitted would also be guided, and such vehicles are equipped with modern

emissions and sound reduction technologies. The guided nature of all park tours would minimize driving misbehaviors. Guiding and BAT requirements, as well as the reduction of travel on several road segments, would contribute to an orderly, clean, and quiet environment in the parks. Also, the CDST would be closed. Because the level of snowmobile use allowed under this alternative would be similar to current conditions, visitor and employee exposure to air toxics and noise would be expected to be similar. The closure of Sylvan Pass and the East Entrance road beyond Lake Butte Overlook to OSV travel would benefit employee and public health and safety as described for alternative 1. For these reasons, this alternative would result in minor to moderate, direct, short-term, and adverse impacts upon visitor and employee health and safety.

Comparison to current conditions, historic conditions, and the No Action Alternative

Commercially guided BAT snowmobile and snowcoach use would continue in this alternative at levels comparable to current conditions. Commercially guided wheeled vehicle use would also be authorized in this alternative, representing an increase in wheeled vehicle traffic as compared to current conditions, but a decrease in overall vehicle usage on those road segments. These changes would result in approximately similar visitor and employee health and safety impacts to current conditions, but because Sylvan Pass, with its avalanche hazards, would be closed to OSV travel under this alternative (substantially reducing the avalanche hazards to which visitors and employees are exposed), this alternative would have reduced impacts upon visitor and employee health and safety relative to present conditions.

Snowmobile use would continue in this alternative, but at lower levels than historical conditions. Similarly, closure of many park roads to OSV travel would result in a reduction of personal and occupational exposure to noise and contaminants. This would be somewhat offset by the use of commercially guided wheeled vehicles on these road segments. These policies, and requirements for commercially guided BAT snowmobiles and snowcoaches, would contribute to a cleaner and quieter environment in the park as compared to historic conditions. Further, closure of Sylvan Pass and the East Entrance road beyond Lake Butte Overlook to OSV travel would benefit employee and public health and safety, relative to historic conditions, as described for alternative 1.

The no-action alternative disallows recreational OSV use in the parks; minimal administrative travel could continue. This alternative allows for recreational OSV and commercially guided wheeled vehicle access. Therefore, the effects of implementing this alternative would be adverse in comparison to the no-action alternative.

Mitigation of Effects

Current mitigation measures such as the wearing of appropriate winter clothing, helmets and earplugs would continue as needed. Other personal protective equipment would be made available for employee use as appropriate.

Additionally, the use of wheeled vehicles, with modern pollution and noise control equipment, would be effective mitigations for air toxic and noise exposure in the areas of plowed roads. Plowed roads are themselves mitigation, as wheeled vehicle travel is generally more comfortable than OSV travel.

Other mitigations on OSV routes would be the same as those listed under alternative 1.

Cumulative Effects

Modeling data suggest that wheeled vehicle use would decrease overall impacts to air quality and sound, as compared to current or historic conditions. Other cumulative effects under

this alternative would be similar to those under alternative 1, especially in areas with continued OSV use.

Conclusion

Because Sylvan Pass would be closed to OSV travel under this alternative, because BAT and guiding requirements would be in place, because snowcoaches would have BAT requirements implemented, and because some roads would be plowed (with consequent reductions in exposure to air toxics, noise, and unsafe touring behavior), the effects of alternative 6 upon visitor and employee health and safety would be minor to moderate, direct, short-term, and adverse.

In terms of cumulative effects, the minor to moderate, short-term, and adverse impacts resulting from direct and indirect actions described in this alternative would contribute a minor, adverse, short-term impact to past, present, and foreseeable actions and impacts on employee health and safety.

Alternative 7

As with alternative 1, all snowmobiles in the parks would meet BAT requirements and all would be commercially guided. Implementation of these guiding and BAT requirements, and extension of BAT requirements to snowcoaches, would contribute to a park environment characterized by orderly, clean and quiet conditions, consistent with current conditions for snowmobiling and snowcoach operations. Current conditions include occupational exposure to air contaminants and noise that is well below established limits, with average entrance station noise exposure levels well below 80 dBA. Although the number of snowmobiles could increase above current levels under this alternative, it is unlikely that toxic pollutant emissions or noise levels would increase significantly, particularly given the fact that peak days have seen between 400 and 500 snowmobiles in the last three years.

Minimal impacts to employee and public health and safety would be generated by the potential closure of Gibbon Canyon (Madison to Norris Junctions) for management experiments investigating the bison-groomed road relationship. Travel between Mammoth Hot Springs and Old Faithful or West Yellowstone, and between Canyon and West Yellowstone, would become substantially more difficult (with greater exposure to rough roads), as visitors and employees would then need to travel around the Lower Loop or via wheeled vehicle through Livingston and Bozeman, Montana. Implementation of the closure would probably also result in a reduced number of such trips, due to the increased time necessary for them.

Seasonal avalanche control operations for spring opening would pose minor, short-term, direct adverse effects to employee safety.

Under this alternative, Sylvan Pass would be closed to OSV travel but remain open to non-motorized travel. Further,

- No avalanche control operations would occur at the pass, other than those necessary for search and rescue operations and spring opening procedures.
- The howitzer platform would be dismantled. Howitzers, ammunition and associated equipment would be removed from the park.
- Homeland security issues currently associated with the howitzer operation would not exist once the equipment is removed from the park.

Under this alternative, impacts to employee and public health and safety in the parks would be minor to moderate, direct, short-term, and adverse as a result of this action.

Comparison to current conditions, historic conditions, and the No Action Alternative

The use levels set by this alternative are lower than those for the Temporary Plan, and they were reached during peak days in the 2006-2007 season. Since this alternative could see similar OSV traffic as compared to current conditions, its safety impacts, relative to the current conditions, would be similar. Historically, all snowmobiles were two-stroke machines, with objectionable levels of noise and air emissions. Because this alternative would continue the temporary plan's restriction to BAT machines and would limit the number of such machines in the park, and because it would implement BAT requirements for snowcoaches, this alternative would result in beneficial effects upon visitor and employee health and safety. Furthermore, the closure of Sylvan Pass, with its substantial avalanche hazards would have significant beneficial effects upon the exposure to avalanche hazards for visitors and employees as compared to both current and historic conditions.

The no-action alternative disallows recreational OSV use in the parks; minimal administrative travel could continue. Compared to this restricted use, this alternative would incur adverse effects upon visitor and employee health and safety. Both alternatives would close Sylvan Pass to OSV travel, so the exposures to avalanche hazards would be similar.

Mitigation of Effects

Current mitigation measures such as the wearing of appropriate winter clothing, helmets and earplugs would continue as needed. Other personal protective equipment would be made available for employee use as appropriate.

Guiding is an effective mitigation for visitor and employee health and safety, because guides are effective at enforcing proper touring behaviors, such as staying within speed limits and on the groomed road surfaces. Requirements for BAT on both snowcoaches and snowmobiles would mitigate exposure to both air toxics and noise. Snowcoach size and numerical limits will mitigate the effects of large vehicles upon the road surfaces. The use of hearing protection, recommended by the NPS for all OSV users, is an effective mitigation against noise exposure.

Cumulative Effects

Cumulative effects under this alternative would be similar to those under alternative 1, although the potential for adverse cumulative effects would be somewhat reduced under this alternative due to the reduced number of allowed snowmobiles.

Conclusion

Because Sylvan Pass would be closed to OSV travel under this alternative while guiding and snowmobile and snowcoach BAT requirements would be implemented, the effects of this alternative upon visitor and employee health and safety would be minor to moderate, direct, short-term, and adverse.

In terms of cumulative effects, the minor to moderate, short-term, and adverse impacts resulting from direct and indirect actions described in this alternative would contribute a minor, adverse, short-term impact to past, present, and foreseeable actions and impacts on employee health and safety.

4.2.5 Effects on Wildlife

The area of analysis for wildlife is the three park units. Because there is considerably less OSV travel in Grand Teton and the Parkway and because the species analyzed in this document occur more frequently on the OSV routes in Yellowstone, the analysis primarily focuses on wildlife in Yellowstone. The impacts upon wildlife in Grand Teton and the Parkway would

be expected to be similar to, but of a lower intensity than, the impacts upon wildlife in Yellowstone.

The following analyses of potential adverse effects to wildlife are limited to various alternatives for OSV recreation in the parks and groomed roads for OSV use. The analyses are broken down by species, or grouping of species: ungulates (bison and elk), gray wolves, Canada lynx and wolverines, coyotes and ravens, and bald eagles and swans. The analyses comply with NPS regulations and policies for management of wildlife, including the legislation and Executive Orders summarized in Chapter I and Appendix A.

Scientific literature on species' life histories, distributions, habitat selection, and responses to human activities were used to assess the levels of impact on wildlife. Additionally informing the analysis was site-specific information on wildlife species in the parks, including information from completed and on-going studies, and the professional judgment of biologists familiar with the management concerns related to individual species. Much of the park-specific information and scientific literature documented in the 2000 Final EIS (pages 143-158 and 237-262) is valid and incorporated in this EIS by reference.

There will always be uncertainty regarding the effects of winter recreation on wildlife in the parks because of the complex interactions of the disparate variables involved. Managers will inevitably need to act without the luxury of complete knowledge, using the best available information to evaluate the range of possible effects. They will also need to weigh the potential benefits and costs of alternate management actions against the risks of inaction. Following is an explanation of some of these uncertainties, associated assumptions used in the subsequent analysis, and the reasons that park managers are able to make informed decisions regarding winter recreation management.

Wildlife responses to winter recreation are dependent on the context of the given species and situation. Random weather events (e.g., severe snows, cold temperatures, etc.) during winter in mid- to high-elevation mountain environments interact with animal density to strongly influence population dynamics and how individual animals move and distribute themselves across the landscape. While the wildlife monitoring of the past several winters in the parks has provided some information on such population dynamics, most of that data have been gathered over a series of relatively mild to moderate winters. It is difficult to gauge the precise effects of more severe winters on the frequency and magnitude of wildlife responses given the complex ecology and behavioral flexibility of Yellowstone's wildlife, as well as the numerous, non-linear interactions between wildlife responses, winter recreation, and other stressors (e.g., snow pack). The NPS acknowledges the potential for fitness costs such as decreased survival and reproduction to develop as winter severity becomes more severe or prolonged. For the subsequent analyses, because severe winters are known to increase energetic costs and chronic under-nutrition in most wildlife species, the NPS assumed that effects of OSVs and associated human activities would be exacerbated during such winters.

Oversnow vehicle activities may cause a wide range of responses from wildlife with effects at differing scales. For example, collisions between OSVs and wildlife can cause direct mortality, while single or repeated interactions between OSVs and wildlife could lead to energy expenditures from flight reactions. Additionally, exposure to natural (such as wind) or human caused (such as OSV traffic) noise may result in a "listening area reduction" (see Section 3.7.2). Animals can be displaced from important habitats by human activity (Gill et al. 1996), or they can experience less obvious effects like elevated heart rate and metabolism which, in turn, can result in high energy expenditures (Canfield et al. 1999), elevated production of stress hormones (i.e., glucocorticoids), increased susceptibility to predation,

decreased reproduction, and diminished nutritional condition (Geist 1978; Aune 1981; Moen et al. 1982; Cassier et al. 1992; Picton 1999; Hardy et al. 2001; Creel et al. 2002). Thus, this analysis assumes that higher oversnow vehicle traffic would result in more frequent responses by, or stress to, wintering wildlife (Hardy 2001; Creel et al. 2002; Borkowski et al. 2006; White et al. 2006).

This analysis assumes that the likelihood of wildlife species actively responding to snowmobiles or snowcoaches increases with vehicle group size. The estimated odds of observing a movement response compared to no response by bison, swans, and bald eagles during 2003 to 2006 were 1.1 (threshold value[12] of 8 snowmobiles), 1.1, and 1.3 (threshold of 18) times greater, respectively, for each additional snowmobile (White et al. 2006).

Similarly, although existing data does not allow precise quantification or direct comparison of the relative effects to wildlife of actions which increase levels of snowcoach or wheeled vehicle use while decreasing snowmobile use (i.e., alternatives 2, 6), some comparisons are possible. This analysis assumes that the likelihood of some species actively responding to oversnow vehicles is higher for snowcoaches than for snowmobiles. Snowcoaches present a larger visual profile than snowmobiles, which could elicit greater responses. The estimated odds of observing a movement response compared to no response by bison, elk, swans, and bald eagles were 1.5 (threshold value of 3), 1.8, 1.7, and 4.2 times greater, respectively, for each additional coach (White et al. 2006). Observations and information gathered along the already plowed roadway through wildlife range across Yellowstone's northern tier similarly provides adequate basis for analysis of the effects of implementing alternative 6.

In the past several winters, the NPS instituted a mandatory guide requirement in Yellowstone whereby all visitors to the park must either snowmobile with a commercial guide or tour in a snowcoach, driven by a trained commercial driver (while private snowcoaches were authorized under the Temporary Plan, on average, only one private coach per winter entered the parks). Guided groups are much more likely to pass bison and other animals which are on or near park roadways with a minimum of wildlife reaction or harassment. Similarly, guides have the responsibility to enforce proper wildlife viewing behavior, such as limiting interaction times and the distances at which their clients approach wildlife. Guides also enforce proper food storage, preventing their clients from inadvertently allowing wildlife to obtain their food (Tabor 2006). Given these behaviors, the NPS assumed in the following analyses that mandatory use of commercial snowmobile guides and snowcoach drivers would reduce adverse wildlife reactions and opportunities for wildlife to obtain human foods.

Despite these assumptions, some uncertainties remain and thereby limit managers' abilities to fully predict the effects of the alternatives. For example, the effects of the alternatives upon habituation of most wildlife are difficult to predict because research findings regarding habituation differ. However, the effects upon coyote and raven habituation (or more specifically, their tendency to seek out human foods) are known and given in a separate section below (under species of concern). Additionally, animals that are in poor condition (sick, low energy reserves, etc.) might be less likely or less able to respond visibly to human presence. Animals in these situations could appear to display habituated tolerance levels even if they are disturbed by the activity. Responses can also be also species-specific.

[12] Threshold values are the number of coaches or snowmobiles beyond which the animal no longer increasingly responds. In this instance, once eight snowmobiles have been reached, there is no longer an increasing movement response; the animals have reacted as much as they will.

Still, enough research and observation-based information exists to enable park managers to make reasoned decisions regarding winter recreation management. In general, the results of data collected over the past four winters of wildlife monitoring indicate that bison, coyotes, eagles, elk, and trumpeter swans in Yellowstone National Park exhibit some behavioral responses to oversnow vehicles in association with human activities (White et al. 2005; Borkowski et al. 2006). However, as several wildlife researchers have found, the majority of behavioral responses are low in intensity and do not appear to be adversely affecting the population dynamics or demography of these species (Hardy 2001; White et al. 2006, Borkowski et al. 2006). As discussed in more detail in the relevant sections below, estimates of bison, elk, and bald eagle abundance have increased despite large variations in annual OSV numbers. Trumpeter swans may be declining in number, but that decline is probably due to other causes, not winter recreation. Grizzly bears and wolves are doing so well that they have been removed from (in the case of grizzlies) or are proposed for delisting from the endangered species list. Research is ongoing regarding the status of wolverines. Coyotes and ravens are abundant throughout the parks and in no danger of population reduction. Finally, all the alternatives analyzed in this document require most or all visitors to travel in the company of commercial guides or snowcoach operators, a provision with the potential to reduce impacts upon wildlife populations substantially.

While the focus of this analysis is predominantly the impact on wildlife populations, the NPS acknowledges that adverse impacts to individual animals should be minimized.

Impacts of actions proposed in each alternative were analyzed on the basis of five major concerns, with the general effects of each summarized below.

- Vehicle-caused mortality to individual animals
- Displacement impacts
- Behavioral responses of wildlife groups to OSVs and associated human activities
- Physiological responses of wildlife groups to OSVs and associated human activities
- Demographic effects at the population level

Vehicle-caused Mortality

Ungulates

The annual number of ungulate deaths caused by snowmobiles from 1989-1999 was estimated as <1% of each species' total abundance in YNP. The possibility of individual bison and elk being killed by OSVs exists, but no population-level impacts to bison and elk have been detected during periods of higher OSV levels. The NPS is not aware of any snowcoach-wildlife collisions, suggesting that trained, experienced snowcoach drivers are more effective than visitors on snowmobiles at avoiding such collisions. In addition, the number of snowcoaches entering the park is considerably less than for snowmobiles. Despite the small number of road-killed ungulates compared to the size of their populations, the NPS is concerned about these losses and seeks to minimize collisions caused by motorized vehicles of all kinds. For the following analyses the NPS assumed that alternatives that increase OSV traffic through the winter ranges of wildlife during winter would likely increase the frequency of road-killed wildlife.

Wolves

Out of 123 documented wolf deaths between 1995 and 2005, only 8 were from vehicle strikes (all from automobiles, not OSVs), representing a total of less than 1% of the estimated Yellowstone wolf population. Similarly, road kill data from 1989-1999 indicated that OSVs were not associated with any wolf mortality during that period. Vehicle-related wolf

mortality, then, appears to influence wolf population dynamics in the parks much less than natural sources of mortality. For these analyses, then, the NPS assumed that alternatives which increase OSV traffic during winter would likely increase the frequency of vehicle-killed wolves. Conversely, decreasing levels of vehicle traffic through wolf habitat during winter would likely decrease the possibility of vehicle-related wolf deaths.

Lynx and Wolverines

One can expect the same effects of increasing or decreasing OSV travel and/or wheeled vehicle travel upon lynx and wolverines (as for wolves, explained in the foregoing paragraph). The majority of the lynx confirmed by Murphy et al. (2006) were located within 12 km of Yellowstone's East Entrance Road, and preliminary information suggests the same to be true for wolverines. Alternatives which close Sylvan Pass would diminish the potential for lynx and wolverine vehicle-caused mortality (although there could still be minor amounts of OSV travel from Fishing Bridge to Lake Butte Overlook under most such alternatives). Overall, the low numbers, wide distribution, and secretive nature of wolverine and lynx are expected to result in a continuing extremely low incidence of vehicle-caused mortality.

Swans and Bald Eagles

The risk of vehicle-caused mortality to trumpeter swan and bald eagles theoretically increases and decreases in a similar manner to described for other species (i.e., more vehicle traffic increases the risk of mortality). However, raptors and swans suffer very little road-associated mortality in the parks; there are no records of any vehicle-killed bald eagles or swans from 1989 to 2006. There is documentation of other road-killed birds in Yellowstone, typically during the spring and summer months, but these do not include eagles or swans and the small numbers of such road kills are not considered threatening to the species involved (ravens, magpies, etc). Thus, given the smaller volumes of traffic under all alternatives in relation to summer traffic, swans and eagles are unlikely to experience substantial vehicle-caused mortality from either OSV or winter wheeled vehicle traffic under any of the alternatives in this EIS.

Displacement of Animals

Ungulates

As discussed in Chapter III, elk and bison displacement seems to be localized and short-term. Bison and elk continue to occupy the same historical winter range in the Madison and Firehole drainages of Yellowstone while exposed to the highest levels of OSV traffic in the park. Consequently, the following analyses assume that increasing OSV use will cause short-term and localized displacement, but not long-term displacement, in large part because the winter OSV season lasts less than 90 days. Also as discussed in Chapter III regarding bison in particular, the NPS proceeded with the understanding that groomed roads are not having a driving effect on bison dynamics. The NPS is examining the relationship between groomed roads and bison further, based upon the research proposal from Garrott and White (2007), the Gates report, and the bison workshop that occurred in January 2006 (summarized in section 3.6.2.2 and Appendix G, respectively).

Wolves

For wolves, the discussion of displacement is combined with the discussions for behavioral and physiological response. As discussed in Chapter III, the low incidence of wolves encountered during surveys over four years suggests that wolf interactions with OSVs are rare. The presence of wolves along the busiest OSV route in YNP (West Yellowstone to Old Faithful) and the low number of interactions with OSVs suggest that wolves avoid human

activity generally, hence OSVs, in the daytime. Overall displacement events of wolves by OSVs appear to be short in duration, in part because wolves are sometimes active in proximity to roads and developed areas at night. This minimizes the possibility of direct behavioral and physiological impacts to wolves from OSV use. Although displacement of wolves is low overall, the analyses which follow make the qualitative assumption that increasing levels of OSV use, and associated human activity, will increase disturbance to, and responses by, wolves.

Lynx and Wolverines

For lynx and wolverines, the discussion of displacement is combined with the discussions for behavioral and physiological response.

Generally, according to the best available information, lynx and wolverines appear unlikely to be adversely impacted by expected levels of OSV traffic in the parks. More specifically, alternatives that would close Sylvan Pass would decrease the OSV traffic, road grooming, and avalanche control activities on the road segment closest to confirmed lynx and wolverine activity and possible denning habitat, thereby decreasing the potential for den abandonment and disturbance. Alternatives which keep the pass open would continue those human activities. However, the daily level of OSV use on the East Entrance Road is small and likely represents little direct impact to wolverine and lynx. Operations necessary to maintain the road include avalanche control and road grooming. The impacts of avalanche control in the parks on lynx and wolverine are not known, but there have been no direct impacts from these activities recorded upon lynx and wolverines in the parks, probably resulting from the low density of both species. The effect of plowed roads on lynx and wolverines in the parks is unknown, but plowed or groomed roads will not be a significant means of travel for these species, both of which are highly adapted for travel in unpacked snow.

This analysis makes the qualitative assumptions that although lynx and wolverines would probably not be affected by the levels of OSV traffic proposed in the parks under these alternatives, more OSV traffic (including more human activity in all forms) would increase the potential disturbance and responses by wolverines and lynx. An additional assumption is that closing Sylvan Pass would have fewer impacts upon these animals than leaving it open would.

Eagles and Swans

The information presented on these two species in Chapter III indicates some eagle and swan tolerance for human activities in the parks (see also White et al. 2006). The historical nesting patterns of eagles and swans in Yellowstone, and the natural history of trumpeter swans indicates that they are not likely to experience substantial displacement from OSV traffic or winter recreation. However, this analysis makes the qualitative assumption that alternatives which increase human activity or vehicle traffic increase the possibility of displacement.

Behavioral Responses

Ungulates

Overall, the comparatively less frequent and lower intensity responses by bison and elk to human disturbance in Yellowstone suggests a certain level of habituation to OSVs and associated human activities. Although habituation as an impact is difficult to predict, behavioral data indicate that more recreationists produce greater behavioral response in wildlife, an assumption the NPS carried forward in the following analyses. Another assumption, based on professional expertise, is that the use of commercial guides may help to reduce such interactions because guides may be trained to limit their groups' interaction time

with animals, to prevent wildlife harassment and chasing, and to limit the distance at which their groups approach animals. Similarly, guides may be trained in recognizing and minimizing those situations where two or more factors may increase wildlife stress.

Wolves

For wolves, the discussion of behavioral responses is combined with the discussions for displacement and physiological response; see the displacement section above.

Lynx and Wolverines

For lynx and wolverines, the discussion of behavioral responses is combined with the discussions for displacement and physiological response; see the displacement section above.

Coyotes and Ravens

As Chapter III indicated, there is no concern that coyotes or ravens will suffer adverse effects at the population level due to OSV use and associated recreationist presence. Rather, the concern with coyotes is that they will actively seek out interactions with people in winter in an effort to obtain food at a time of scarcity. While coyote behavior cannot be controlled, human behavior can; as suggested in Chapter III, mandatory guiding substantially reduces the availability of human foods for these two species. Consequently, the analysis of effects on coyotes and ravens largely depends on the guiding requirements proposed under the various alternatives.

Eagles and Swans

For eagles and swans, the discussions of behavioral and physiological responses are combined.

As with ungulates, behavioral data indicate that more recreationists produce greater behavioral response in wildlife, an assumption the NPS carried forward in the following analyses. Again as for ungulates, the NPS assumed that the use of guides for visitors helps to reduce such interactions because guides are trained to limit their groups' interaction time with animals, to prevent wildlife harassment and chasing, and to limit the distance at which their groups approach animals. Similarly, guides may be trained in recognizing and minimizing those situations where two or more factors may produce more wildlife stress. This analysis also assumes that the likelihood of bald eagles and trumpeter swans actively responding to snowmobiles or snowcoaches increases with vehicle group size and with vehicle size (i.e. snowcoaches will produce a greater response than snowmobiles).

There is no current information from the parks which would allow inferences about avian physiological stress in reference to OSV use. Therefore, as with other species and in agreement with behavioral response data, this analysis assumed that higher OSV traffic would result in more frequent physiological responses by, and more stress to, bald eagles and trumpeter swans.

Physiological Responses

All Species

The majority of responses by wildlife documented in YNP have been low-intensity vigilance or movements such as travel (Borkowski et al. 2006, White et al. 2006). Just because an animal exhibits no external response, however, does not mean physiological responses are absent. Animals may experience elevated heart rate, blood pressure, breathing rate, and release of adrenaline. Quantifying these physiological responses in wildlife is extremely difficult. Numerous assumptions are required and poorly defined parameter estimates can strongly

affect research outcomes. Given the difficulties with quantitative analysis of physiological responses to recreation by wildlife, analyses for this document made the qualitative but conservative assumption 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

Ungulates

As discussed in Chapter III, oversnow vehicle use and winter recreation in Yellowstone and Grand Teton National Parks have not affected bison and elk populations. Any adverse behavioral and energetic effects of OSV recreation to these ungulate populations have apparently been compensated for at the population level.

An unknown number of individual bison and elk will incur adverse effects when exposed to snowmobile and snowcoach traffic and winter recreation under the alternatives of this EIS (including snowcoaches only). Small numbers or groups of bison and elk may be displaced or experience impacts from interactions with oversnow vehicles, for instance. Mitigation measures listed under each alternative seek to lessen the frequency and intensity of impacts to individual animals.

Overall, for the following analyses, the NPS assumed, based on the research summarized in Chapter III, that those forms of winter recreation practiced in the parks may have cumulative effects to individual animals, but that such impacts have not risen to the level at which they impact overall wildlife populations in the parks.

Wolves

As discussed in Chapter III, wolf populations increased throughout the GYA since their reintroduction, and even though disease has likely produced a recent drop in their populations, the populations remain healthy throughout the area, including heavily-traveled areas such as Yellowstone's Lamar Valley. Impacts to denning wolves which could cause decreases in reproduction are not expected to occur because wolves den in April, after the closure of the OSV season in the parks.

Significant predictive correlations have been found with park and wilderness lands and wolf presence, as well as negative relationships between roads and wolves. As noted, wolf populations in the GYA are healthy, suggesting that the levels and types of human recreational activity in the parks and road densities therein (pre-existing paved roads are the only OSV routes in Yellowstone and Grand Teton national parks) are generally below the threshold necessary to adversely impact wolf populations. The combined evidence, then, suggests that if existing human winter activity were displacing wolves, the impacts have not been sufficient to significantly increase mortality or decrease reproductive success at the population level. Alternatives are analyzed with this understanding.

Lynx and Wolverines

Of the three lynx identified through DNA in Yellowstone, one was offspring (Murphy et al. 2006). Although detections of offspring do not confirm the presence of a viable, reproductively-stable population in the park or ecosystem, they do suggest resident females. The dynamics of the GYA lynx population are not well understood, making the impacts of the proposed action to a regional lynx population difficult to determine with accuracy. However, impacts to breeding lynx are not expected to occur because the winter recreation season in the parks overlaps the initiation of the lynx breeding season by only a week or two.

Similarly, predicting the effects of any alternative upon wolverines is difficult due to the paucity of information about them anywhere in published literature. However, their preferences for habitat and denning sites mean that they will rarely occur near the road systems of the parks, the majority of which is in habitat that wolverines utilize primarily only as travel corridors between areas of preferential habitat. Further, their wide-ranging nature means that even places like Sylvan Pass, which, although good habitat, may only be rarely frequented by wolverines.

Eagles and Swans

Decreases in reproductive rates have been detected in birds exposed to increased recreational activity. Decreases over large numbers of birds would presumably result in a cumulative, detectable population-level impact. However, nesting success and numbers of fledgling bald eagles in YNP increased during a period of intense OSV use, 1987 to 2005, and were not significantly correlated with cumulative OSV traffic. This suggests that any impacts to individual bald eagles have been compensated for at the population level.

Swan numbers have been declining for several decades, including those in productive areas such as the Centennial Valley of Montana. It is unlikely that poor production across the GYA has resulted from OSV use in Yellowstone or GTNP, because swans in the parks generally return to their breeding territories between February and late May, with young hatching in late June, when OSV traffic is no longer a presence in the parks. Further, swan numbers in the parks decrease as areas of open water diminish as winter progresses, exposing proportionally fewer trumpeter swans to OSV use in the parks.

Overall, for the following analyses, the NPS assumed, based on the information presented in Chapter III, that those forms of winter recreation practiced in the parks may have cumulative effects to individual birds, but that such impacts have not risen to the level at which they impact overall eagle or swan populations in the parks.

Closure of Gibbon Canyon (the Gates Experiment)

An action common to all alternatives is the implementation of a tiered research proposal investigating the relationship between groomed roads and bison movements in the Gibbon Canyon area (Madison to Norris), including the potential closure of that route in winter. Because alternative 3 would already close that stretch of road, it would not be affected by this change. This research opportunity may offer scientists a valuable opportunity to study the relationship between groomed roads and bison movements and distribution in Yellowstone.

If the closure is implemented (see section 2.5.5), it would not only eliminate travel on that stretch of roadway, but would also substantially decrease OSV travel on the roads from Norris to Canyon and Canyon to Fishing Bridge (as based on the travel factors in Appendix C) primarily because visitors entering from West Yellowstone would no longer be able to travel to the Canyon area in a day. In the following analyses, the NPS assumed 1) that the Gibbon Canyon Road would be open and 2) that closing it would have fewer effects upon wildlife than presented in the analyses below, for wildlife along the Norris-Canyon, Canyon to Fishing Bridge, and Norris to Madison Road stretches.

Travel on the West, South, and East Entrance roads would see little change (compared to the baseline travel on those stretches under each alternative), with no change in the estimated impacts upon wildlife in those areas if the road closure were implemented. OSV travel between Madison Junction and Old Faithful, Old Faithful and West Thumb, and West Thumb and Fishing Bridge would increase by small amounts, as all West Entrance visitors would only be able to go to Old Faithful and points east of there for the day. Of these roads, only the one from Madison to Old Faithful traverses important winter wildlife habitat and

OSV travel would only increase about 10% on it, a modest increase that, under all alternatives but Alternative 4, is still well below historic use levels on that stretch. This modest an increase means that, if the closure is implemented, the impacts from that closure would be very similar to those analyzed below. There would also be a small increase in travel on the road from Mammoth to Norris, but such use is already so low that effects upon wildlife in that road stretch are minimal.

In summary, if the road closure is implemented, impacts upon wildlife due to OSV use in the park would be the same, or nearly the same, as those presented in the analysis which follows.

Definition of Impacts

The foregoing discussions represent the basis for the definition of impact levels defined in Table 4-47.

Table 4-47: Definition of Impacts to Wildlife

Impact Category	Definition
Negligible Effect	An action that may affect a population or individuals of a species, but the effect would be so small that it would not be of any measurable or perceptible consequence to the population.
Minor Effect	An action that may affect a population or individuals of a species, but the effect would be small; if it is measurable, it would be a small and localized consequence to the population.
Moderate Effect	An action that will affect a population or individuals of a species; the effect may be measurable and may have a sufficient consequence to the population but is more localized.
Major Effect	An action that will noticeably affect a population or individuals of a species; the effect will be measurable and have a substantial and possibly permanent consequence to the population.

Impacts on Bison and Elk by Alternative

Alternative 1

Vehicle-Caused Mortality

Generally, alternatives that increase traffic through wildlife winter ranges would likely increase the frequency of road-killed wildlife. Under this alternative, the potential for vehicle collisions with individual bison and elk would increase relative to alternatives 2, 3, 5 and 7, and current conditions, because of higher OSV numbers. This alternative would decrease the potential for vehicle collisions relative to historical conditions and alternatives 4 and 6. Thus, vehicle collision impacts to bison and elk are predicted to be negligible, adverse, short-term and direct.

Displacement

Past levels of OSV use higher than predicted under this alternative have not resulted in significant displacement-related impacts to bison and elk populations in the parks. Thus, displacement impacts to bison and elk under alternative 1 are predicted to be moderate, adverse, short-term and direct under alternative 1. Because this alternative would allow more recreational use, it would increase the possibility for bison and elk displacement relative to alternatives 2, 3, 5, 6, and 7, and current conditions. It would decrease the potential for displacement relative to historical conditions and alternative 4, because that alternative would allow more human use.

Behavioral and Physiological Responses

The likelihood of bison actively responding to groups of OSVs increases as bison encounter the larger groups possible under alternative 1. Minor to moderate energy costs from behavioral responses to disturbance should be easily compensated for and, most likely, not have significant demographic consequences. No adverse impacts to park bison or elk populations have been detected at levels of OSV use greater than those predicted under this alternative. Impacts to bison and elk resulting from behavioral and physiological responses under alternative 1 are therefore predicted to be moderate, adverse, short-term, and direct under alternative 1. Higher OSV levels and associated human activity are likely to result in more behavioral and physiological responses from bison and elk. Therefore, behavioral responses and the associated physiological reactions are predicted to increase under alternative 1 relative to alternatives 2, 3, 5, 6, and 7, and current conditions, due to increased traffic levels. Behavioral and physiological responses are predicted to decrease relative to historical conditions and alternative 4.

Population- level Impacts

Population-level effects presumably result from cumulative effects to individual animals. In the case of OSV use and winter recreation, no adverse population level impacts to bison and elk have been detected under higher levels of winter use in the parks, so decreased levels of use under alternative 1 should minimize the possibility of population-level impacts to wildlife. Thus, population-level impacts are predicted to be none to minor, adverse, short-term and direct under alternative 1.

Mitigations

The impacts identified above would be mitigated in several ways under this alternative. First, the daily entry restrictions would limit OSV visitation to a level substantially less than the historic limits. Because most impacts increase with the numbers of visitors, restricting visitor numbers also limits wildlife impacts. Secondly, as discussed in section 2.5.3, monitoring of human-wildlife interactions will continue under all alternatives. If this monitoring indicates that human presence or activities are having unacceptable effects on wildlife that cannot otherwise be mitigated, selected areas of the parks (including sections of roads) may be closed to visitor use. Finally, and as discussed in Chapter III, the requirement to use commercial guides is an effective mitigation for some human impacts upon wildlife. Guides are trained to avoid causing wildlife displacement or stress and are familiar with likely wildlife locations along the road system. Accompanied by guides, OSV users may be less likely to interact improperly with wildlife, causing less mortality, less displacement, and fewer negative behavioral and physiological responses.

Cumulative Effects

The area of concern is that which is used by bison and elk for wintering and seasonal migration. This includes all of the three park units plus adjacent lands that elk, and to a lesser degree bison, utilize, primarily in winter. Because the area of concern is defined bison and elk winter habitat, impact sources include winter uses—motorized and non-motorized—and other activities, actions, and trends which displace bison or elk from that particular habitat or render the habitat unusable or less suitable for them.

Bison which leave Yellowstone are currently subject to management control at the park boundary, pursuant to the 2000 Interagency Bison Management Plan (IBMP). Such controls include hazing back into Yellowstone, retaining the animals in holding facilities for eventual release back into Yellowstone, and/or removal from the population. The plan provides that when Yellowstone's bison population drops below 3,000, non-lethal management actions

will be preferred for sero-negative bison rather than the lethal removal options, in order to preserve a self-sustaining population inside Yellowstone (sero-positive bison may still be sent to slaughter). If the population drops below 2,300, then the agencies are required to assess risk management strategies in favor of population conservation.

Hunting of both species is allowed outside the parks and (for elk) in Grand Teton National Park. While such hunting is outside the management purview of the NPS and the scope of this EIS, hunting seasons and limits are managed by the states in such a way as to ensure long-term wildlife viability.

Population growth in the GYA, rural land subdivision, improving snowmobile technologies, and increasing outfitter/guide activity can all influence wildlife populations by introducing more recreationists into big game habitat and/or fragmenting wildlife habitat. Additionally, Grand Teton has recently completed a summer transportation plan, and Teton County has completed the Teton Pathways Master Plan. These actions should have little effect on bison, since their movement outside the park is restricted by the IBMP, and human activities within the parks are fairly restricted in winter. Elk could be adversely affected by these trends. Presumably, however, state wildlife management agencies would attempt to minimize significant population declines. Additionally, the large amount of federal land in the GYA and large amounts of elk winter range which have been placed in federal ownership in the last twenty years add some security to elk populations.

The Gallatin National Forest has consolidated much of its checker-boarded holdings in recent years, although that has also been accompanied by the consolidation of private lands, especially in the Big Sky area. It is difficult to predict the net effect of these actions on bison and elk, since the consolidated USFS lands are less likely to be developed while the private lands are more likely to be.

Noxious weed growth is a problem throughout the GYA, with potentially adverse effects on bison and elk. The federal, state, and county agencies have active noxious weed control programs which attempt to prevent further spread of these plants, limiting their effect on bison and elk. Additionally, restoration of some of the Gardiner Basin (see section 1.9) would have likely benefits for both bison and elk, since the native plants they prefer would be favored by such restoration.

Timber harvest, grazing and mining, fires, and fuels reduction projects will continue to occur on federal and other lands outside the parks. These actions have variable effects on bison and elk, sometimes stimulating the growth of their preferred forage and sometimes limiting it.

Several national forests in the region are revising their forest plans and/or travel plans. Also, Yellowstone is in the process of writing an EIS on the remote delivery of brucellosis vaccine for bison and Grand Teton has recently completed an elk and bison management plan. These plans will have variable effects on bison and elk, but all such actions would most likely ensure the continued viability of both ungulate populations.

Road construction is a recurring event in the region, as are other construction projects such as proposed for the Laurance S. Rockefeller Preserve in Grand Teton. Within the parks, these projects are undertaken in such a way as to minimize their effects on wildlife. On the national forests, this is generally true as well. For example, most facility construction projects within the parks and forests are subject to environmental analyses and are either replacements of existing facilities or are located within existing developed areas, therefore minimizing their effects upon wildlife. Still, the faster travel speeds resulting from road improvements can result in greater wildlife road kill.

Conclusion

The qualitative assumptions, grounded in the available literature on bison and elk, made in this analysis are that increases in winter traffic levels and associated human recreational activity cause increases in vehicle-caused mortality, wildlife displacement, behavior- or physiology-related energy costs, and the potential for adverse demographic impacts. However, the mitigations (limited number of visitors, continued wildlife monitoring, and mandatory guiding) discussed above, coupled with adaptive management, would limit wildlife impacts to acceptable levels. According to the best available information, then, direct and indirect impacts under this alternative are predicted to be negligible to moderate, adverse, and short-term.

In terms of cumulative effects, the negligible to moderate, adverse, and short-term impacts resulting from direct and indirect actions described in this alternative would contribute a negligible to minor, adverse, and short-term impact to past, present, and foreseeable actions and impacts on bison and elk. The impacts associated with alternative 1 would not be of sufficient magnitude to constitute unacceptable impacts or impairment of elk and bison wildlife resources.

Alternative 2

Vehicle-related Mortality

Snowcoaches have not contributed to any known deaths of bison or elk, suggesting that they and their operators may be more able than snowmobilers to avoid collisions with wildlife. The possibility of individual bison and elk being killed by snowcoaches exists, but the overall number of each species is expected to be minimal. Thus, snowcoach collision impacts to bison and elk are predicted to be negligible, adverse, short-term and direct under alternative 2. Alternative 2 would reduce the risk of vehicle-caused mortality relative to historical conditions, current conditions, and all EIS alternatives except 3 because overall traffic volume in the parks would decrease under this alternative. The risk would be greater than in alternative 3 because more OSVs are traveling through winter range under this alternative.

Displacement

Existing data suggest that snowcoaches may elicit a higher level of behavioral response from bison and elk than snowmobiles due to their larger profile. Allowing access only by snowcoaches may not prevent displacement of individual bison and elk. However, these events are predicted to have small, localized impacts. Overall, displacement impacts are predicted to be minor to moderate, adverse, short-term and direct under alternative 2.

Because this alternative would allow less recreational use, it would decrease the possibility for bison and elk displacement or habitat avoidance relative to alternatives 1, 4, 5, 6, 7, current conditions, and historic conditions. It would increase the potential for displacement relative to alternative 3, because both 3A and 3B would allow substantially less human use.

Behavioral and Physiological Responses

Allowing access only by snowcoaches may not prevent behavioral or physiological responses by individual bison and elk, but the impacts are predicted to be small and localized. Overall, impacts due to behavioral and physiological responses from bison and elk are predicted to be minor to moderate, adverse, short-term, and direct under alternative 2. Behavioral responses and associated physiological reactions resulting from exposure to human disturbance are expected to be reduced under alternative 2 relative to historical conditions, current conditions, and alternatives 1, 4, 5, 6, and 7 due to lower traffic volume. The possibility is

higher relative to alternative 3 because more OSVs would travel through winter range and would, therefore, be likely to encounter wildlife under alternative 2.

Population-level Impacts

No adverse population level impacts to bison and elk have been detected under higher levels of winter use, so decreased levels of use under alternative 2 should minimize disturbance to wildlife. Thus, population-level impacts are predicted to be negligible, adverse, short-term and direct under alternative 2.

Mitigations

Mitigations for bison and elk impacts under alternative 2 would be the same as those for alternative 1. While this alternative would have no commercial snowmobile guides because snowmobiles would be banned, commercial snowcoach drivers have the same mitigating effects upon wildlife.

Cumulative Effects

Past, present, and foreseeable actions occurring within and around the parks which could affect bison and elk are the same as those for alternative 1. Cumulative effects for this alternative would be higher than those for Alternative 1, due to the higher behavioral response of wildlife to the larger visual profile of snowcoaches.

Conclusion

The qualitative assumptions, grounded in the available literature on bison and elk, made in this analysis are that increases in winter traffic levels and associated human recreational activity cause increases in vehicle-caused mortality, wildlife displacement, behavior- or physiology-related energy costs, and the potential for adverse demographic impacts. Existing data suggest that the much larger visual profile of a snowcoach may elicit a higher level of behavioral response from bison and elk than snowmobiles. Thus, restricting OSV traffic to snowcoaches would not completely eliminate impacts to wildlife. However, the mitigations (limited number of visitors, continued wildlife monitoring, and mandatory travel in snowcoaches) discussed above, and adaptive management, would limit any wildlife impacts to acceptable levels. According to the best available information, impactson bison and elk from alternative 2 are predicted to be negligible to moderate, adverse, short-term and direct.

In terms of cumulative effects, the adverse, short-term, and negligible to moderate impacts resulting from direct and indirect actions described in this alternative would contribute a negligible to minor, adverse, short-term impact to past, present, and foreseeable actions and impacts on bison and elk. The impacts associated with alternative 2 are not predicted to be of sufficient magnitude to constitute unacceptable impacts or impairment of elk and bison populations.

Alternative 3

Vehicle- Caused Mortality

Alternative 3A would allow a higher number of OSVs than alternative 2, but all OSV traffic would be confined to the road from Yellowstone's South Entrance to Old Faithful. This area is not important winter range for ungulates: bison and elk are almost non-existent on these road segments. The reduced concentration and changed traffic pattern would reduce the potential for OSV-wildlife encounters, thereby reducing the risk of vehicle-caused mortality. Under alternative 3A, then, the potential for vehicle collisions would decrease relative to both historical and current conditions. The possibility of individual bison and elk being killed by OSVs would continue to exist, but given the relatively low risk of wildlife-OSV

collisions on the road from YNP's South Entrance to Old Faithful, vehicle collision impacts to bison and elk are predicted to be negligible, adverse, short-term, and direct.

Under alternative 3B, impacts would be even less, because this no-action possibility would eliminate all possibility of visitors' OSV-wildlife encounters and vehicle-caused mortality.

Displacement

Because OSV traffic through bison and elk winter ranges is substantially reduced under alternative 3A, the potential for bison and elk displacement relative to historical conditions, current conditions, and all other alternatives (except alternative 3B) is decreased. The restriction of OSV traffic to YNP's Old Faithful to South Entrance road is predicted to significantly reduce the likelihood of wildlife-OSV encounters. Elk and bison in Yellowstone have historically utilized the same winter ranges despite increasing OSV use and this alternative moves OSV use outside of important winter range. Therefore, the impacts of displacement under alternative 3A are predicted to be negligible, adverse, short-term, and direct.

Under alternative 3B, impacts would be even less. Because OSV traffic through bison and elk winter ranges would be eliminated there would be no potential for bison and elk displacement.

Behavioral and Physiological Responses

Past patterns of OSV use in the parks featured higher numbers of OSVs and oversnow travel occurred in all areas of the parks accessible by the main roadways. These conditions did not result in significant impacts to bison and elk populations in the parks. Under alternative 3A, OSV presence in bison and elk winter ranges is substantially reduced by the restriction of having only the South Entrance to Old Faithful road open. In recent snowmobile surveys, nine groups of wildlife were encountered on the South Entrance Road and only three interactions were documented between wildlife and OSVs. This suggests that the OSV traffic pattern under alternative 3A is unlikely to result in frequent interactions between humans and wildlife, substantially reducing behavioral responses and physiological costs to bison and elk. For these reasons, alternative 3A is predicted to decrease the potential for behavioral responses and associated physiological responses, relative to historical conditions, current conditions, and all other alternatives except 3B. Impacts resulting from responses by bison and elk are predicted to be negligible to minor, adverse, short-term, and direct.

Under alternative 3B, impacts would be even less. This variation would eliminate the potential for behavioral responses and associated physiological responses relative to historical conditions, current conditions, and all other alternatives.

Population- level Impacts

No adverse population level impacts to bison and elk have been detected under higher levels of winter use than proposed in alternative 3A, so decreased levels of use and restriction of OSV traffic to areas outside bison and elk winter ranges should minimize impacts to wildlife. Thus, population-level impacts are predicted to be negligible.

Under variation 3B, the potential for population-level impacts would be eliminated.

Mitigations

Mitigations for bison and elk impacts under alternative 3 would be the same as those for alternative 1, with the additional mitigation that most areas of Yellowstone frequented by wildlife would be closed to human entry, virtually eliminating any possibility of adverse human impacts upon wildlife.

Cumulative Effects

Past, present, and foreseeable actions occurring within and around the parks which could affect bison and elk are the same as those for alternative 1. Cumulative effects for this alternative would be slightly less than those for Alternative 1, because only the Old Faithful to South Entrance Road is open; that road does not traverse important wildlife habitat.

Conclusion

The qualitative assumptions, grounded in the available literature on bison and elk, made in this analysis are that increases in winter traffic levels and associated human recreational activity cause increases in vehicle-caused mortality, wildlife displacement, behavior- or physiology-related energy costs, and the potential for adverse demographic impacts. Alternative 3A would restrict OSV traffic to roads which are not located in important ungulate winter ranges. Under alternative 3A, OSVs are predicted to interact substantially less frequently with wildlife, resulting in less mortality, less displacement, fewer negative behavioral responses and no population-level impacts. Mitigations such as guiding, lower use levels and continued monitoring, in conjunction with adaptive management, would substantially reduce human impacts upon bison and elk. Thus, according to the best available information, impacts under alternative 3A are predicted to be negligible to minor, adverse, short-term and direct. There would be no impacts under alternative 3B.

In terms of cumulative effects, the negligible to minor, adverse, and short-term impacts resulting from direct and indirect actions described in this alternative would contribute a negligible, adverse, and short-term impact to past, present, and foreseeable actions and impacts on bison and elk. The impacts associated with either variation of alternative 3 would not be of sufficient magnitude to constitute unacceptable impacts or impairment of elk and bison resources.

Alternative 4

Vehicle- Caused Mortality

This alternative would increase the potential for vehicle-killed bison and elk relative to historical conditions, current conditions, and alternatives 1, 2, 3, 5, and 7 due to increased OSV numbers in the parks. Alternative 4 would decrease the risk of vehicle-killed bison and elk relative to alternative 6. The possibility of individual bison and elk being killed by OSVs exists under alternative 4 because the level of use could be up to 29% higher than historical daily averages. While the numbers of individual bison and elk struck could substantially rise under this alternative, the overall number of collisions between ungulates and OSVs is likely to be small. Thus, according to the best available information, vehicle collision impacts to bison and elk are predicted to be minor, adverse, short-term, and direct under alternative 4.

Displacement

Because this alternative would allow more recreational use, it would increase the possibility for bison and elk displacement relative to all other alternatives, current conditions, and historic conditions. Daily average snowmobile traffic under alternative 4 could rise 29% from the historical average of 795 snowmobiles per day. Displacement impacts to bison and elk under alternative 4 are predicted to be moderate, adverse, short-term, and direct, and greater than all other alternatives or historic or current conditions.

Behavioral and Physiological Responses

Because traffic volumes under alternative 4 would be higher than historical averages, the frequency of behavioral responses would also be higher than historical conditions, current conditions, and all other alternatives. Therefore, the incidence of bison or elk responding

behaviorally or physiologically to human activity is predicted to increase under this alternative. The impacts of this alternative are predicted to be moderate, adverse, short-term, and direct.

Population- level Impacts

Population-level effects presumably result from cumulative effects to individual animals. Alternative 4 represents an increase over historical levels of daily OSV use. While effects are predicted to increase over historical levels, the best available information suggests that interactions with groomed roads and human activities associated with oversnow recreation do not appear to be a primary factor influencing the distribution and movements of bison and elk in YNP. The lack of long-term adverse impacts to individual bison and elk suggests that their populations would experience only minor effects even under increased use. Therefore, in accordance with the best available information, the population-level impacts of this alternative are predicted to be minor, adverse, short-term, and direct.

Mitigations

Mitigations for bison and elk impacts under alternative 4 would be the same as those for alternative 1, although the mitigations would be less effective under this alternative due to this alternative's higher daily visitation limit and provision for some visitors to be unguided.

Cumulative Effects

Past, present, and foreseeable actions occurring within and around the parks which could affect bison and elk are the same as those for alternative 1. Cumulative effects for this alternative would be higher than those for Alternative 1, due to the greater volume of OSV traffic and the provision for some unguided visitation permitted under this alternative.

Conclusion

The qualitative assumptions, grounded in the available literature on bison and elk, made in this analysis are that increases in winter traffic levels and associated human recreational activity cause increases in vehicle-caused mortality, wildlife displacement, behavior- or physiology-related energy costs, and the potential for adverse demographic impacts. The number of OSVs allowed under this alternative would be an increase of 29% over historical daily averages. Effects are, therefore, predicted to increase over historical conditions, current conditions, and all other alternatives. However, the mitigations (limited number of visitors, continued wildlife monitoring, and use of commercial guides for 75% of park visitors) discussed above and adaptive management would limit wildlife impacts to some degree. While seventy-five percent of snowmobile riders would be led by a commercial guide under this alternative, twenty-five percent would not be. Under such conditions, the majority of OSV users would be less likely to interact improperly with wildlife, causing less mortality, less displacement, and fewer negative behavioral and physiological responses, but a substantial minority would be more likely to exhibit such behaviors and associated wildlife effects. For these reasons, impacts under this alternative are predicted to be minor to moderate, adverse, short-term and direct.

In terms of cumulative effects, the minor to moderate, adverse, and short-term impacts resulting from direct and indirect actions described in this alternative would contribute a minor, adverse, and short-term impact to past, present, and foreseeable actions and impacts on bison and elk. The impacts associated with alternative 4 would not be of sufficient magnitude to constitute unacceptable impacts or impairment of elk and bison wildlife resources.

Alternative 5

Vehicle- Caused Mortality

No population-level impacts to bison and elk resulting from vehicle collisions have been detected during periods of higher levels of OSV use. While the possibility of individual bison and elk being killed by OSVs exists under this alternative, the overall number of each species is expected to be small. Thus, according to the best available information, vehicle collision impacts to bison and elk are predicted to be negligible, adverse, short-term, and direct under alternative 5. The potential for vehicle collisions with individual bison and elk would be higher, relative to alternatives 2, 3, and current conditions, due to the increased OSV numbers under this alternative. Alternative 5 would decrease the potential for vehicle collisions relative to historical conditions and alternatives 1, 4, and 6. While this alternative and alternative 7 differ in that this alternative includes the provision for unguided snowmobiles, vehicle collisions under this alternative would be similar to alternative 7 because the number of OSVs is comparable.

Displacement

Levels of OSV use higher than what would be seen under alternative 5 have not resulted in significant, long-term displacement of bison or elk. While the possibility of individual bison and elk being displaced exists under this alternative, those effects are predicted to be localized and low in frequency. Thus, displacement impacts to individual bison and elk under alternative 5 are predicted to be minor to moderate, adverse, short-term, and direct. Because this alternative would allow more recreational use than alternatives 2, 3, and 6, it would increase the potential for displacement relative to those alternatives. Because use under this alternative would be less than alternatives 1, 4, and historic conditions, this alternative would decrease the risk of displacement relative to them. While this alternative and alternative 7 differ in that this alternative includes the provision for unguided snowmobiles, displacement under this alternative would be similar to alternative 7 because the number of OSVs is comparable.

Behavioral and Physiological Responses

Bison and elk have continued to occupy the same historical winter range in the Madison and Firehole drainages of YNP while exposed to the highest levels of OSV traffic in the park. This alternative would decrease OSV traffic relative to historic use, so the impacts to bison and elk resulting from behavioral and physiological responses under alternative 5 are predicted to be minor to moderate, adverse, short-term, and direct. The potential for OSV encounters with individual bison and elk would increase under this alternative relative to alternatives 2, 3, 6, and current conditions, because of increased OSV numbers. This alternative would decrease the potential for behavioral and physiological responses relative to historic conditions and alternatives 1 and 4. While this alternative and alternative 7 differ in that this alternative includes the provision for unguided snowmobiles, the potential for behavioral and physiological responses under this alternative would be similar to alternative 7 because the number of OSVs is comparable.

Population- level Impacts

Population-level effects presumably result from cumulative effects to individual animals. In the case of OSV use and winter recreation, no adverse population level impacts to bison and elk have been detected under higher levels of winter use in the parks, so decreased levels of use under alternative 5 relative to historic conditions should minimize the possibility of population-level impacts to wildlife. Thus, population-level impacts are predicted to be negligible, adverse, short-term, and direct.

Mitigations

Mitigations for bison and elk impacts under alternative 5 would be the same as those for alternative 1, although the mitigations would be less effective under this alternative due to this alternative's provision for some visitors to be unguided.

Cumulative Effects

Past, present, and foreseeable actions occurring within and around the parks which could affect bison and elk are the same as those for alternative 1. Cumulative effects for this alternative would be about the same as those for Alternative 1, due to the provision for some unguided visitation under this alternative.

Conclusion

The qualitative assumptions, grounded in the available literature on bison and elk, made in this analysis are that increases in winter traffic levels and associated human recreational activity cause increases in vehicle-caused mortality, wildlife displacement, behavior- or physiology-related energy costs, and the potential for adverse demographic impacts. However, the mitigations (limited number of visitors, continued wildlife monitoring, and use of commercial guides for 80% of park visitors) discussed above and adaptive management would limit impacts to acceptable levels. While eighty percent of snowmobile riders would be led by a commercial guide under this alternative, twenty percent would not be. Under such conditions, the majority OSV users would be less likely to interact improperly with wildlife, causing less mortality, less displacement, and fewer negative behavioral and physiological responses, but a substantial minority could be more likely to exhibit such behaviors and associated wildlife effects. According to the best available information, impacts under this alternative are predicted to be negligible to moderate, adverse, short-term, and direct.

In terms of cumulative effects, the negligible to moderate, adverse, and short-term impacts resulting from direct and indirect actions described in this alternative would contribute a negligible to minor, adverse, and short-term impact to past, present, and foreseeable actions and impacts on bison and elk. The impacts associated with alternative 5 would not be of sufficient magnitude to constitute unacceptable impacts or impairment of elk and bison wildlife resources.

Alternative 6

Yellowstone's Lamar Valley represents the best approximation of the conditions possible under this alternative. Cooke City and Silver Gate, Montana, are located on Yellowstone's northeast entrance road and the road from Mammoth Hot Springs to these communities is plowed to provide winter access for their residents and winter visitors. Throughout much of this plowed road corridor—but especially in the Lamar River valley—ungulates (especially elk and bison) find some of the best winter range in Yellowstone. The national forests adjacent to the northeast corner of Yellowstone are popular destinations for winter recreationists, bringing many residents, skiers, snowmobilers, park visitors, delivery vehicles, and wildlife watchers to the northeast entrance road during the winter months. For the following analyses, the number of wheeled vehicles allowed on Yellowstone's west-side roads under this alternative (100) is less than the unregulated number allowed between Mammoth Hot Springs and Cooke City in the winter.

Vehicle-related Mortality

Alternative 6 reduces the amount of oversnow traffic in relation to some other alternatives, but would increase the amount of wheeled traffic through bison and elk winter range on the

west side of YNP. In order to allow wheeled vehicles to utilize interior park roads, traffic under this alternative would include snow plows and other heavy snow-clearing equipment. The possibility would exist for individual bison and elk to be killed either by OSVs or by wheeled vehicles.

Wheeled Vehicles – Given that wheeled vehicle traffic was responsible for 99% of the wildlife road kill in Yellowstone from 1989 to 1999, this alternative would increase the risk of wheeled vehicle-caused mortality relative to historical conditions, current conditions, and all other alternatives. However, 40% of the mortality during that period occurred on Highway 191, a U.S. highway on YNP's western boundary (management of this highway is outside the scope of this EIS). No significant adverse impacts to bison and elk have been detected due to summer vehicle-related mortality, nor have adverse population-level effects been found resulting from winter wheeled vehicle collisions on the northeast entrance road. Wheeled traffic under alternative 6 is predicted to remain well below the levels of summer and northeast entrance road vehicle traffic. Potential impacts from wheeled vehicle traffic would be mitigated in several ways, as described in the mitigations section below.

Oversnow vehicles – This analysis assumes the same qualitative relationship between OSV numbers and wildlife mortality as the other alternatives. Historical OSV use, at levels higher than the 480 OSVs (combined for both parks) allowed under alternative 6, has not resulted in a degree of vehicle-caused mortality high enough to impact bison or elk populations. In areas not influenced by plowing operations, alternative 6 would reduce the probability of bison and elk vehicle-related mortality relative to alternatives 1, 4, 5, 7, and historic conditions. This alternative would increase the probability relative to alternatives 2, 3, and current conditions.

Overall Impact – Vehicle collision impacts to bison and elk are predicted to be minor, adverse, short-term, and direct under alternative 6.

Displacement

Wheeled vehicles – Bison and elk populations on Yellowstone's Northern Range have not declined as a result of displacement impacts caused by winter wheeled vehicle use in that area. Similarly, winter wheeled traffic under alternative 6 is expected to remain below unregulated summer levels on both that stretch of road and the currently plowed winter roads. Bison and elk populations in the parks have not declined as a result of displacement impacts associated with summer traffic levels. The impact of winter wheeled traffic under alternative 6 is limited to the plowed roads. Plowing operations would be designed to minimize wildlife disturbance.

Oversnow vehicles – This analysis assumes that increased OSV numbers are concomitant with increased wildlife displacement. Historical levels of OSV use higher than the 480 OSVs allowed under alternative 6 have not resulted in significant, long-term displacement of bison or elk. In areas uninfluenced by plowing operations, alternative 6 reduces the probability of bison and elk displacement relative to alternatives 1, 4, 5, 7, and historic conditions. This alternative would increase that possibility relative to alternatives 2, 3, and current conditions. OSV impacts under alternative 6 would be dispersed in patterns similar to other alternatives.

Overall Impact – According to the best available evidence, overall displacement impacts to bison and elk are predicted to be moderate, adverse, short-term, and direct.

Behavioral and Physiological Responses

Wheeled vehicles – Bison and elk populations on Yellowstone's Northern Range have not declined as a result of behavioral or physiological impacts caused by winter wheeled vehicle

use in that area. Similarly, winter wheeled traffic under alternative 6 is expected to remain below unregulated summer levels on both that stretch of road and the currently plowed winter roads. Bison and elk populations in the parks have not declined as a result of impacts associated with summer traffic levels. The impact of winter wheeled traffic under alternative 6 would be limited to the plowed roads. Plowing operations would be designed to minimize wildlife disturbance. Consequently, some of the potential wildlife impacts of this alternative would be mitigated through adjustments in plowing design.

Oversnow vehicles – This analysis assumes that an increase in OSV numbers would bring an increase in wildlife behavioral responses. Historical levels of OSV use higher than the 440 snowmobiles allowed under alternative 6 have not resulted in bison and elk behavioral responses that reach population-level significance. Consequently, in areas not influenced by plowing operations, alternative 6 reduces the probability of bison and elk behavioral and physiological responses relative to relative to alternatives 1, 4, 5, 7, and historic conditions. This alternative would increase that possibility relative to alternatives 2, 3, and current conditions. Alternative 6 would also allow groups of eight snowmobiles with one guide or groups of 17 snowmobiles with two guides. The likelihood of bison actively responding to groups increases as bison encounter the larger groups of 17 allowable under alternative 6.

Overall – According to the best available information, impacts due to behavioral and physiological responses from bison and elk would be moderate, adverse, short-term, and direct under alternative 6.

Population- level Impacts

Wheeled vehicles – As presented in the introduction to this alternative's analysis, bison and elk on the Yellowstone's northeast entrance road are exposed to winter wheeled vehicle levels higher than those expected under alternative 6. Bison and elk populations in the parks have not declined as a result of interactions with wheeled vehicle traffic in the summer or extensive snow-clearing operations in either park in the spring, suggesting that any impacts to individual animals have been compensated for at the population level.

Oversnow vehicles – No adverse population-level impacts to bison and elk have been detected under higher levels of winter use in the parks, so decreased levels of use under alternative 6 should minimize the possibility of population-level impacts to wildlife.

Overall Impact – In accordance with the best available evidence, negligible population-level impacts are predicted to occur under alternative 6.

Mitigations

Mitigations for bison and elk impacts under alternative 6 would be the same as those for alternative 1, plus several additional mitigations. The mortality risk to bison and elk from wheeled vehicle traffic would be mitigated in several ways. First, only Yellowstone's west-side roads would be plowed under this alternative. Wheeled vehicle numbers would be limited to 100 per day and all such vehicles would be commercially-guided. Further, guided wheeled vehicle traffic in the winter is expected to travel at lower speeds than summer wheeled traffic (mainly due to snow-packed road conditions) and professional drivers would be familiar with common wildlife locations, both on and off the road.

Plowing operations would be designed to provide escape routes in the roadside snow berms for wildlife that might be caught on plowed roads.

Cumulative Effects

Past, present, and foreseeable actions occurring within and around the parks which could affect bison and elk are the same as those for alternative 1. Cumulative effects for this

alternative would be about the same as those for Alternative 1, due to the provision for wheeled vehicle traffic on Yellowstone's west side.

Conclusion

The qualitative assumptions, grounded in the available literature on bison and elk, made in this analysis are that increases in winter traffic levels and associated human recreational activity cause increases in vehicle-caused mortality, wildlife displacement, behavior- or physiology-related energy costs, and the potential for adverse demographic impacts. However, the mitigations (limited number of visitors, continued wildlife monitoring, use of commercial guides, wheeled vehicle operations, and plowing operations) discussed above, and adaptive management, would limit any wildlife impacts to acceptable levels.

While the number of OSVs in the parks under alternative 6 is reduced relative to some other alternatives, the number of wheeled vehicles allowed into YNP would increase relative to all other alternatives. During winter, bison and elk congregate on winter ranges. In the Madison, Firehole, and Gibbon drainages, roads traverse some of these low-elevation areas. Factors such as severe weather and foraging requirements may leave animals less able to disperse to areas away from roads as they can in the summer months. However, on Yellowstone's Northern Range, a similar situation exists and ungulate populations have not experienced significant adverse effects when exposed to higher levels of wheeled traffic.

According to the best available evidence, then, impacts on bison and elk under alternative 6 are predicted to be negligible to moderate, adverse, short-term and direct.

In terms of cumulative effects, the negligible to moderate, adverse, and short-term impacts resulting from direct and indirect actions described in this alternative would contribute a negligible to minor, adverse, and short-term impact to past, present, and foreseeable actions and impacts on bison and elk. The impacts associated with alternative 6 would not be of sufficient magnitude to constitute unacceptable impacts or impairment of elk and bison populations.

Alternative 7

Vehicle- Caused Mortality

No population-level impacts to bison and elk resulting from vehicle collisions have been detected during periods of higher levels of OSV use. While the possibility of individual bison and elk being killed by OSVs exists under this alternative, the overall number of each species is expected to be small. Thus, according to the best available information, vehicle collision impacts to bison and elk are predicted to be negligible, adverse, short-term, and direct under alternative 7. The potential for vehicle collisions with individual bison and elk would be higher, relative to alternatives 2, 3, and current conditions, due to the increased OSV numbers under this alternative. Alternative 7 would decrease the potential for vehicle collisions relative to historical conditions and alternatives 1, 4, and 6. Vehicle collisions involving bison and elk under this alternative would be similar to alternative 5 because the number of OSVs is comparable. Unlike alternative 5, this alternative requires all OSVs to be commercially guided.

Displacement

Levels of OSV use higher than what would be seen under alternative 7 have not resulted in significant, long-term displacement of bison or elk. While the possibility of individual bison and elk being displaced exists under this alternative, those effects are predicted to be localized and low in frequency. Thus, displacement impacts to individual bison and elk under alternative 7 are predicted to be minor to moderate, adverse, short-term, and direct. Because

this alternative would allow more recreational use than alternatives 2, 3, and 6, it would increase the potential for displacement relative to those alternatives. Because use under this alternative would be less than alternatives 1, 4, and historic conditions, this alternative would decrease the risk of displacement relative to them. Displacement of bison and elk under this alternative would be similar to alternative 5 because the number of OSVs is comparable. Unlike alternative 5, this alternative requires OSVs to be commercially guided.

Behavioral and Physiological Responses

Bison and elk have continued to occupy the same historical winter range in the Madison and Firehole drainages of YNP while exposed to the highest levels of OSV traffic in the park. This alternative would decrease OSV traffic relative to historic use, so the impacts to bison and elk resulting from behavioral and physiological responses under alternative 7 are predicted to be minor to moderate, adverse, short-term, and direct. The potential for OSV encounters with individual bison and elk would increase under this alternative relative to alternatives 2, 3, and 6, and current conditions, because of increased OSV numbers. This alternative would decrease the potential for behavioral and physiological responses relative to historic conditions and alternatives 1 and 4. The potential for behavioral and physiological responses by bison and elk under this alternative would be similar to alternative 5 because the number of OSVs is comparable. Unlike alternative 5, this alternative requires OSVs to be commercially guided.

Population- level Impacts

Population-level effects presumably result from cumulative effects to individual animals. In the case of OSV use and winter recreation, no adverse population level impacts to bison and elk have been detected under higher levels of winter use in the parks, so decreased levels of use under alternative 7 relative to historic conditions should minimize the possibility of population-level impacts to wildlife. Thus, population-level impacts are predicted to be negligible, adverse, short-term, and direct.

Mitigations

Mitigations for bison and elk impacts under alternative 7 would be the same as those for alternative 1.

Cumulative Effects

Past, present, and foreseeable actions occurring within and around the parks which could affect bison and elk are the same as those for alternative 1. Cumulative effects for this alternative would be about the same as those for Alternative 1 because vehicle numbers would be similar (fewer snowmobiles under this alternative, but five more snowcoaches, which elicit greater behavioral responses from wildlife due to their larger visual profile).

Conclusion

The qualitative assumptions, grounded in the available literature on bison and elk, made in this analysis are that increases in winter traffic levels and associated human recreational activity cause increases in vehicle-caused mortality, wildlife displacement, behavior- or physiology-related energy costs, and the potential for adverse demographic impacts. However, the mitigations (limited number of visitors, continued wildlife monitoring) discussed above, and adaptive management, would limit impacts to acceptable levels. Guided OSV users would be less likely to interact improperly with wildlife, causing less mortality, less displacement, and fewer negative behavioral and physiological responses. According to the best available information, impacts under this alternative are predicted to be negligible to moderate, adverse, short-term, and direct.

In terms of cumulative effects, the negligible to moderate, adverse, short-term impacts resulting from direct and indirect actions described in this alternative would contribute a negligible to minor, adverse, and short-term impact to past, present, and foreseeable actions and impacts on bison and elk. The impacts associated with alternative 7 would not be of sufficient magnitude to constitute unacceptable impacts or impairment of elk and bison wildlife resources.

Impacts on Wolves by Alternative

Alternative 1

Vehicle-Caused Mortality

Under this alternative, the potential for vehicle collisions would increase relative to current conditions and alternatives 2, 3, 5, and 7 because of higher OSV numbers. This alternative would decrease the potential for vehicle collisions relative to historic conditions and alternatives 4 and 6. Impacts are predicted to be negligible, adverse, direct, and short-term.

Displacement, Behavioral, and Physiological Effects

Under this alternative, the potential for displacement and behavioral and physiological responses by wolves under this alternative would increase relative to current conditions and alternatives 2, 3, 5, 6, and 7 because of higher OSV numbers. This alternative would decrease the potential relative to historic conditions and alternative 4. Impacts are predicted to be adverse, moderate, direct, and short-term.

Population-level Effects

While OSVs and associated human activity may displace wolves for short periods of time, there is no evidence from wolf territories in the parks of large-scale displacement or habitat avoidance in the parks. Wolves appear to interact with OSVs rarely, minimizing direct behavioral and physiological impacts from contact with oversnow vehicle traffic. Wolf abundance in the parks has increased, including during periods of intense OSV use. Data suggest that inter-species aggression and natural causes influence park wolf populations more than OSV use. The best available information suggests that the impacts associated with this alternative upon wolf populations would be negligible.

Mitigations

The impacts identified above would be mitigated in several ways under this alternative. First, daily entry restrictions would limit OSV visitation to a level substantially less than the historic limits. Because most impacts increase with the numbers of visitors, restricting visitor numbers also limits wildlife impacts. Secondly and as discussed in section 2.5.3, monitoring of human-wildlife interactions will continue under all alternatives. If monitoring indicates that human presence or activities are having unacceptable effects on wildlife that cannot otherwise be mitigated, selected areas of the parks (including sections of roads) may be closed to visitor use. Third, and as discussed in Chapter III, the requirement to use commercial guides is an effective mitigation for some human impacts upon wildlife. Guides are trained to avoid causing wildlife displacement or stress and are familiar with likely wildlife locations along the road system. Accompanied by guides, OSV users may be less likely to interact improperly with wildlife, causing less mortality, less displacement, and fewer negative behavioral and physiological responses. Finally, in accordance with park policy, areas within a one-mile radius of wolf dens are closed to public entry in YNP; GTNP also has the authority to enact closures. In YNP, many of the wolf dens are within grizzly bear spring closure areas and thus are not subjected to disturbance from humans.

Cumulative Effects

The area of concern includes habitat for wolves within the three park units and other habitat beyond the parks' boundaries.

Currently, the USFWS is considering delisting wolves in the northern Rockies from the threatened and endangered species list under the Endangered Species Act. In February 2008, the agency plans to propose removing the species from the list in Idaho, Montana, Yellowstone and Grand Teton National Parks, and eastern Wyoming. Delisting in the remainder of western Wyoming will be contingent upon current negotiations between the state and the USFWS regarding the state's wolf management plan. Montana and Idaho have already produced such plans ensuring the long-term viability of wolf populations; the USFWS has accepted those plans. Once delisted, management of wolves in the three states will be transferred to them (some elements of wolf management in Montana and Idaho already have been). While this transfer of management responsibility could include wolf hunting, the states must ensure the long-term viability of wolves, as stated above.

Population growth in the GYA, rural land subdivision, improving snowmobile technologies, and increasing outfitter/guide activity can all influence wolf populations by introducing more recreationists into big game and wolf habitat and/or fragmenting wildlife habitat. Wolf sightings in particular are highly desired components of many guided tours in the parks, although guides generally remain at respectful distances from wolves. Additionally, Grand Teton has recently completed a summer transportation plan, Teton County has completed the Teton Pathways Master Plan, and several of the forests in the region are revising their forest plans and/or travel plans. Wolves could be affected by these trends and plans. However, the federal and state wildlife management agencies are required to ensure the species' long-term survival.

The Gallatin National Forest has consolidated much of its checker-boarded holdings in recent years, although that has also been accompanied by the consolidation of private lands, especially in the Big Sky area. It is difficult to predict the net effect of these actions on wolves, since the consolidated USFS lands are less likely to be developed while the private lands are more likely to be.

Noxious weed growth is a problem throughout the GYA, with potentially adverse effects on wolf prey species. The federal, state, and county agencies have active noxious weed control programs which attempt to prevent further spread of these plants, limiting their effect on wolf prey species and, therefore, wolves. Additionally, restoration of some of the Gardiner Basin would have likely benefits for both wolf prey species, since the native plants they prefer would be favored by such restoration.

Ranching and cattle grazing will continue to occur outside and on the border of the national parks. While the majority of wolves prey exclusively on wild game, a small percentage preys upon domestic livestock. When this occurs, the depredating wolves are usually removed from the population. Such control activities will continue, with more of the authority to do so transferred to the states and ranchers affected as delisting proceeds. These actions clearly have adverse effects upon wolves, but the states are required to maintain viable populations of wolves for perpetuity.

Road construction is a recurring event in the region, as are other construction projects such as the new West Entrance in Yellowstone. Within the parks, such projects are undertaken in such a way as to minimize their effects on wolves; on the national forests, this is generally true as well. For example, most facility construction projects within the parks and forests are either replacements of existing facilities or are located within existing developed areas,

therefore minimizing their effects upon wolves. Still, the faster travel speeds usually resulting from road improvements can result in greater wolf road kill.

Conclusion

The qualitative assumptions, grounded in the available literature on wolves, made in this analysis are that although increases in winter traffic levels and associated human recreational activity may cause increases in vehicle-caused mortality, wildlife displacement, and behavior- or physiology-related energy costs; wolf populations would not be affected. Additionally, the mitigations (limited number of visitors, continued wildlife monitoring, mandatory guiding, and seasonal closures around wolf dens) discussed above would limit any wolf impacts to acceptable levels. According to the best available information, then, impacts under this alternative are predicted to be negligible to moderate, adverse, short-term, and direct. In terms of cumulative effects, the negligible to moderate, adverse, short-term impacts resulting from direct and indirect actions described in this alternative would contribute a negligible to minor impact to past, present, and foreseeable actions and impacts on wolves. The impacts associated with alternative 1 would not be of sufficient magnitude to constitute unacceptable impacts or impairment of wolf wildlife resources.

Alternative 2

Vehicle-Caused Mortality

The potential for vehicle-caused mortality would decrease relative to historic and current conditions and alternatives 1, 4, 5, 6, and 7 because overall traffic volume in the parks would decrease under this alternative. The potential for such mortality would increase relative to alternative 3. Impacts are predicted to be negligible, adverse, direct, and short-term.

Displacement, Behavioral, and Physiological Effects

The potential for displacement and behavioral and physiological responses under this alternative would decrease relative to historic and current conditions and alternatives 1, 4, 5, 6, and 7 because overall traffic volume in the parks would decrease under this alternative. This alternative would increase that possibility in comparison to alternative 3. However, a lack of snowmobile traffic (as called for under this alternative) will not eliminate impacts to wolves. Therefore, impacts are predicted to be adverse, minor to moderate, direct, and short-term.

Population-level Effects

For the reasons expressed in this topical area discussion under alternative 1, this alternative would have negligible effects upon wolf populations.

Mitigations

Mitigations for wolf impacts under alternative 2 would be the same as those for alternative 1. While this alternative would have no commercial snowmobile guides because snowmobiles would be banned, snowcoach drivers have the same mitigating effects upon wildlife.

Cumulative Effects

Past, present, and foreseeable actions occurring within and around the parks which could affect wolves are the same as those for alternative 1. Cumulative effects for this alternative would be about the same as those for Alternative 1.

Conclusion

The qualitative assumptions, grounded in the available literature on wolves, made in this analysis are that increases in winter traffic levels and associated human recreational activity

cause increases in vehicle-caused mortality, wildlife displacement, and behavior- or physiology-related energy costs; wolf populations would not be affected. However, the mitigations (limited number of visitors, continued wildlife monitoring, mandatory use of guided snowcoaches, and seasonal closures around wolf dens) discussed above, and adaptive management, would limit any wolf impacts to acceptable levels. According to the best available information, impacts on wolves from alternative 2 are predicted to be negligible to moderate, adverse, short-term, and direct.

In terms of cumulative effects, the negligible to moderate, adverse, short-term impacts resulting from direct and indirect actions described in this alternative would contribute a negligible to minor, adverse, and short-term impact to past, present, and foreseeable actions and impacts on wolves. The impacts associated with alternative 2 are not predicted to be of sufficient magnitude to constitute unacceptable impacts or impairment of wolf populations.

Alternative 3

Vehicle-Caused Mortality

The potential for vehicle-caused mortality under this alternative would be substantially reduced by the closure of most or all roads to OSV traffic, and the fact that the remaining road open to OSV travel under alternative 3A is not frequented by wolves because little prey exists there. Under alternative 3 the potential for vehicle collisions would decrease relative to historic and current conditions and all other alternatives. Under alternative 3B, there would be no potential for vehicle-caused mortality from recreational OSV. Wheeled vehicle risks would be confined to Highway 191 and the road from Gardiner to the Northeast Entrance. Impacts are predicted to be negligible.

Displacement, Behavioral, and Physiological Effects

The potential for displacement and behavioral and physiological responses under alternative 3A would be substantially reduced by the restriction of OSV traffic to fewer roads, roads which are not frequented by wolves. Under this alternative, the potential would decrease relative to historic and current conditions and all other alternatives. Under alternative 3B, there would be no potential for displacement, behavioral, and physiological effects from recreational OSV use. Wheeled vehicle risks would be confined to U.S. Highway 191 and the Northeast Entrance Road, whose management is outside the scope of this EIS. Impacts are predicted to be negligible.

Population-level Effects

For the reasons expressed in this topical area discussion under alternative 1, this alternative would have negligible effects upon wolf populations.

Mitigations

Mitigations for wolf impacts under alternative 3 would be the same as those for alternative 1, with the additional mitigation that virtually all areas of Yellowstone frequented by wildlife would be closed to recreational use, virtually eliminating any possibility of adverse human impacts upon wildlife.

Cumulative Effects

Past, present, and foreseeable actions occurring within and around the parks which could affect wolves are the same as those for alternative 1. Cumulative effects for this alternative would be less than those for Alternative 1 because most roads traversing important wolf habitat in Yellowstone would be closed to OSV traffic.

Conclusion

The qualitative assumptions, grounded in the available literature on wolves, made in this analysis are that increases in winter traffic levels and associated human recreational activity cause increases in vehicle-caused mortality, wildlife displacement, and behavior- or physiology-related energy costs; wolf populations would not be affected. Alternative 3A restricts OSV traffic to roads which are not located in important wolf range. Under alternative 3A, OSVs are predicted to interact substantially less frequently with wolves, resulting in less mortality, less displacement, and fewer negative behavioral and physiological responses and no population-level impacts. The other mitigations (guiding, lower numbers, continued monitoring, and seasonal closures), and adaptive management, would also substantially reduce any human impacts upon wolves. Thus, according to the best available information, impacts under alternative 3A are predicted to be negligible, adverse, short-term, and direct. There would be no impacts under alternative 3B.

In terms of cumulative effects, the negligible, adverse, short-term impacts resulting from direct and indirect actions described in this alternative would contribute a negligible, adverse, and short-term impact to past, present, and foreseeable actions and impacts on wolves. The impacts associated with either alternative 3A or 3B would not be of sufficient magnitude to constitute unacceptable impacts or impairment to wolves.

Alternative 4

Vehicle-Caused Mortality

The potential for vehicle-killed wolves under this alternative would increase relative to historic and current conditions and all other alternatives except 6, due to increased OSV numbers in the parks. Conversely, alternative 4 would have about the same risk of vehicle impacts as alternative 6, because that alternative would allow a minor amount of wheeled vehicle travel to occur. The impacts are predicted to be adverse, minor, direct, and short-term.

Displacement, Behavioral, and Physiological Effects

The potential for displacement and behavioral and physiological responses to wolves under this alternative would increase relative to historic and current conditions and all other alternatives due to increased OSV numbers in the parks. The impacts are predicted to be adverse, moderate, direct, and short-term.

Population-level Effects

For the reasons expressed in this topical area discussion under alternative 1, this alternative would have negligible effects upon wolf populations.

Mitigations

Mitigations for wolf impacts under alternative 4 would be the same as those for alternative 1, although the mitigations would be less effective under this alternative due to this alternative's higher daily visitation limit and provision for some visitors to be unguided.

Cumulative Effects

Past, present, and foreseeable actions occurring within and around the parks which could affect wolves are the same as those for alternative 1. Cumulative effects for this alternative would be higher than those for Alternative 1, due to the greater volume of OSV traffic and the provision for some unguided visitation permitted under this alternative.

Conclusion

The qualitative assumptions, grounded in the available literature on wolves, made in this analysis are that increases in winter traffic levels and associated human recreational activity cause increases in vehicle-caused mortality, wildlife displacement, and behavior- or physiology-related energy costs; wolf populations would not be affected. The number of OSVs allowed under this alternative represents an increase of 29% over historical daily averages. Effects are therefore predicted to increase over historical conditions, current conditions, and all other alternatives. However, the mitigations (limited number of visitors, continued wildlife monitoring, use of commercial guides for 75% of park visitors, and seasonal closures around wolf dens) discussed above, and adaptive management, would limit any wildlife impacts to some degree. While 75 percent of snowmobile riders would be led by a commercial guide under this alternative, 25 percent would not be. Under such conditions, the majority of OSV users would be less likely to interact improperly with wolves, causing less mortality, less displacement, and fewer negative behavioral and physiological responses, but a substantial minority of winter visitors would be more likely to exhibit such behaviors and associated wildlife effects. For these reasons, impacts under this alternative are predicted to be minor to moderate (negligible for wolf populations), adverse, short-term, and direct.

In terms of cumulative effects, the minor to moderate (negligible for wolf populations), adverse, short-term impacts resulting from direct and indirect actions described in this alternative would contribute a minor, adverse, and short-term impact to past, present, and foreseeable actions and impacts on wolves. The impacts associated with alternative 4 would not be of sufficient magnitude to constitute unacceptable impacts or impairment of wolf resources.

Alternative 5

Vehicle-Caused Mortality

The potential for vehicle collisions with wolves under this alternative would increase relative to current conditions and alternatives 2, 3A, and 3B, because of increased OSV numbers. Conversely, this alternative would decrease the potential for vehicle collisions relative to historical conditions and alternatives 1, 4, and 6. While this alternative and alternative 7 differ in that this alternative includes the provision for unguided snowmobiles and keeps Sylvan Pass open, vehicle collisions involving wolves under this alternative would be similar to alternative 7 because the number of OSVs is comparable. The impacts are predicted to be negligible, adverse, direct, and short-term.

Displacement, Behavioral, and Physiological Effects

The potential for wolf displacement and behavioral and physiological responses under this alternative would increase relative to current conditions and alternatives 2, 3A, and 3B, because of increased OSV numbers. This alternative would decrease the potential relative to historic conditions and alternative 1 and 4. While this alternative and alternative 7 differ in that this alternative includes the provision for unguided snowmobiles and keeps Sylvan Pass open, displacement and behavioral and/or physiological impacts involving wolves under this alternative would be similar to alternative 7 because the number of OSVs is comparable. The impacts are predicted to be adverse, minor to moderate, direct, and short-term.

Population-level Effects

For the reasons expressed in this topical area discussion under alternative 1, this alternative would have negligible effects upon wolf populations.

Mitigations

Mitigations for wolf impacts under alternative 5 would be the same as those for alternative 1, although the mitigations would be less effective under this alternative due to its provision for some visitors to be unguided.

Cumulative Effects

Past, present, and foreseeable actions occurring within and around the parks which could affect wolves are the same as those for alternative 1. Cumulative effects for this alternative would be about the same as those for Alternative 1.

Conclusion

The qualitative assumptions, grounded in the available literature on wolves, made in this analysis are that increases in winter traffic levels and associated human recreational activity cause increases in vehicle-caused mortality, wildlife displacement, and behavior- or physiology-related energy costs; wolf populations would not be affected. However, the mitigations (limited number of visitors, continued wildlife monitoring, use of commercial guides for 80 percent of park visitors, and seasonal wolf den closures) discussed above and adaptive management would limit any wildlife impacts to acceptable levels. While 80 percent of snowmobile riders would be led by a commercial guide under this alternative, 20 percent would not be. Under such conditions, the majority of OSV users would be less likely to interact improperly with wildlife, causing less mortality, less displacement, and fewer negative behavioral and physiological responses, but a substantial minority of such visitors could be more likely to exhibit such behaviors and associated wildlife effects. According to the best available information, impacts under this alternative are predicted to be negligible to moderate, adverse, short-term, and direct.

In terms of cumulative effects, the negligible to moderate, adverse, short-term impacts resulting from direct and indirect actions described in this alternative would contribute a negligible to minor, adverse, and short-term impact to past, present, and foreseeable actions and impacts on wolves. The impacts associated with alternative 5 would not be of sufficient magnitude to constitute unacceptable impacts or impairment of wolf resources.

Alternative 6

Vehicle-Caused Mortality

The potential for wheeled vehicle impacts to wolves under this alternative would increase relative to current and historic conditions and all other alternatives except 4, whose impacts would be approximately the same as this alternative. This potential, however, would be mitigated by the use of trained commercial drivers familiar with Yellowstone routes and wolf-frequented areas, the low number of such vehicles (100 or less), and the slower winter speed limits (35 in most areas) (see the mitigations section below). Also, in areas uninfluenced by plowing operations, alternative 6 reduces the probability of wolf mortality relative to historic conditions and alternatives 1, 4, 5, and 7 based on OSV numbers (although this alternative would still increase that possibility relative to current conditions and alternatives 2, 3A, and 3B in those areas). Overall, impacts are predicted to be adverse, minor, direct, and short-term.

Displacement, Behavioral, and Physiological Effects

The potential for wolf displacement and behavioral and physiological responses under this alternative would be reduced under alternative 6 relative to historic conditions and alternatives 1, 4, 5, and 7 based on overall vehicle numbers. The potential for such effects

would increase relative to current conditions and alternatives 2, 3A, and 3B. Impacts are predicted to be adverse, minor to moderate, direct, and short-term.

Population-level Effects

For the reasons expressed in this topical area discussion under alternative 1, this alternative would have negligible effects upon wolf populations.

Mitigations

Mitigations for wolf impacts under alternative 6 would be the same as those for alternative 1, with several additional mitigations. The mortality risk to wolves from wheeled vehicle traffic would be mitigated in several ways. First, only Yellowstone's west-side roads would be plowed under this alternative. Wheeled vehicle numbers would be limited to 100 per day and all such vehicles would be commercially guided. Further, guided wheeled traffic in the winter is expected to travel at lower speeds than summer wheeled traffic and professional drivers would be familiar with common wildlife locations, both on and off the road. Plowing operations would also be designed to provide escape routes in the roadside snow berms for wildlife that may be caught on plowed roads.

Cumulative Effects

Past, present, and foreseeable actions occurring within and around the parks which could affect wolves are the same as those for alternative 1. Cumulative effects for this alternative would be about the same as those for Alternative 1.

Conclusion

The qualitative assumptions, grounded in the available literature on wolves, made in this analysis are that increases in winter traffic levels and associated human recreational activity cause increases in vehicle-caused mortality, wildlife displacement, and behavior- or physiology-related energy costs; wolf populations would not be affected. However, the mitigations (limited number of visitors, continued wildlife monitoring, use of commercial guides, seasonal closures around wolf dens, wheeled vehicle operations, and plowing operations) discussed above, and adaptive management, would limit any wolf impacts to acceptable levels.

While the number of OSVs in the parks under alternative 6 is reduced relative to some other alternatives, the number of wheeled vehicles allowed into YNP would increase relative to all other alternatives. During winter, wolf prey congregate on winter ranges. In the Madison, Firehole, and Gibbon drainages, roads traverse some of these low-elevation areas. Factors such as severe weather and foraging requirements may leave animals less able to disperse away from roads as they can in the summer months. However, on Yellowstone's Northern Range, a similar situation exists and wolf prey populations have not experienced significant adverse effects when exposed to higher levels of wheeled traffic.

According to the best available evidence, then, impacts on wolves under alternative 6 are predicted to be negligible to moderate, adverse, short-term, and direct.

In terms of cumulative effects, the negligible to moderate, adverse, short-term impacts resulting from direct and indirect actions described in this alternative would contribute a negligible to minor, adverse, and short-term impact to past, present, and foreseeable actions and impacts on wolves. The impacts associated with alternative 6 would not be of sufficient magnitude to constitute unacceptable impacts or impairment of wolf populations.

Alternative 7

Vehicle-Caused Mortality

The potential for vehicle collisions with wolves under this alternative would increase relative to current conditions and alternatives 2, 3A, and 3B, because of increased OSV numbers. Conversely, this alternative would decrease the potential for vehicle collisions relative to historical conditions and alternatives 1, 4, and 6. Vehicle collisions involving wolves under this alternative would be similar to alternative 5 because the number of OSVs is comparable. Unlike alternative 5, this alternative requires all OSVs to be commercially guided and closes Sylvan Pass. The impacts are predicted to be negligible, adverse, direct, and short-term.

Displacement, Behavioral, and Physiological Effects

The potential for wolf displacement and behavioral and physiological responses under this alternative would increase relative to current conditions and alternatives 2, 3, and 6 because of increased OSV numbers. This alternative would decrease the potential relative to historic conditions and alternative 1 and 4. Displacement of wolves under this alternative would be similar to alternative 5 because the number of OSVs is comparable. Unlike alternative 5, this alternative requires OSVs to be commercially guided and closes Sylvan Pass. The impacts are predicted to be adverse, minor to moderate, direct, and short-term.

Population-level Effects

For the reasons expressed in this topical area discussion under alternative 1, this alternative would have negligible effects upon wolf populations.

Mitigations

Mitigations for wolf impacts under alternative 7 would be the same as those for alternative 1.

Cumulative Effects

Past, present, and foreseeable actions occurring within and around the parks which could affect wolves are the same as those for alternative 1. Cumulative effects for this alternative would be about the same as those for Alternative 1.

Conclusion

The qualitative assumptions, grounded in the available literature on wolves, made in this analysis are that increases in winter traffic levels and associated human recreational activity cause increases in vehicle-caused mortality, wildlife displacement, and behavior- or physiology-related energy costs; wolf populations would not be affected. However, the mitigations (limited number of visitors, continued wildlife monitoring, use of commercial guides for park visitors, and seasonal wolf den closures) discussed above, and adaptive management, would limit any wildlife impacts to acceptable levels. According to the best available information, impacts under this alternative are predicted to be negligible to moderate, adverse, short-term, and direct.

In terms of cumulative effects, the negligible to moderate, adverse, short-term impacts resulting from direct and indirect actions described in this alternative would contribute a negligible to minor, adverse, and short-term impact to past, present, and foreseeable actions and impacts on wolves. The impacts associated with alternative 7 would not be of sufficient magnitude to constitute unacceptable impacts or impairment of wolf resources.

Impacts on Lynx and Wolverines by Alternative

Alternative 1

Vehicle-Caused Mortality

Because this alternative would close Sylvan Pass, it would have negligible effects on lynx and wolverines. The potential for vehicle collisions would increase relative to current conditions and alternatives 2, 3A, 3B, 5, and 7 because of higher OSV numbers. This alternative would decrease the potential for vehicle collisions relative to historic conditions and alternatives 4 and 6. The closure of Sylvan Pass substantially reduces motorized human activity in the area most likely to yield vehicle interactions with wolverines or lynx. The overall risk of vehicle collisions is believed to be generally very low, but alternatives which close the pass reduce the risk further.

Displacement, Behavioral, and Physiological Effects

Because this alternative would close Sylvan Pass, it would substantially reduce OSV travel through the prime lynx and wolverine habitats in Yellowstone, and would consequently have negligible impacts upon the two species. The potential for displacement and responses by wolverines and lynx would increase relative to current conditions and alternatives 2, 3A, 3B, 5, 6, and 7 because of higher OSV numbers. This alternative would decrease that potential relative to historic conditions and alternative 4. The overall risk of displacement and behavioral and/or physiological impacts is believed to be generally very low, but alternatives which close the pass reduce the risk further.

Population-level Effects

Because the breeding season for lynx has little overlap with the winter recreation season in the parks and because this alternative would close Sylvan Pass, it would have negligible effects upon lynx and wolverine populations in YNP. Relative to alternatives 2, 3A, 3B, 6, and 7 this alternative would have similar effects upon lynx and wolverine populations because those alternatives would also close Sylvan Pass. Relative to alternatives 4 and 5 and both historic and current conditions, this alternative would have a reduced effect upon lynx and wolverine populations because Sylvan Pass is open under those scenarios.

Mitigations

The impacts identified above would be mitigated in several ways under this alternative. First, the daily entry restrictions would limit OSV visitation to a level substantially less than the historic limits. Because most impacts increase with the numbers of visitors, restricting visitor numbers also limits lynx and wolverine impacts. Secondly, the NPS will complete the current research project into wolverine ecology under all alternatives and monitoring of human-wildlife interactions, discussed in section 2.5.3, will continue under all alternatives. If this monitoring indicates that human presence or activities are having unacceptable effects on lynx or wolverines that cannot otherwise be mitigated, selected areas of the parks (including sections of roads) may be closed to visitor use. Third, and as discussed in Chapter III, the requirement to use commercial guides is an effective mitigation for some human impacts upon wildlife. Guides are trained to avoid causing wildlife displacement or stress and are familiar with likely wildlife locations along the road system. Accompanied by guides, OSV users may be less likely to interact improperly with wildlife, causing less mortality, less displacement, fewer negative behavioral and physiological responses, and ultimately lower population-level impacts. Finally, both parks have the authority to enact closures for wildlife purposes, such as to prevent disturbance of denning lynx or wolverines. Should such dens be

identified in areas of the parks near human activities (and, therefore, likely to suffer disturbance), the superintendents could implement such closures.

Cumulative Effects

The area of concern includes habitat for these mid-sized carnivores within the three park units and other habitat beyond the parks' boundaries. While the USFWS has received petitions to list wolverines as a threatened or endangered species under the Endangered Species Act, the agency has declined to list them due to the lack of information on them.

Population growth in the GYA, changing demographics, rural land subdivision, improving snowmobile technologies, and increasing outfitter/guide activity can all influence wildlife populations by introducing more recreationists into lynx and wolverine habitat and/or fragmenting wildlife habitat. In particular, improving snowmobile technologies, population growth, and changing demographics are of concern for these two species because these trends tend to bring more recreationists into the remote areas inhabited by lynx and wolverines. Additionally, Grand Teton has recently completed a summer transportation plan, Teton County has completed the Teton Pathways Master Plan, and several of the forests in the region are revising their forest plans and/or travel plans. Lynx and wolverines could be affected by all of these trends. However, 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). The federal agencies are gathering information on wolverine life habits as this document goes to press, which will help determine the effects on this species.

The Gallatin National Forest has consolidated much of its checker-boarded holdings in recent years, although that has also been accompanied by the consolidation of private lands, especially in the Big Sky area. It is difficult to predict the net effect of these actions on lynx and wolverines, since the consolidated USFS lands are less likely to be developed while the private lands are more likely to be. However, many of these private lands (in contrast to most of those undergoing rapid subdivision and growth in the GYA) are in relatively high areas that could be, or could have been, important range for lynx and wolverines.

Timber harvest, fires, and fuels reduction projects will continue to occur on federal and other lands outside the parks. These actions could affect lynx by altering the forest structure that they and their prey need for survival. Effects on wolverines are less clear due to the paucity of information about them.

Road construction is a recurring event in the region, as are other construction projects such as those at the Laurance S. Rockefeller Preserve in Grand Teton. Within the parks, such projects are undertaken in such a way as to minimize their effects on wildlife; on the national forests, this is generally true as well. For example, most facility construction projects within the parks and forests are either replacements of existing facilities or are located within existing developed areas, therefore minimizing their effects upon wildlife. Still, the faster travel speeds usually resulting from the road improvements can result in greater wildlife road kill.

Conclusion

The qualitative assumptions, grounded in the available literature on lynx and wolverines, made in this analysis are that increases in winter traffic levels and associated human recreational activity cause increases in vehicle-caused mortality, wildlife displacement, behavior- or physiology-related energy costs, and their populations. However, the mitigations (limited number of visitors, completion of existing research, continued monitoring efforts, mandatory guiding, and potential closures around their dens) discussed

above, and adaptive management, would limit any impacts to acceptable levels. The closure of Sylvan Pass substantially reduces motorized human activity in the area most likely to yield human interactions (and associated impacts) with wolverines or lynx. The overall risk to wolverines and lynx is believed to be generally very low, but alternatives which close the pass reduce the risk further. According to the best available information, then, impacts under this alternative are predicted to be negligible, adverse, short-term, and direct.

In terms of cumulative effects, the negligible, adverse, short-term impacts resulting from direct and indirect actions described in this alternative would contribute a negligible, adverse, and short-term impact to past, present, and foreseeable actions and impacts on lynx or wolverines. The impacts associated with alternative 1 would not be of sufficient magnitude to constitute unacceptable impacts or impairment of lynx or wolverines.

Alternative 2

Vehicle-Caused Mortality

Because this alternative would close Sylvan Pass, reducing motorized human activity in the area most likely to yield vehicle interactions with wolverines or lynx and because snowcoaches appear less likely to strike wildlife in YNP, it would have negligible effects on lynx and wolverines. The potential for vehicle-caused mortality would decrease relative to current and historic conditions and alternatives 1, 4, 5, 6, and 7 because overall traffic volume in the parks would decrease under this alternative. Because traffic would increase relative to alternatives 3A and 3B, alternative 2 would increase that possibility.

Displacement, Behavioral, and Physiological Effects

Because this alternative would close Sylvan Pass, it would substantially reduce OSV travel through the prime lynx and wolverine habitats in YNP, and would consequently have negligible impacts upon the two species. The potential for displacement and behavioral and physiological responses would decrease relative to historic and current conditions and alternatives 1, 4, 5, 6, and 7 because overall traffic volume in the parks would decrease under this alternative. Conversely, it would increase that possibility in relation to alternatives 3A and 3B. The overall risk of displacement and behavioral and/or physiological impacts is believed to be generally very low, but alternatives which close the pass reduce the risk further. Note, however, that a lack of snowmobile traffic cannot be predicted to eliminate impacts to wolverines or lynx.

Population-level Effects

This alternative would have effects upon lynx and wolverine populations similar to those described under alternative 1.

Mitigations

Mitigations for lynx and wolverine impacts under alternative 2 would be the same as those for alternative 1. While this alternative would have no commercial snowmobile guides because snowmobiles would be banned, snowcoach drivers have the same mitigating effects upon wildlife.

Cumulative Effects

Past, present, and foreseeable actions occurring within and around the parks which could affect lynx and wolverines are the same as those for alternative 1. Cumulative effects for this alternative would be about the same as those for Alternative 1 because Sylvan Pass would also be closed under this alternative.

Conclusion

The qualitative assumptions, grounded in the available literature on lynx and wolverines, made in this analysis are that increases in winter traffic levels and associated human recreational activity cause increases in vehicle-caused mortality, wildlife displacement, behavior- or physiology-related energy costs, and their populations. However, the mitigations (limited number of visitors, completion of existing research, continued wildlife monitoring, mandatory use of guided snowcoaches, and potential closures around their dens) discussed above and adaptive management would limit any impacts to acceptable levels. The closure of Sylvan Pass substantially reduces motorized human activity in the area most likely to yield human interactions (and associated impacts) with wolverines or lynx. The overall risk to wolverines and lynx is believed to be generally very low, but alternatives which close the pass reduce the risk further. According to the best available information, impacts on lynx and wolverines from alternative 2 are predicted to be negligible, adverse, short-term, and direct.

In terms of cumulative effects, the negligible, adverse, short-term impacts resulting from direct and indirect actions described in this alternative would contribute a negligible, adverse, short-term impact to past, present, and foreseeable actions and impacts on lynx or wolverines. The impacts associated with alternative 2 are not predicted to be of sufficient magnitude to constitute unacceptable impacts or impairment of lynx or wolverine populations.

Alternative 3

Vehicle-Caused Mortality

Because this alternative would close most roads in Yellowstone, it would substantially reduce the potential for vehicle-caused mortality and would have negligible effects on lynx and wolverines. Furthermore, under alternative 3A the only road to remain open (South Entrance to Old Faithful) is not frequented by lynx or wolverines. Under this alternative the potential for vehicle collisions would decrease relative to current and historic conditions and all other alternatives except 3B. Under alternative 3B, No Action, the potential for OSV-killed wolverines or lynx is removed due to the lack of OSV traffic on any park roads. Wheeled vehicle risks would be confined to U.S. Highway 191 and the Northeast Entrance Road, whose management is outside the scope of this EIS.

Displacement, Behavioral, and Physiological Effects

Because the two variations of this alternative would close Sylvan Pass and most other YNP roads, they would substantially reduce OSV travel through the prime lynx and wolverine habitats in YNP and would consequently have negligible impacts upon the two species. The potential for displacement and behavioral and physiological responses would be substantially reduced by the restriction of OSV traffic to fewer roads relative to current and historic conditions and all other alternatives, with 3A having slightly more impacts than 3B because it would allow the South Entrance to Old Faithful road to remain open.

Population-level Effects

This alternative would have effects upon lynx and wolverine populations similar to those described under alternative 1.

Mitigations

Mitigations for lynx and wolverine impacts under alternative 3 would be the same as those for alternative 1, with the additional mitigation that virtually all areas of YNP frequented by

wildlife would be closed to human entry, virtually eliminating any possibility of adverse human impacts upon wildlife.

Cumulative Effects

Past, present, and foreseeable actions occurring within and around the parks which could affect lynx and wolverines are the same as those for alternative 1. Cumulative effects for this alternative would be about the same as those for Alternative 1 because Sylvan Pass would also be closed under this alternative.

Conclusion

The qualitative assumptions, grounded in the available literature on lynx and wolverines, made in this analysis are that increases in winter traffic levels and associated human recreational activity cause increases in vehicle-caused mortality, wildlife displacement, behavior- or physiology-related energy costs, and their populations. However, the mitigations (limited number of visitors, completion of existing research, continued wildlife monitoring, mandatory use of guides, and potential closures around their dens) discussed above, and adaptive management, would limit any impacts to acceptable levels. The closure of Sylvan Pass substantially reduces motorized human activity in the area most likely to yield human interactions (and associated impacts) with wolverines or lynx. The overall risk to wolverines and lynx is believed to be generally very low, but alternatives which close the pass reduce the risk further. According to the best available information, impacts on lynx and wolverines from alternative 3 are predicted to be negligible, adverse, short-term, and direct.

In terms of cumulative effects, the negligible, adverse, short-term impacts resulting from direct and indirect actions described in this alternative would contribute a negligible, adverse, short-term impact to past, present, and foreseeable actions and impacts on lynx or wolverines. The impacts associated with alternative 3 are not predicted to be of sufficient magnitude to constitute unacceptable impacts or impairment of lynx or wolverine populations.

Alternative 4

Vehicle-Caused Mortality

Because this alternative would increase OSV travel through the prime lynx and wolverine habitats in YNP, it would incur minor, adverse, direct, and short or long-term effects on both lynx and wolverines. Because OSV usage could increase beyond the historic and current average visitation, the potential for vehicle-killed wolverines and lynx would increase relative to both those situations and to alternatives 1, 2, 3A, 3B, 5, and 7 due to increased OSV numbers in the parks and continued motorized activity in Sylvan Pass. Conversely, alternative 4 would incur roughly the same risk of vehicle-killed lynx and wolverines as alternative 6 because that alternative would allow a minor amount of wheeled vehicle travel to occur, although there have never been any of either species struck in the parks.

Displacement, Behavioral, and Physiological Effects

Because this alternative would allow increased OSV use of the parks' road systems and would keep Sylvan Pass open, it would have minor, adverse, direct, and short and long-term impacts upon lynx and wolverines. The potential for displacement and behavioral and physiological responses by wolverines and lynx would increase relative to historic and current conditions and all other alternatives.

Population-level Effects

This alternative would have negligible effects upon lynx and wolverine populations similar to those described under alternative 1. The provision to allow a limited number of unguided or non-commercially guided snowmobiles would have little effect upon lynx or wolverine populations because most park roads do not traverse good habitat for them.

Mitigations

Mitigations for lynx and wolverine impacts under alternative 4 would be the same as those for alternative 1, although the mitigations could be less effective under this alternative due to this alternative's higher daily visitation limit and provision for some visitors to be unguided.

Cumulative Effects

Past, present, and foreseeable actions occurring within and around the parks which could affect lynx and wolverines are the same as those for alternative 1. Cumulative effects for this alternative would be greater than those for Alternative 1 because Sylvan Pass would remain open for OSV travel.

Conclusion

The qualitative assumptions, grounded in the available literature on lynx and wolverines, made in this analysis are that increases in winter traffic levels and associated human recreational activity cause increases in vehicle-caused mortality, wildlife displacement, behavior- or physiology-related energy costs, and their populations. However, the mitigations (limited number of visitors, completion of existing research, continued wildlife monitoring, use of guides for most visitors, and potential closures around their dens) discussed above, and adaptive management, would limit any impacts to acceptable levels. Sylvan Pass is the area most likely to yield human interactions (and associated impacts) with wolverines or lynx. The overall risk to wolverines and lynx is believed to be generally very low, but alternatives which keep the pass open slightly increase that risk. According to the best available information, impacts on lynx and wolverines from alternative 4 are predicted to be negligible to minor, adverse, short-term, and direct.

In terms of cumulative effects, the negligible to minor, adverse, short-term impacts resulting from direct and indirect actions described in this alternative would contribute a negligible, adverse, short-term impact to past, present, and foreseeable actions and impacts on lynx or wolverines. The impacts associated with alternative 4 are not predicted to be of sufficient magnitude to constitute unacceptable impacts or impairment of lynx or wolverine populations.

Alternative 5

Vehicle-Caused Mortality

Because this alternative would keep Sylvan Pass open, but would have both stricter daily limits and seasonal limits than current conditions, it would incur negligible effects on the two species. Under this alternative, the potential for vehicle collisions with wolverine or lynx would increase relative to current conditions and alternatives 2, 3A, 3B, and 7 because of increased OSV numbers and continued motorized activity in Sylvan Pass. Alternative 5 would decrease the potential for vehicle collisions relative to historic conditions and alternatives 1, 4, and 6.

Displacement, Behavioral, and Physiological Effects

Because this alternative would allow increased OSV use of the parks' road systems (compared to present conditions) and would keep Sylvan Pass open, it would have minor,

adverse, direct, and short and long-term impacts upon lynx and wolverines. The potential for wolverine and lynx displacement and behavioral and physiological responses would increase relative to current conditions, alternatives 2, 3A, 3B, 6, and 7 because of increased OSV numbers and continued motorized activity in Sylvan Pass. This alternative would decrease that potential relative to historic conditions and alternatives 1 and 4.

Population-level Effects

This alternative would have negligible effects upon lynx and wolverine populations similar to those described under alternative 1. The provision to allow a limited number of unguided snowmobiles would have little effect upon lynx or wolverine populations because most park roads do not traverse good habitat for them.

Mitigations

Mitigations for lynx and wolverine impacts under alternative 5 would be the same as those for alternative 1, although the mitigations would be less effective under this alternative due to its provision for some visitors to be unguided.

Cumulative Effects

Past, present, and foreseeable actions occurring within and around the parks which could affect lynx and wolverines are the same as those for alternative 1. Cumulative effects for this alternative would be greater than those for Alternative 1 because Sylvan Pass would remain open for OSV travel.

Conclusion

The qualitative assumptions, grounded in the available literature on lynx and wolverines, made in this analysis are that increases in winter traffic levels and associated human recreational activity cause increases in vehicle-caused mortality, wildlife displacement, behavior- or physiology-related energy costs, and their populations. However, the mitigations (limited number of visitors, completion of existing research, continued wildlife monitoring, use of guides for most visitors, and potential closures around their dens) discussed above, and adaptive management, would limit any impacts to acceptable levels. Sylvan Pass is the area most likely to yield human interactions (and associated impacts) with wolverines or lynx. The overall risk to wolverines and lynx is believed to be generally very low, but alternatives which keep the pass open slightly increase that risk. According to the best available information, impacts on lynx and wolverines from alternative 5 are predicted to be negligible to minor, adverse, direct, and short-term.

In terms of cumulative effects, the minor, adverse, short-term impacts resulting from direct and indirect actions described in this alternative would contribute a negligible, adverse, and short-term impact to past, present, and foreseeable actions and impacts on lynx or wolverines. The impacts associated with alternative 5 are not predicted to be of sufficient magnitude to constitute unacceptable impacts or impairment of lynx or wolverine populations.

Alternative 6

Vehicle-Caused Mortality

Because this alternative would allow wheeled vehicles on more roads than currently used in the winter, it would incur minor, adverse, direct, and short- and long-term impacts upon lynx and wolverines. The potential for wheeled vehicle impacts to wolverines or lynx would increase relative to current conditions and alternatives 1, 2, 3A, 3B, 5, and 7. The impacts would be roughly equivalent to alternative 4 and historic conditions. In areas uninfluenced

by plowing operations, alternative 6 would reduce the probability of mortality relative to alternatives 1, 4, 5, and 7 based on OSV numbers, but would increase that possibility relative to alternatives 2, 3A, and 3B. The overall risk of vehicle collisions with wolverine and lynx is believed to be generally very low, but alternatives which close the pass reduce the risk further.

Displacement, Behavioral, and Physiological Effects

Because this alternative would close Sylvan Pass, it would substantially reduce OSV travel through the prime lynx and wolverine habitats in YNP and would consequently have negligible impacts upon the two species. The potential for wolverine and lynx displacement, behavioral and physiological responses would be reduced under alternative 6 relative to historic conditions and alternatives 1, 4, and 5 based on overall vehicle numbers. There would be a potential increase relative to current conditions and alternatives 2, 3A, and 3B, due to the higher numbers of OSVs possible under this alternative. The overall risk of displacement and behavioral and/or physiological impacts is believed to be generally very low, but alternatives which close the pass reduce the risk further.

Population-level Effects

This alternative would have effects upon lynx and wolverine populations similar to those described under alternative 1.

Mitigations

Mitigations for lynx and wolverine impacts under alternative 6 would be the same as those for alternative 1, with several additional mitigations. The mortality risk to these animals from wheeled vehicle traffic would be mitigated in several ways. First, only YNP's west-side roads would be plowed under this alternative; lynx and wolverines are not known to occur in the areas traversed by these roads. Wheeled vehicle numbers would be limited to 100 per day and all such vehicles would be commercially guided. Further, guided wheeled traffic in the winter is expected to travel at lower speeds than summer wheeled traffic and professional drivers would be familiar with common wildlife locations, both on and off the road.

Plowing operations would also be designed to provide escape routes in the roadside snow berms for wildlife that may be caught on plowed roads.

Cumulative Effects

Past, present, and foreseeable actions occurring within and around the parks which could affect lynx and wolverines are the same as those for alternative 1. Cumulative effects for this alternative would be the same or slightly higher than those for Alternative 1 because Sylvan Pass would also be closed under this alternative but wheeled vehicle traffic would be allowed on the west side of Yellowstone.

Conclusion

The qualitative assumptions, grounded in the available literature on lynx and wolverines, made in this analysis are that increases in winter traffic levels and associated human recreational activity cause increases in vehicle-caused mortality, wildlife displacement, behavior- or physiology-related energy costs, and their populations. However, the mitigations (limited number of visitors, completion of existing research, continued wildlife monitoring, mandatory use of guides, and potential closures around their dens) discussed above, and adaptive management, would limit any impacts to acceptable levels. The closure of Sylvan Pass substantially reduces motorized human activity in the area most likely to yield human interactions (and associated impacts) with wolverines or lynx. The overall risk to wolverines and lynx is believed to be generally very low, but alternatives which close the pass

reduce the risk further. According to the best available information, impacts on lynx and wolverines from alternative 6 are predicted to be negligible to minor, adverse, short-term, and direct.

In terms of cumulative effects, the negligible to minor, adverse, short-term impacts resulting from direct and indirect actions described in this alternative would contribute a negligible, adverse, and short-term impact to past, present, and foreseeable actions and impacts on lynx or wolverines. The impacts associated with alternative 6 are not predicted to be of sufficient magnitude to constitute unacceptable impacts or impairment of lynx or wolverine populations.

Alternative 7

Vehicle-Caused Mortality

Under this alternative, the potential for vehicle collisions with wolverine or lynx would increase relative to current conditions and alternatives 2, 3A, and 3B because of increased OSV numbers. Alternative 7 would decrease the potential for vehicle collisions relative to historic conditions and alternatives 1, 4, and 6 based on OSV numbers. Traffic levels are comparable to alternative 5. However, unlike alternative 5, the closure of Sylvan Pass under this alternative substantially reduces motorized human activity in the area most likely to yield vehicle interactions with wolverines or lynx. The overall risk of vehicle collisions with wolverine and lynx is believed to be negligible, but alternatives which close the pass reduce the risk further.

Displacement, Behavioral, and Physiological Effects

Because this alternative would close Sylvan Pass, it would substantially reduce OSV travel through the prime lynx and wolverine habitats in Yellowstone, and would consequently have negligible impacts upon the two species. The potential for displacement and responses by wolverines and lynx would increase relative to current conditions and alternatives 2, 3A, 3B, and 6 because of higher OSV numbers. Traffic levels are comparable to alternative 5. This alternative would decrease that potential relative to historic conditions and alternatives 1 and 4. The overall risk of displacement and behavioral and/or physiological impacts is believed to be generally very low, but alternatives which close the pass reduce the risk further.

Population-level Effects

Because the breeding season for lynx has little overlap with the winter recreation season in the parks and because this alternative would close Sylvan Pass, it would have negligible effects upon lynx and wolverine populations in YNP. Relative to alternatives 1, 2, 3A, 3B, and 6, this alternative would have similar effects upon lynx and wolverine populations because those alternatives would also close Sylvan Pass. Relative to alternatives 4 and 5 and both historic and current conditions, this alternative would have a reduced effect upon lynx and wolverine populations because Sylvan Pass is open under those scenarios.

Mitigations

Mitigations for lynx and wolverine impacts under alternative 7 would be the same as those for alternative 1.

Cumulative Effects

Past, present, and foreseeable actions occurring within and around the parks which could affect lynx and wolverines are the same as those for alternative 1. Cumulative effects for this alternative would be about the same as those for Alternative 1 because Sylvan Pass would also be closed under this alternative.

Conclusion

The qualitative assumptions, grounded in the available literature on lynx and wolverines, made in this analysis are that increases in winter traffic levels and associated human recreational activity cause increases in vehicle-caused mortality, wildlife displacement, behavior- or physiology-related energy costs, and their populations. The closure of Sylvan Pass substantially reduces motorized human activity in the area most likely to yield human interactions (and associated impacts) with wolverines or lynx. The overall risk to wolverines and lynx is believed to be generally very low, but alternatives which close the pass reduce the risk further. Additionally, the mitigations (limited number of visitors, completion of existing research, continued wildlife monitoring, use of guides for most visitors, and potential closures around their dens) discussed above and adaptive management would limit any impacts to acceptable levels. According to the best available information, then, impacts on lynx and wolverines from alternative 7 are predicted to be negligible, adverse, short-term, and direct.

In terms of cumulative effects, the negligible, adverse, short-term impacts resulting from direct and indirect actions described in this alternative would contribute a negligible, adverse, and short-term impact to past, present, and foreseeable actions and impacts on lynx or wolverines. The impacts associated with alternative 7 are not predicted to be of sufficient magnitude to constitute unacceptable impacts or impairment of lynx or wolverine populations.

Impacts on Coyotes and Ravens by Alternative

Because only two alternatives provide for some unguided visitation, their analyses are combined, as are the analyses for the remaining alternatives, which all feature 100% guided visitation. The exception to both of these analyses would occur with option B in alternative 3, which would close Yellowstone to recreational use.

Alternatives 1, 2, 3, 6, and 7

Under all five of these alternatives, all visitation to Yellowstone would be guided, either in snowcoaches only (alternative 2), a mixture of snowmobiles and snowcoaches (alternatives 2 and 3A), or in a mixture of snowmobiles, snowcoaches, and wheeled vehicles (alternative 6). As the discussion in Chapter III suggests, the fact that all of these alternatives would require trained commercial guides removes almost all opportunity for coyotes and ravens to engage in their respective problem behaviors, because guides are trained and required to prevent their clients from encouraging them. Consequently, alternatives 1, 2, 3A, 6, and 7 would result in negligible, direct, short-term, and adverse effects to coyotes and ravens. Relative to the other alternatives, these five would have a smaller impact upon coyote and raven populations than alternatives 4 and 5 and historic conditions, while the impacts would be about the same as current conditions. These five alternatives would have a greater impact than alternative 3B. The impacts associated with these alternatives would not be of sufficient magnitude to constitute impairment of coyote or elk populations.

Mitigations

As discussed in Chapter III, the requirement to use commercial guides is an effective mitigation for some human impacts upon coyotes and ravens. Guides are trained to avoid causing wildlife displacement or stress and are familiar with likely wildlife locations along the road system. Accompanied by guides, OSV users may be less likely to interact improperly with wildlife, causing less begging or food stealing behaviors. These alternatives would have two other mitigations. First, the daily entry restrictions would limit OSV visitation to a level substantially less than the historic limits. Because most impacts increase with the numbers of

visitors, restricting visitor numbers also limits impacts upon coyotes and ravens. Secondly, and as discussed in section 2.5.3, monitoring of human-wildlife interactions will continue under all alternatives. If this monitoring indicates that human presence or activities are having unacceptable effects on coyotes or ravens that cannot otherwise be mitigated, selected areas of the parks (including sections of roads) may be closed to visitor use.

Cumulative Effects

The area of concern includes habitat within the three park units and other habitat beyond the parks' boundaries. Although hunting of coyotes is allowed outside the parks, it has little discernible effect upon their populations in the GYA. While many of the broader population trends in the GYA (such as population growth and rural land subdivision) may affect coyotes and ravens by making more human food available to them, such an effect will not generally result in population reductions for two species, which are widespread and common. Further, both species have small individual ranges, which means that habituation outside the park is unlikely to influence their populations or behavior in Yellowstone. Similarly, while the various road projects in the region may increase travel speeds and associated road kill (mainly of coyotes), their population is abundant and healthy and unlikely to be adversely affected by such road kill. Finally, the proposed restoration of the Gardiner Basin lands would benefit these two species by increasing the distribution of native plants and the small animals which feed upon them (which are often prey for coyotes).

Conclusion

According to the best available information, impacts effects on coyotes and ravens from these alternatives are predicted to be negligible, adverse, short-term, and direct. In terms of cumulative effects, the negligible, adverse, short-term impacts resulting from direct and indirect actions described in this alternative would contribute no impact to past, present, and foreseeable actions and impacts on coyotes or ravens. The impacts associated with these alternatives are not predicted to be of sufficient magnitude to constitute unacceptable impacts or impairment of coyote or raven populations.

Alternatives 4 and 5

During the historic era, before the implementation of vehicle limits and mandatory guiding, coyotes and ravens exhibited problem behaviors. While an unguided or non-commercially guided program would attempt to educate visitors on the need to prevent these behaviors from redeveloping, enforcement of proper visitor behaviors would not be as effective as it is with mandatory guiding. Consequently, some recurrence of coyote begging behavior and raven food stealing behavior would be expected to occur, although it would not be as common as it was in the historic era. Alternatives 4 and 5, then, would be expected to have direct, adverse, minor, and short-term effects upon coyote and raven behaviors. Relative to the other alternatives and current conditions, these two would have a greater impact upon coyote and raven populations, while the impacts would be less than historic conditions. The impacts associated with these alternatives would not be of sufficient magnitude to constitute impairment of coyote or raven populations.

Mitigations

As discussed in Chapter III, the requirement to use commercial guides is an effective mitigation for some human impacts upon coyotes and ravens. Guides are trained to avoid causing wildlife displacement or stress and are familiar with likely wildlife locations along the road system. Accompanied by guides, OSV users may be less likely to interact improperly with wildlife, causing less begging or food stealing behaviors, although the provisions for some unguided or non-commercially guided visitors under these two alternatives would

mean that some visitors could (knowingly or unknowingly) encourage problem coyote and raven behaviors. These alternatives would have other mitigations. First, the daily entry restrictions under alternative 5 would limit OSV visitation to a level significantly less than the historic limits. Because most impacts increase with the numbers of visitors, restricting visitor numbers also limits impacts upon coyotes and ravens. Secondly, and as discussed in section 2.5.3, monitoring of human-wildlife interactions will continue under both alternatives. If this monitoring indicates that human presence or activities are having unacceptable effects on coyotes or ravens that cannot otherwise be mitigated, selected areas of the parks (including sections of roads) may be closed to visitor use.

Cumulative Effects

Past, present, and foreseeable actions occurring within and around the parks which could affect coyotes and ravens are the same as those for alternatives 1, 2, 3, 6, and 7. Cumulative effects for alternatives 4 and 5 would be slightly greater than those for the other alternatives due to the provision for some unguided or non-commercially guided visitation under alternatives 4 and 5.

Conclusion

According to the best available information, impacts on coyotes and ravens from these alternatives are predicted to be minor, adverse, short-term, and direct. In terms of cumulative effects, the minor, adverse, short-term impacts resulting from direct and indirect actions described in this alternative would contribute a negligible, adverse, and short-term impact to past, present, and foreseeable actions and impacts on coyotes or ravens. The impacts associated with these alternatives are not predicted to be of sufficient magnitude to constitute unacceptable impacts or impairment of coyote or raven populations.

Impacts on Bald Eagles and Swans by Alternative

Alternative 1

Vehicle-Caused Mortality

Under this alternative, the potential for vehicle-caused mortality would increase relative to alternatives 2, 3A, 3B, 5, and 7, and current conditions due to its provision for higher OSV numbers. This alternative would decrease the potential for vehicle collisions relative to historical conditions and alternatives 4 and 6. Impacts are predicted to be negligible, adverse, direct, and short-term.

Displacement

The potential for displacement would increase under this alternative relative to alternatives 2, 3A, 3B, 5, 6, and 7, and current conditions because of higher OSV numbers. This alternative would decrease the potential for displacement relative to historical conditions and alternative 4. Impacts are predicted to be adverse, moderate, direct, and short-term.

Behavioral and Physiological Effects

The potential for behavioral and associated physiological responses from bald eagles and swans under this alternative would increase relative to alternatives 2, 3A, 3B, 5, 6, and 7, and current conditions due to higher OSV numbers. This alternative would decrease the potential for responses relative to historical conditions and alternative 4. Impacts are predicted to be adverse, moderate, direct, and short-term.

Population-level Effects

The potential for population-level impacts to bald eagles and swans under this alternative would increase relative to alternatives 2, 3A, 3B, 5, 6, and 7, and current conditions due to higher OSV numbers. This alternative would decrease the potential for impacts relative to historic conditions and alternative 4. Impacts are predicted to be negligible to minor, adverse, direct, and short-term.

Mitigations

The impacts identified above would be mitigated in several ways under this alternative. First, the daily entry restrictions would limit OSV visitation to a level substantially less than the historic limits. Because most impacts increase with the numbers of visitors, restricting visitor numbers also limits eagle and swan impacts. Secondly, and as discussed in section 2.5.3, monitoring of human-wildlife interactions will continue under all alternatives. If this monitoring indicates that human presence or activities are having unacceptable effects on eagles or swans that cannot otherwise be mitigated, selected areas of the parks (including sections of roads) may be closed to visitor use. Third, and as discussed in Chapter III, the requirement to use commercial guides is an effective mitigation for some human impacts upon wildlife. Guides are trained to avoid causing wildlife displacement or stress and are familiar with likely wildlife locations along the road system. Accompanied by guides, OSV users may be less likely to interact improperly with wildlife, causing less mortality, less displacement, fewer negative behavioral and physiological responses, and ultimately lower population-level impacts. Finally, both parks have the authority to enact—and have enacted—closures for wildlife purposes, such as to prevent disturbance of nesting eagles or swans.

Cumulative Effects

The area of concern includes habitat within the three park units and other habitat beyond the parks' boundaries. Actions taken outside the parks which would decrease the ability of eagles and swans to produce viable offspring contribute to the overall population health of the two species. With swans such actions could have the cumulative effect of furthering the regional population decline.

Population growth in the GYA, changing demographics, rural land subdivision, improving snowmobile technologies, and increasing outfitter/guide activity can all influence wildlife populations by introducing more recreationists into bald eagle and swan habitat and/or fragmenting their habitat. Population growth and changing demographics may particularly affect eagles and swans because much of that growth is occurring along the region's rivers and lakes and because changing demographics mean that river sports like kayaking and white water rafting are increasingly popular. These two trends are bringing more and more residents and recreationists into the habitats and nesting areas preferred by eagles and swans.

Grand Teton has recently completed a summer transportation plan, Teton County has completed the Teton Pathways Master Plan, and several of the forests in the region are revising their forest plans and/or travel plans. Eagles and swans could be affected by these plans. However, the federal and state wildlife management agencies must ensure the long-term viability of bald eagle populations, and generally strive to do the same for trumpeter swans.

The Gallatin National Forest has consolidated much of its checker-boarded holdings in recent years, although that has also been accompanied by the consolidation of private lands, especially in the Big Sky area. It is difficult to predict the net effect of these actions on eagles

and swans, since the consolidated USFS lands are less likely to be developed while the private lands are more likely to be.

Road construction is a recurring event in the region, as are other construction projects such as the proposed natural gas pipeline through Hoback Canyon south of Jackson, an area known to have several bald eagle nests. Within the parks, these projects are undertaken in such a way as to minimize their effects on wildlife. On the national forests, this is generally true as well. For example, most facility construction projects within the parks and forests are either replacements of existing facilities or are located within existing developed areas, therefore minimizing their effects upon wildlife. Developers must minimize the effects of such projects on bald eagles, but swans are not similarly protected.

Conclusion

The qualitative assumptions, grounded in the available literature on eagles and swans, made in this analysis are that increases in winter traffic levels and associated human recreational activity cause increases in vehicle-caused mortality, wildlife displacement, behavior- or physiology-related energy costs, and the potential for adverse demographic impacts. However, the mitigations (limited number of visitors, continued research and monitoring efforts, mandatory guiding, and potential closures around their nests) discussed above, and adaptive management, would limit any impacts to acceptable levels. According to the best available information, then, impacts under this alternative are predicted to be negligible to minor to moderate, adverse, short-term, and direct.

In terms of cumulative effects, the negligible to moderate, adverse, short-term impacts resulting from direct and indirect actions described in this alternative would contribute a negligible to minor, adverse, and short-term impact to past, present, and foreseeable actions and impacts on eagles and swans. The impacts associated with alternative 1 would not be of sufficient magnitude to constitute unacceptable impacts or impairment of eagles or swans.

Alternative 2

Vehicle-Caused Mortality

The potential for vehicle-caused mortality would decrease under this alternative relative to historical and current conditions and alternatives 1, 4, 5, 6, and 7 because overall traffic volume in the parks would decrease under this alternative. In relation to alternatives 3A and 3B, the potential for impacts would be increased. Additionally, snowcoaches (the only OSVs allowed under this alternative) appear less likely to strike wildlife in YNP. Impacts are predicted to be negligible, adverse, direct, and short-term.

Displacement

The potential for displacement under this alternative would decrease relative to historical and current conditions and alternatives 1, 4, 5, 6, and 7 because overall traffic volume in the parks would decrease under this alternative. Potential displacement would increase relative to alternatives 3A and 3B. However, the lack of snowmobile traffic will not eliminate impacts to swans and bald eagles. Impacts are predicted to be adverse, minor to moderate, direct, and short-term.

Behavioral and Physiological Effects

The potential for eagle and swan responses under this alternative would decrease relative to historic and current conditions and alternatives 1, 4, 5, 6, and 7 because overall traffic volume in the parks would decrease under this alternative. That potential would increase relative to alternatives 3A and 3B. However, a lack of snowmobile traffic will not eliminate impacts to

trumpeter swans and bald eagles. Impacts are predicted to be adverse, minor to moderate, direct, and short-term.

Population-level Effects

The potential for impacts to swan and eagle populations under this alternative would decrease relative to historic and current conditions and alternatives 1, 4, 5, 6, and 7 because overall traffic volume in the parks would decrease. However, a lack of snowmobile traffic would not eliminate impacts to trumpeter swans and bald eagles. Indeed, because overall usage would be even lower under alternatives 3A and 3B, this alternative would see increased impacts relative to that alternative. Overall, impacts are predicted to be negligible, adverse, direct, and short-term.

Mitigations

Mitigations for eagle and swan impacts under alternative 2 would be the same as those for alternative 1. While this alternative would have no commercial snowmobile guides because snowmobiles would be banned, snowcoach drivers have the same mitigating effects upon wildlife.

Cumulative Effects

Past, present, and foreseeable actions occurring within and around the parks which could affect eagles and swans are the same as those for alternative 1. Cumulative effects for this alternative would be about the same as those for Alternative 1.

Conclusion

The qualitative assumptions, grounded in the available literature on eagles and swans, made in this analysis are that increases in winter traffic levels and associated human recreational activity cause increases in vehicle-caused mortality, wildlife displacement, behavior- or physiology-related energy costs, and the potential for adverse demographic impacts. However, the mitigations (limited number of visitors, continued research and monitoring efforts, mandatory use of snowcoach travel, and potential closures around their nests) discussed above, and adaptive management, would limit any impacts to acceptable levels. According to the best available information, impacts on eagles and swans from alternative 2 are predicted to be negligible to moderate, adverse, short-term, and direct.

In terms of cumulative effects, the negligible to moderate, adverse, short-term impacts resulting from direct and indirect actions described in this alternative would contribute a negligible, adverse, short-term impact to past, present, and foreseeable actions and impacts on eagles or swans. The impacts associated with alternative 2 are not predicted to be of sufficient magnitude to constitute unacceptable impacts or impairment of eagle or swan populations.

Alternative 3

Vehicle-Caused Mortality

The potential for vehicle-caused mortality would be substantially reduced under both variations of this alternative by the closure of most roads to OSV traffic. Additionally, under alternative 3A, the only open road would be one which is not adjacent to productive winter eagle and swan habitat (i.e., areas of open water). Under both variations of this alternative the potential for vehicle collisions would decrease relative to historical and current conditions and all other alternatives, with the no action variation of this alternative (3B) eliminating the potential for vehicle-caused mortality and therefore having the least potential for vehicle-

caused mortality to eagles and swans of all the alternatives and comparative conditions. Impacts are predicted to be negligible, adverse, direct, and short-term.

Displacement

The potential for eagle and swan displacement under either variation of this alternative is substantially reduced by the elimination of OSV traffic in most or all of the parks, and, under alternative 3A, the restriction of OSV traffic to roads which are not adjacent to productive winter habitat for eagles and swans (i.e., areas of open water). Under alternative 3A, the potential for displacement would decrease relative to historical and current conditions and alternatives 1, 2, 4, 5, 6, and 7. Impacts are predicted to be negligible to minor, adverse, direct, and short-term. Because OSV traffic is eliminated under the no-action variation of this alternative (3B), impacts due to them would be negligible.

Behavioral and Physiological Effects

The potential for eagle and swan responses would be substantially reduced by the closure of most roads to OSV traffic and the restriction of OSV traffic to roads which are not adjacent to their productive winter habitat (i.e., areas of open water) under alternative 3A. Both alternatives would reduce such potential relative to all other alternatives and historical and current conditions. Impacts are predicted to be negligible to minor, adverse, direct, and short-term. Under alternative 3B, the no-action alternative, which would eliminate all recreational oversnow vehicle travel, the potential for impact would be even less.

Population-level Effects

The potential for population-level impacts to eagles or swans would be eliminated under this alternative, due to the restriction of OSV traffic to roads which are not adjacent to productive winter habitat for them (i.e., areas of open water). This alternative (both 3A and 3B) would have lower population-level impacts than all other alternatives and both current and historic conditions. There would be negligible impacts.

Mitigations

Mitigations for eagle and swan impacts under alternative 3 would be the same as those for alternative 1, with the additional mitigation that virtually all areas of YNP frequented by wildlife would be closed to recreational human entry, practically eliminating any possibility of adverse human impacts upon wildlife.

Cumulative Effects

Past, present, and foreseeable actions occurring within and around the parks which could affect eagles and swans are the same as those for alternative 1. Cumulative effects for this alternative would be less than those for Alternative 1 because most OSV routes in Yellowstone would be closed.

Conclusion

The qualitative assumptions, grounded in the available literature on eagles and swans, made in this analysis are that increases in winter traffic levels and associated human recreational activity cause increases in vehicle-caused mortality, wildlife displacement, behavior- or physiology-related energy costs, and the potential for adverse demographic impacts. However, the mitigations (limited number of visitors, continued research and monitoring efforts, mandatory guiding, and potential closures around their nests) discussed above, and adaptive management, would limit any impacts to acceptable levels. According to the best available information, impacts on eagles and swans from alternative 3A are predicted to be

negligible to minor, adverse, short-term, and direct; impacts and cumulative effects from 3B would be negligible.

In terms of cumulative effects, the negligible to minor, adverse, short-term impacts resulting from direct and indirect actions described in this alternative would contribute a negligible, adverse, and short-term impact to past, present, and foreseeable actions and impacts on eagles or swans. The impacts associated with alternative 3 are not predicted to be of sufficient magnitude to constitute unacceptable impacts or impairment of eagle or swan populations.

Alternative 4

Vehicle-Caused Mortality

The potential for vehicle-killed swans and eagles would increase under this alternative relative to historical and current conditions and alternatives 1, 2, 3A, 3B, 5, and 7 due to increased OSV numbers in the parks. While alternative 4 is difficult to compare to alternative 6 due to the latter's provision for wheeled vehicle use, the two alternatives would probably have about the same level of vehicle-caused mortality, because alternative 4 would have about twice as many vehicles in the park as alternative 6, but the latter would allow up to 100 wheeled vehicles per day, which have a higher probability of striking wildlife. Consequently, the impacts of alternative 4 on vehicle-caused mortality are predicted to be adverse, minor, direct, and short-term.

Displacement

The potential for eagle and swan displacement would increase under this alternative relative to historic and current conditions and all other alternatives due to increased OSV numbers in the parks. The impacts are predicted to be adverse, moderate, direct, and short-term.

Behavioral and Physiological Effects

The potential for swan and eagle responses would increase under this alternative relative to historical and current conditions and all other alternatives due to increased OSV numbers in the parks. The impacts are predicted to be adverse, moderate, direct, and short-term.

Population-level Effects

The potential for swan and eagle population impacts under this alternative would increase relative to historical and current conditions and all other alternatives due to increased OSV numbers in the parks. The impacts are predicted to be adverse, negligible to minor, direct, and short-term.

Mitigations

Mitigations for eagle and swan impacts under alternative 4 would be the same as those for alternative 1, although the mitigations would be less effective under this alternative due to this alternative's higher daily visitation limit and provision for some visitors to be unguided.

Cumulative Effects

Past, present, and foreseeable actions occurring within and around the parks which could affect eagles and swans are the same as those for alternative 1. Cumulative effects for this alternative would be greater than those for Alternative 1 because more OSV traffic, some of it unguided or non-commercially guided, would be allowed under this alternative.

Conclusion

The qualitative assumptions, grounded in the available literature on eagles and swans, made in this analysis are that increases in winter traffic levels and associated human recreational activity cause increases in vehicle-caused mortality, wildlife displacement, behavior- or physiology-related energy costs, and the potential for adverse demographic impacts. However, the mitigations (limited number of visitors, continued research and monitoring efforts, use of guides for most visitors, and potential closures around their nests) discussed above, and adaptive management, would limit any impacts to acceptable levels. According to the best available information, impacts on eagles and swans from alternative 4 are predicted to be negligible to moderate, adverse, short-term, and direct.

In terms of cumulative effects, the negligible to moderate, adverse, short-term impacts resulting from direct and indirect actions described in this alternative would contribute a negligible to minor, adverse, short-term impact to past, present, and foreseeable actions and impacts on eagles or swans. The impacts associated with alternative 4 are not predicted to be of sufficient magnitude to constitute unacceptable impacts or impairment of eagle or swan populations.

Alternative 5

Vehicle-Caused Mortality

The potential for vehicle collisions with swans and eagles under this alternative would increase relative to alternatives 2, 3A, 3B, and current conditions because of increased OSV numbers under alternative 5. Conversely, this alternative would decrease the potential for vehicle collisions relative to historical conditions and alternatives 1, 4, and 6. While this alternative and alternative 7 differ in that this alternative includes the provision for unguided snowmobiles, vehicle collisions involving swans and eagles under this alternative would be similar to alternative 7 because the number of OSVs is comparable. The impacts are predicted to be negligible, adverse, direct, and short-term.

Displacement

The potential for displacement of trumpeter swan and bald eagles under this alternative would increase relative to alternatives 2, 3A, 3B, and 6, and current conditions due to increased OSV numbers. This alternative would decrease the potential for displacement relative to historical conditions and alternatives 1 and 4. While this alternative and alternative 7 differ in that this alternative includes the provision for unguided snowmobiles, displacement and behavioral and/or physiological impacts involving swans and eagles under this alternative would be similar to alternative 7 because the number of OSVs is comparable. The impacts are predicted to be adverse, minor to moderate, direct, and short-term.

Behavioral and Physiological Effects

The potential for swan and bald eagle responses under this alternative would increase relative to current conditions and alternatives 2, 3A, 3B, and 6 due to increased OSV numbers. This alternative would decrease the potential relative to historic conditions and alternatives 1 and 4. While this alternative and alternative 7 differ in that this alternative includes the provision for unguided snowmobiles, displacement and behavioral and/or physiological impacts involving swans and eagles under this alternative would be similar to alternative 7 because the number of OSVs is comparable. The impacts are predicted to be adverse, minor to moderate, direct, and short-term.

Population-level Effects

The potential for swan and bald eagle population impacts under this alternative would increase relative to current conditions and alternatives 2, 3A, 3B, and 6 because of increased OSV numbers. This alternative would decrease the potential relative to historical conditions and alternatives 1 and 4. The impacts would be similar to alternative 7 because OSV numbers are comparable. The impacts are predicted to be adverse, negligible, direct, and short-term.

Mitigations

Mitigations for eagle and swan impacts under alternative 5 would be the same as those for alternative 1, although the mitigations would be less effective under this alternative due to its provision for some visitors to be unguided.

Cumulative Effects

Past, present, and foreseeable actions occurring within and around the parks which could affect eagles and swans are the same as those for alternative 1. Cumulative effects for this alternative would be about the same as those for Alternative 1 due to the provision for some unguided visitation under this alternative.

Conclusion

The qualitative assumptions, grounded in the available literature on eagles and swans, made in this analysis are that increases in winter traffic levels and associated human recreational activity cause increases in vehicle-caused mortality, wildlife displacement, behavior- or physiology-related energy costs, and the potential for adverse demographic impacts. However, the mitigations (limited number of visitors, continued research and monitoring efforts, use of guides for most visitors, and potential closures around their nests) discussed above and adaptive management, would limit any impacts to acceptable levels. According to the best available information, impacts on eagles and swans from alternative 5 are predicted to be negligible to moderate, adverse, short-term, and direct.

In terms of cumulative effects, the negligible to moderate, adverse, short-term impacts resulting from direct and indirect actions described in this alternative would contribute a negligible to minor, adverse, short-term impact to past, present, and foreseeable actions and impacts on eagles or swans. The impacts associated with alternative 5 are not predicted to be of sufficient magnitude to constitute unacceptable impacts or impairment of eagle or swan populations.

Alternative 6

Vehicle-Caused Mortality

The potential for wheeled vehicle impacts to swans and eagles under this alternative would increase relative to historic and current conditions and alternatives 1, 2, 3A, 3B, 5, and 7. As explained under the alternative 4 discussion, the potential is probably about equal between alternatives 4 and 6. However, no road-killed bald eagles or trumpeter swans were reported in the parks from 1989 to 2006, indicating that mortality from wheeled vehicles is very rare. In areas uninfluenced by plowing operations, alternative 6 would reduce the probability of swans and eagle mortality relative to alternatives 1, 4, 5, and 7, and historic conditions based on OSV numbers. The possibility would increase relative to alternatives 2, 3A, 3B, and current conditions. Overall, impacts are predicted to be adverse, minor, direct, and short-term.

Displacement

The potential for eagle displacement under this alternative would increase relative to current conditions and alternatives 2, 3A, and 3B, due to the higher level of total vehicle use under this alternative. Conversely, alternative 6 would reduce the probability of eagle and swan displacement relative to historic conditions and alternatives 1, 4, 5, and 7 because total vehicle use would decline under this alternative. Impacts are predicted to be adverse, minor to moderate, direct, and short-term.

Behavioral and Physiological Effects

The potential for eagle and swan responses under this alternative would increase relative to current conditions and alternatives 2, 3A, and 3B, due to increased OSV and wheeled vehicle numbers. Alternative 6 would reduce the probability of eagle and swan responses relative to historic conditions and alternatives 1, 4, 5, and 7 based on OSV numbers. Impacts are predicted to be adverse, minor to moderate, direct, and short-term.

Population-level Effects

The potential for eagle and swan population impacts under this alternative would increase relative to current conditions and alternatives 2, 3A, and 3B, due to increased OSV and wheeled vehicle numbers. Alternative 6 would reduce that probability relative to historic conditions and alternatives 1, 4, 5, and 7 based on OSV numbers. Impacts are predicted to be none to adverse, negligible, direct, and short-term.

Mitigations

Mitigations for eagle and swan impacts under Alternative 6 would be the same as those for Alternative 1, with several additional mitigations. The mortality risk to these animals from wheeled vehicle traffic would be mitigated in several ways. First, only YNP's west-side roads would be plowed under this alternative. Wheeled vehicle numbers would be limited to 100 per day, and all such vehicles would be commercially guided. Further, guided wheeled traffic in the winter is expected to travel at lower speeds than summer wheeled traffic, and professional drivers would be familiar with common wildlife locations, both on and off the road.

Cumulative Effects

Past, present, and foreseeable actions occurring within and around the parks which could affect eagles and swans are the same as those for alternative 1. Cumulative effects for this alternative would be the same as those for Alternative 1.

Conclusion

The qualitative assumptions, grounded in the available literature on eagles and swans, made in this analysis are that increases in winter traffic levels and associated human recreational activity cause increases in vehicle-caused mortality, wildlife displacement, behavior- or physiology-related energy costs, and the potential for adverse demographic impacts. However, the mitigations (limited number of visitors, continued wildlife monitoring, mandatory use of guides, and potential closures around their nests) discussed above, and adaptive management, would limit any impacts to acceptable levels. According to the best available information, impacts on eagles and swans from alternative 6 are predicted to be negligible to moderate, adverse, short-term, and direct.

In terms of cumulative effects, the negligible to moderate, adverse, short-term impacts resulting from direct and indirect actions described in this alternative would contribute a negligible to minor, adverse, and short-term impact to past, present, and foreseeable actions

and impacts on eagles or swans. The impacts associated with alternative 6 are not predicted to be of sufficient magnitude to constitute unacceptable impacts or impairment of eagle or swan populations.

Alternative 7

Vehicle-Caused Mortality

The potential for vehicle collisions with swans and eagles under this alternative would increase relative to alternatives 2, 3A, 3B, and current conditions because of increased OSV numbers under alternative 7. Conversely, this alternative would decrease the potential for vehicle collisions relative to historical conditions and alternatives 1, 4, and 6. Vehicle collisions involving swans and eagles under this alternative would be similar to alternative 5 because the number of OSVs is comparable. Unlike alternative 5, this alternative requires all OSVs to be commercially guided. The impacts are predicted to be negligible, adverse, direct, and short-term.

Displacement

The potential for displacement of trumpeter swan and bald eagles under this alternative would increase relative to alternatives 2, 3A, 3B, and 6, and current conditions due to increased OSV numbers. This alternative would decrease the potential for displacement relative to historical conditions and alternatives 1 and 4. Displacement involving swans and eagles under this alternative would be similar to alternative 5 because the number of OSVs is comparable. Unlike alternative 5, this alternative requires all OSVs to be commercially guided. The impacts are predicted to be adverse, minor to moderate, direct, and short-term.

Behavioral and Physiological Effects

The potential for swan and bald eagle responses under this alternative would increase relative to current conditions and alternatives 2, 3A, 3B, and 6 due to increased OSV numbers. This alternative would decrease the potential relative to historic conditions and alternatives 1 and 4. Displacement involving swans and eagles under this alternative would be similar to alternative 5 because the number of OSVs is comparable. Unlike alternative 5, this alternative requires all OSVs to be commercially guided. The impacts are predicted to be adverse, minor to moderate, direct, and short-term.

Population-level Effects

The potential for swan and bald eagle population impacts under this alternative would increase relative to current conditions and alternatives 2, 3A, 3B, and 6 because of increased OSV numbers. This alternative would decrease the potential relative to historical conditions and alternatives 1 and 4. Displacement involving swans and eagles under this alternative would be similar to alternative 5 because the number of OSVs is comparable. Unlike alternative 5, this alternative requires all OSVs to be commercially guided. The impacts are predicted to be adverse, negligible, direct, and short-term.

Mitigations

Mitigations for eagle and swan impacts under alternative 7 would be the same as those for alternative 1.

Cumulative Effects

Past, present, and foreseeable actions occurring within and around the parks which could affect eagles and swans are the same as those for alternative 1. Cumulative effects for this alternative would be the same as those for Alternative 1.

Conclusion

The qualitative assumptions, grounded in the available literature on eagles and swans, made in this analysis are that increases in winter traffic levels and associated human recreational activity cause increases in vehicle-caused mortality, wildlife displacement, behavior- or physiology-related energy costs, and the potential for adverse demographic impacts. However, the mitigations (limited number of visitors, continued research and monitoring efforts, use of guides for most visitors, and potential closures around their nests) discussed above, and adaptive management, would limit any impacts to acceptable levels. According to the best available information, impacts on eagles and swans from alternative 7 are predicted to be negligible to moderate, adverse, short-term, and direct.

In terms of cumulative effects, the negligible to moderate, adverse, short-term impacts resulting from direct and indirect actions described in this alternative would contribute a negligible to minor, adverse, and short-term impact to past, present, and foreseeable actions and impacts on eagles or swans. The impacts associated with alternative 7 are not predicted to be of sufficient magnitude to constitute unacceptable impacts or impairment of eagle or swan populations.

4.2.6 Effects on the Natural Soundscape

Assumptions and Methods

A more complete discussion of the assumptions and methods used to evaluate the alternative's impacts on the natural soundscape are documented in the modeling report: "Modeling Sound Due to Over-Snow Vehicles in Yellowstone and Grand Teton National Parks" (U.S. Dept. of Transportation Volpe Center 2006a). This document, as amended, is incorporated by reference and available for review on the YNP website. In short, acoustical modeling was performed by the U.S. Department of Transportation, Volpe National Transportation Systems Center (Volpe), using the Federal Aviation Administration's (FAA) Integrated Noise Model (INM) (U.S. Dept. of Transportation Volpe Center 1999; U.S. Dept. of Transportation Volpe Center 2002; Horonjeff and Roof 2006), adapted for use with oversnow vehicles. Model adaptation included the development of ground-to-ground sound propagation models to better account for propagation over snow-covered terrain. The best available natural ambient sound levels were provided by the NPS and natural ambient sound maps were generated for the parks; see figures 3-10 and 3-11 in the affected environment section for sound. Volpe developed Noise-Speed-Distance (NSD) relationships for oversnow vehicles partially based on acoustical studies conducted during the winter 2005-2006 season. Modeled vehicle types included two- and four-stroke snowmobiles, purpose-built snowcoaches, and snowcoaches based on modified conversion vans with either two or four tracks. For alternative 6, wheeled vehicles were also modeled.

Modeling of OSVs in a complex environment involves many variables, some of which cannot be controlled. Examples of factors affecting OSV sound at an observer's location include terrain profile and ground cover, ambient sound levels, vehicle grouping and spacing, temperature, humidity, wind, vehicle type, sound source location, path and speed of vehicle, speed variations (i.e., acceleration/deceleration), vehicle loading, snow hardness, snow depth, and snow moisture content. One shortfall of this modeling is that the model does not account for sounds other than those generated during steady state travel, such as vehicles traveling at slow speeds within a developed area. Several important modeling assumptions were made in this study. Assumptions include: modeling for temperature, relative humidity, and snow cover representative of an average day during the winter season in the parks (see Section 3 and Appendix A in the Volpe modeling report), no wind or other ambient sounds, constant operational speed over a given path segment, and an even distribution of vehicles

over an 8-hour day (i.e., there are different use numbers depending on the hour, but use is evenly distributed across each hour).

The Integrated Noise Model requires the following data: natural ambient sound level maps, "tracks" (OSV travel routes), operations data, and OSV sound source characteristics. Because the A-weighted sound levels and unweighted, one-third octave-band levels of a large number of snowcoaches and two- and four-stroke snowmobiles have been measured in previous studies (Harris Miller Miller & Hanson Inc. 2002; Harris Miller Miller & Hanson Inc. 2001; NPS unpublished data), the model utilized these data.

Modeled versus Measured Results

Alternative modeling, unlike monitoring, allows comparison among the proposed alternatives relative to the volume and type of recreation use allowed. However, for any comparison between the modeling results for alternatives effects and monitoring results describing the existing conditions in Chapter III (see especially 3.7.4), it should be noted that the model excludes all administrative vehicle traffic; monitoring data includes it. It is unlikely that this difference greatly affected modeled sound level results, although it did affect percent time audible. The model did not include other ambient sounds, both natural and non-natural, while monitoring data does include these sounds.

When interpreting results, it is important to keep in mind the distinction between what a human listener actually hears and between monitored and modeled results. What a human hears depends on the sound sources and meteorological conditions as well as her or his hearing ability at the time the sound occurs. Monitored results also depend on sound sources and meteorological conditions; however those at the time of monitoring may not be the same as those that existed when a person experienced them. Monitoring results are based on actual measured field conditions, while modeled results are based on principles that describe how acoustic waves propagate and how humans perceive sound. They are also based on simplified representations of sound sources and propagation paths. The accuracy of modeled results depends on the detail of model inputs and how these would vary from actual field conditions. For example, because the OSV sound sources in this modeling work are based on averaged data for each vehicle type, those with the highest and lowest sound levels are not represented. So even though a human listener may be able to hear a vehicle with an above average sound level, the model may indicate that the vehicle could not be heard.

Weather conditions, such as temperature inversions and wind, are common during the winter and have a substantial effect on sound propagation and masking. Inversions may cause sounds to travel much farther than predicted by the INM sound propagation model. Ambient sounds, such as wind, thermal activity, flowing water, and aircraft mask OSV sounds. These conditions were not modeled, but they were part of field measurements.

Therefore, there are a number of factors that make comparison between modeling and monitoring problematic. Nevertheless, a simple comparison of the Volpe modeling and NPS monitoring data at twelve sites in Yellowstone and Grand Teton was undertaken to better understand the similarities and differences in the results of both techniques. The model underestimated the sound level of OSVs at eight of twelve sites compared to the field measurements; it never overestimated the sound level. The model underestimated the percent time audible at seven of the twelve sites, and overestimated audibility at one site.

Modeled and monitored results compare favorably at Grassy Lake Road (190 feet from OSVs), Lone Star (1 mile from OSVs), Mary Mountain (4000 feet from OSVs) and Sylvan Lake (425 feet to OSVs). Results at the other eight sites were not as similar. Overall, it appears

that the model underestimated, sometimes substantially, the sound level and the percent time audible of OSVs in the parks as compared to data derived from field measurement.

Differences in Sound Quality and Propagation

Both modeling and monitoring provide useful tools in analyzing the effects of oversnow vehicles on the natural soundscapes of the parks. The difference between the two methods and the fact that modeling does not include other ambient sources of sound beyond the average background natural sound level has been discussed previously. Modeling also does not account for some other attributes of oversnow vehicle sound that are important to an understanding of the impacts on the natural soundscape. The modeling that was performed for this analysis does not account for such factors as the abruptness of sound onset, harshness (i.e. tonal quality), and fluctuations of sound levels and frequency (pitch) that can all affect how noticeable the sound is.

The modeling does not account for differences between the quality of 2-stroke versus 4-stroke snowmobile sound that can influence the detectability of that sound within the area of audibility. Two-stroke snowmobile sound is readily recognizable even at very low sound levels (i.e. the lower limit of audibility) due to its higher tonal qualities and greater amplitude and frequency variations (throttle fluctuations). In contrast, 4-stroke BAT snowmobile sounds at lower sound levels can be difficult to distinguish from wind or other indistinct ambient sounds and, therefore, may go unrecognized as resulting from the use of oversnow vehicles.

For these reasons, it is important to consider that within the areas where oversnow vehicles are audible, and in particular in the travel corridors, developed areas, and transition zones, distinct differences in the quality of the sounds produced by 4-stroke BAT versus 2-stroke snowmobiles are important considerations.

Effects of Group Size

Group size provides a potential tradeoff mechanism between park area affected and audibility. For example, in some areas of the park an increase in group size would increase the amount of time between successive OSV group events and would consequently increase the noise-free interval. The tradeoff for this is that the sound level associated with the group would increase and therefore the park area with “any audibility” would increase. Conversely, for areas of the park where 100% audibility has been reached, reducing group size and lowering the allowable speed limit would decrease the park area with “any audibility” but would not increase the percent time audible in the area nearest the corridor since it would already be at 100%.

Definition of Impacts

The assessment of impacts on the natural soundscape consists of modeling the alternatives and predicting, among other things, the percent of time that oversnow vehicles are audible, the percentage of the park in which oversnow vehicle sound is audible, and the sound levels that are produced accordingly. These modeled outputs are compared to the impact threshold definitions shown below. Although the impact definitions presented in Table 4-48 differ slightly from those in previous analyses, such as for the Temporary EA, the underlying concepts have not been altered. The changes reflect both new information from several winters of monitoring data, and a growing understanding of acceptable levels of impact. The specific thresholds consider only visitor (recreation) sound impacts and not those of administrative travel; therefore, the thresholds are reduced accordingly.

Impact comparisons are presented for each alternative. In applying these definitions, two considerations should be highlighted. First, should the assessed impact level (i.e., negligible, minor, moderate, or major) for one parameter be higher than for another, the overall impact is judged to be at the higher level. For example, if one alternative is modeled to result in a moderate impact for the percent time oversnow vehicles are audible but a major impact for the maximum sound level present, the overall impact conclusion is for a major impact. Second, modeled results for area of audibility are judged against impact thresholds shown in the second column, labeled "Percent of Total Park in which OSV Sound is Audible." These outputs have not been refined to allow comparison by management zone. However, part of the analysis is to predict oversnow vehicle sound at selected points in each park unit; these outputs are compared against the parameters shown in the fourth (Audibility) and fifth (Maximum Sound Level) columns of Table 4-48.

Table 4-48 Definition of Impacts on the Natural Soundscape (as modeled)[5]

Impact Category [1]	Percent of Total Park in which OSV Sound is Audible	Management Zone [4]	Audibility % Time[2]	Maximum Sound Level [3] dBA
Negligible Impact: An action that may affect the natural soundscape or potential for its enjoyment by resulting in oversnow vehicle sound that is heard over a small area of the total park, or with infrequent occurrence and only for short duration or at a decibel level that may not be noticeable to humans engaged in other activities.	≤ 5	Developed	< 15	< 40
		Travel Corridor	< 10	< 40
		Backcountry	< 5	< 20
Minor Impact: An action that may affect the natural soundscape or potential for its enjoyment by resulting in oversnow vehicle sound heard over a modest area of the total park, or for a relatively small percent of the time or at a decibel level that would begin to affect conversation.	>5 ≤ 10	Developed	< 25	< 50
		Travel Corridor	< 20	< 50
		Backcountry	< 10	< 30
Moderate Impact: An action that may affect the natural soundscape or potential for its enjoyment by resulting in oversnow vehicle sound heard over an intermediate area of the total park, or for modest amounts of time or at a decibel level that would affect conversation.	>10 ≤ 20	Developed	< 40	< 70
		Travel Corridor	< 35	< 70
		Backcountry	< 15	< 40
Major Impact: An action that may affect the natural soundscape or potential for its enjoyment by resulting in oversnow vehicle sound heard over a substantial area of the total park, or for substantial amounts of time or at a decibel level that would make normal conversation difficult.	> 20	Developed	> 40	> 70
		Travel Corridor	> 35	> 70
		Backcountry	> 15	> 40

[1] Daily averages are calculated for 8 a.m. to 4 p.m; unit of analysis is one day.
[2] Audibility is the ability of humans with normal hearing to hear a sound.
[3] dBA = decibels measured on an A-weighted scale, measured at least 100 feet from the sound source.
[4] The transition zone is not included in the impact definitions.
[5] These definitions are intended for use in analysis of modeled results and should not be confused with adaptive management thresholds as described in Appendix E.

Impacts Common to All Alternatives

In addition to those impacts created by recreational access to the parks, soundscape impacts are also created by NPS and concessionaire use of oversnow vehicles (hereafter called administrative use). These uses may include snow grooming, snow plowing, search and rescue, maintenance activities, ranger patrols, employee ingress and egress, and re-supply for interior facilities. These impacts are measured during soundscape monitoring. They are not, however, included in the modeled assessment of impacts below. While impacts due to administrative use would likely vary by alternative in relation to the amount and location of allowable recreation use, these additive sound impacts would be common to all alternatives.

General Impacts by Alternative

The nature of impacts on the natural soundscape has two essential features: whether or not a non-natural sound (an oversnow vehicle in this case) is audible,[13] and if it is audible, what is the magnitude and extent of the sound. This represents a complex set of conditions involving both sound frequency[14] and sound pressure level.[15] Predicted impacts of the alternatives, as well as modeled impacts of current and historic use in the two park units, are illustrated with two metrics intended to describe this relationship:

"Percent Time Audible" – The percentage of time that oversnow vehicle sound levels are audible. These data are displayed in two ways; park-wide and by representative points.

"Sound Level" – The sound levels caused by oversnow vehicles. These data are displayed as the percentage of time that modeled sound levels at a given point are within a range of decibel increments (dBA).

These metrics are explained in greater detail below. For each of these metrics, alternative impacts are illustrated using maps with "audibility contours" and tables showing the amount of time (percent) oversnow vehicle sound levels were in 5 decibel increments from 0 to 60 dBA. The reader will note that all maps and tables for Yellowstone in this section illustrate the modeled results for the hour of 9 a.m. to 10 a.m. during the average day. This hour was selected as an index to illustrate impacts for all alternatives and modeled locations, allowing for comparison. However, the impact definition was derived from modeling results for all hours. The reader is encouraged to review the modeled results for all hours and all locations in appendices E (audibility maps) and F (number of seconds in decibel increments at selected sites) in the Volpe report (as amended). That report is available on the Yellowstone website at http://www.nps.gov/yell/parkmgmt/winterusetechnicaldocuments.htm. Because peak and off-peak hours were not modeled for GTNP and the Parkway, all hours during the day are the same in the modeled results.

Percent Time Audible

Park-wide percent time audible is displayed on a series of maps, two for each alternative (one each for Yellowstone and Grand Teton). The modeling report displays maps for multiple hours of the average day; the reader is referred to that report for a more complete

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[13] Audibility refers to the capacity of a human with normal hearing to detect the presence of sound. Additionally, the sound pressure levels and frequency content of ambient sounds influence the ability of a human to hear a given sound.

[14] In reference to the portion of the frequency spectrum that is audible to humans, measured in Hertz, sometimes termed "tone."

[15] The amplitude of sound measured in decibels, a logarithmic function. A-weighting indicates that measures have been adjusted to human hearing.

comparison. As noted, each map illustrates percent time audible for the modeled hour of 9 a.m. to 10 a.m., daily. The contours on the maps are increments showing the percent of time during the hour that OSVs are audible.

In contrast, the values in Tables 4-50 and 4-52 for area of audibility are based on all hours of operation, 8 a.m. to 4 p.m. These values are used in the impact assessment for each alternative by reporting the area (in square miles and by percent of park) in which sound is audible.

To summarize the results, the modeled alternatives were rank-ordered based on the percent of the park affected by >0 and >50% time audible for Yellowstone and by >0% time audible for Grand Teton. The rank orders for any non-zero percent time audible, i.e. at least one audible event, are shown for Yellowstone in Figure 4-1 and for Grand Teton in Figure 4-2. From this point on, these data will be referred to as "any audibility" or "audible at all."[16]

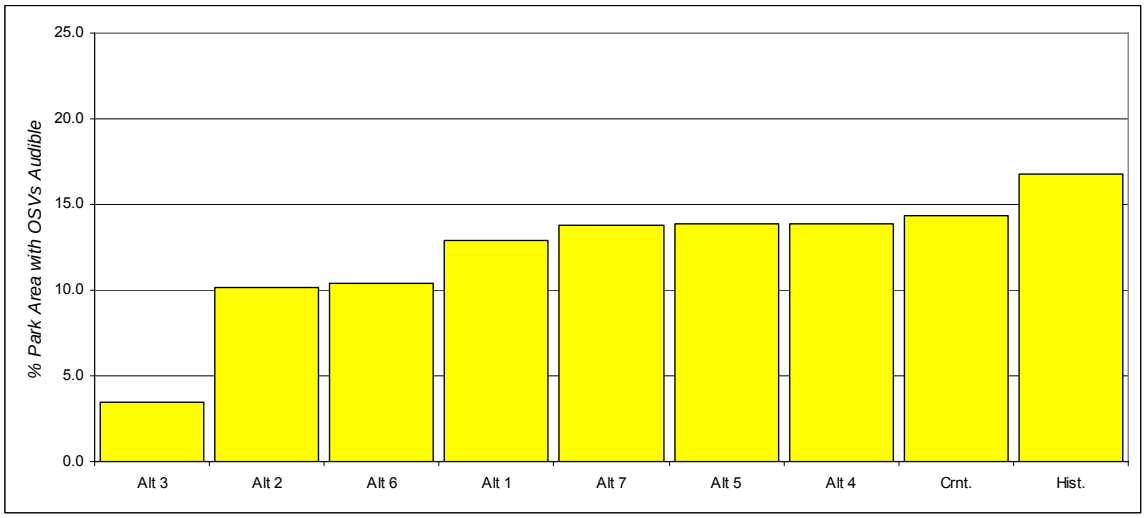

Figure 4-1: Percent of Yellowstone with Any Level of OSV Audibility[17]

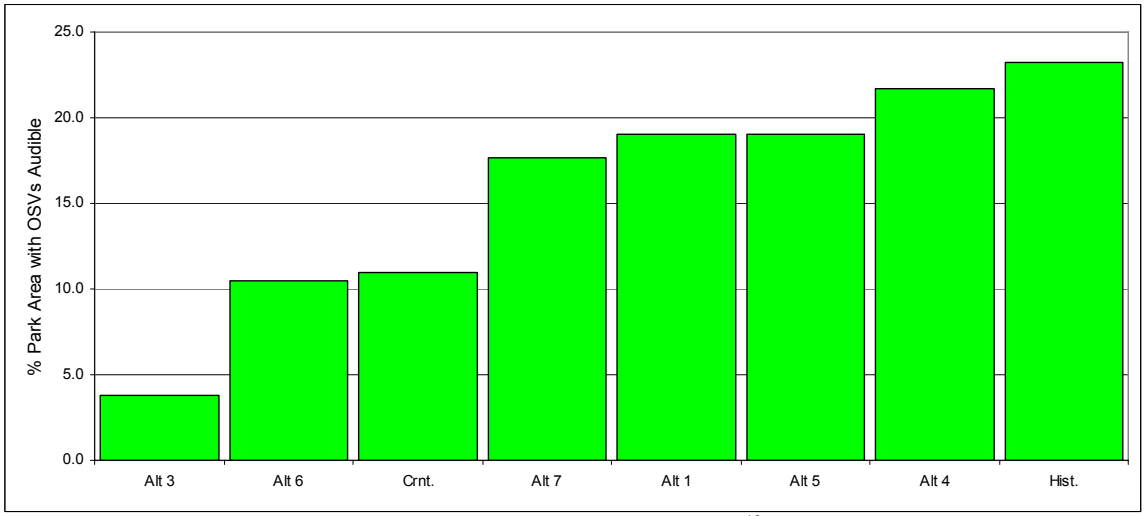

Figure 4-2: Percent of Grand Teton with Any Level of OSV Audibility[18]

[16] The park percentages are obtained from the contour plots from the sound modeling report by reading off the value in the "% Park" column of the map contours for the desired "% Time Audible." Since "no action" option 3B has no recreational OSV use, it was not modeled and does not appear in the tables.

[17] Updated from Volpe Report Fig. 32.

Table 4-49: Yellowstone: Percent of Park Area for 10% Increments of % Time Audible (updated from Volpe Report Table 36)

Percent Time Audible (8-hours)	Alt 1	Alt 2	Alt 3A	Alt 4	Alt 5	Alt 6	Alt 7	Current Condition	Historic Condition
0	12.9	10.2	3.5	13.9	13.9	10.4	13.8	14.4	16.2
10	8.6	6.5	2.4	10.2	9.1	5.8	7.6	5.4	13.6
20	6.1	3.9	1.4	8.3	6.5	3.9	5.6	2.5	12.1
30	4.1	2.1	1.0	6.2	4.6	3.1	4.1	1.3	10.4
40	2.8	1.4	0.8	4.5	3.4	2.6	2.8	0.8	9.0
50	2.2	1.0	0.8	3.8	2.4	2.1	1.8	0.6	8.1
60	1.7	0.9	0.7	3.1	1.8	1.6	1.4	0.5	7.4
70	1.3	0.8	0.6	2.5	1.4	1.0	1.2	0.3	6.6
80	1.1	0.8	0.6	1.9	1.1	0.7	1.0	0.2	5.6
90	1.0	0.6	0.5	1.5	0.9	0.6	0.9	0.2	4.6

Table 4-50: Yellowstone: Square Miles of Park Area at a Specified Percent Time Audible (updated from Volpe Report Table 37)

Percent Time Audible (8-hours)	Alt 1	Alt 2	Alt 3A	Alt 4	Alt 5	Alt 6	Alt 7	Current Condition	Historic Condition
0	447.9	354.1	121.5	482.6	482.6	361.1	479.5	499.2	582.0
10	298.6	225.7	83.3	354.1	316.0	201.4	260.5	188.0	512.0
20	211.8	135.4	48.6	288.2	225.7	135.4	193.6	86.7	464.2
30	142.4	72.9	34.7	215.3	159.7	107.6	141.0	46.4	408.1
40	97.2	48.6	27.8	156.2	118.0	90.3	96.5	27.6	354.2
50	76.4	34.7	27.8	131.9	83.3	72.9	62.7	21.3	323.9
60	59.0	31.2	24.3	107.6	62.5	55.6	48.0	17.1	300.3
70	45.1	27.8	20.8	86.8	48.6	34.7	39.8	11.8	273.9
80	38.2	27.8	20.8	66.0	38.2	24.3	34.7	8.5	241.0
90	34.7	20.8	17.4	52.1	31.2	20.8	30.5	6.1	205.0

Table 4-51: Grand Teton: Percent of Park Area at a Specified Percent Time Audible (updated from Volpe Report Table 38)

Percent Time Audible (8-hours)	Alt 1	Alt 2	Alt 3A	Alt 4	Alt 5	Alt 6	Alt 7*	Current Conditions	Historic Conditions
0	19.0	X	3.8	21.7	19.0	10.5	17.7	11.0	23.3
10	8.4	X	2.3	13.2	8.4	2.3	1.3	0.2	14.7
20	1.6	X	0.8	8.3	1.6	0.5	0.0	0.0	9.2
30	0.5	X	0.0	1.4	0.5	0.0	0.0	0.0	4.6
40	0.1	X	0.0	0.7	0.1	0.0	0.0	0.0	0.8
50-90	0.0	X	0.0	0.0	0.0	0.0	0.0	0.0	0.0
*Note that Alternative 7 was modeled with the CDST as open to OSV travel rather than as a trailered route therefore the actual area affected would be less than the 17.7% shown in this table.									

[18] Updated from Volpe Report Fig. 34; Note that alternative 7 was modeled with the CDST as open to OSV travel rather than as a trailered route. Also note that there were no modeled impacts in GRTE for alternative 2.

Table 4-52: Grand Teton: Square Miles of Park Area at a Specified Percent Time Audible (updated from Volpe Report Table 39)

Percent Time Audible (8-hours)	Alt 1	Alt 2	Alt 3A	Alt 4	Alt 5	Alt 6	Alt 7*	Current Conditions	Historic Conditions
0	99.2	X	19.8	113.1	99.2	54.6	101.6	57.2	121.2
10	44.0	X	12.0	69.0	44.0	12.1	7.2	0.9	76.7
20	8.2	X	4.0	43.4	8.2	2.6	0.0	0.0	47.9
30	2.3	X	0.0	7.1	2.3	0.0	0.0	0.0	24.2
40	0.5	X	0.0	3.6	0.5	0.0	0.0	0.0	3.9
50-90	0.0	X	0.0	1.7	0.0	0.0	0.0	0.0	1.2
*Note that Alternative 7 was modeled with the CDST as open to OSV travel rather than as a trailered route therefore the actual area affected would be less than the 101.6 square miles shown in this table.									

Audibility at Selected Sites

In addition to the impact assessment for the modeled percent of park area at which OSVs are audible, the differences in audibility among alternatives at eight selected sites within Yellowstone and Grand Teton were analyzed. Points were selected that had the best agreement between the modeled and monitoring results and that represented developed and travel corridor management zones. Audibility at these sites was calculated by hour in Yellowstone and by day in Grand Teton, but the daily average is used here to simplify analysis. Because the small sample size of selected locations may not represent other locations within the same management zone, these results are included in the discussion below, but not in the conclusions table (Table 4-66).

Time Above Sound Level at Selected Sites

Non-natural sounds can be audible well below the natural ambient sound level. The audibility modeling accounts for this phenomena by considering sound levels across the frequency spectrum. The sound level metric[19] is intended to answer the question: when OSVs produce sound, how "loud" is it? Selected points within the two park units, representative of management zone types and sensitive resources, were modeled for this type of analysis.

The model calculated the number of seconds that OSV sounds were within specified dBA intervals. It does not indicate whether they were audible or not because audibility depends on ambient sound levels, the tonal quality of the OSV sounds and the threshold of hearing. The highest increment with non-zero values indicated the maximum sound level from oversnow vehicles during that period of time. This section summarizes the modeled results by alternative, and provides tables in which the seconds are converted to percentage of an hour. It may be useful, in comparing effects across alternatives, to review Appendix G.2 in the modeling report. In many cases the indicated sound levels were below ambient for a given location. This does not necessarily mean they would not be audible events. That is, audibility can occur even when the overall level is below the ambient (Harris Miller Miller & Hanson Inc. 2003). Figures 4-3 and 4-4 show the locations in the two park units for which sound level was modeled.

[19] The duration that a time-varying sound level is above a given sound level threshold in a given area during a given time period.

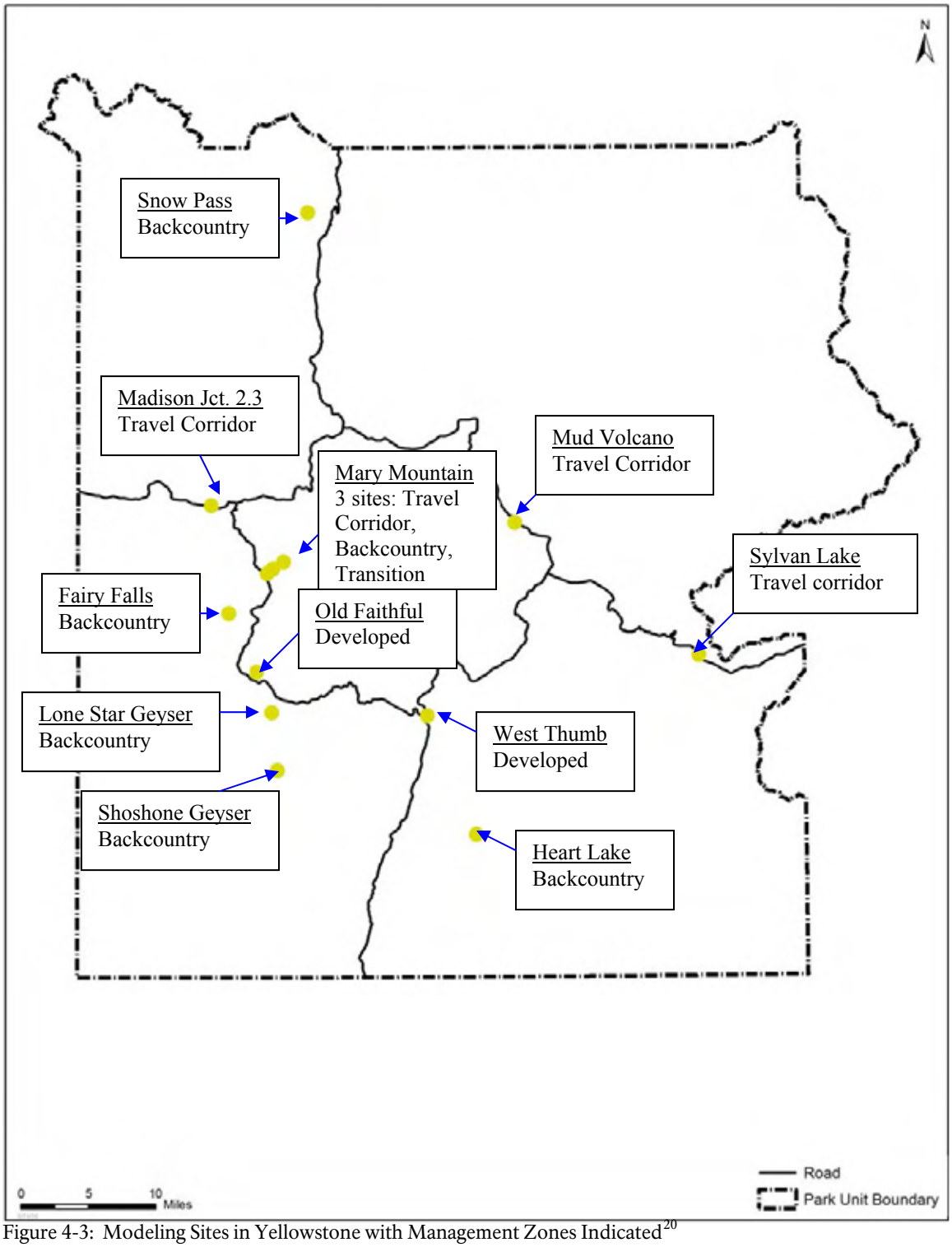

Figure 4-3: Modeling Sites in Yellowstone with Management Zones Indicated[20]

[20] Updated from Volpe Report Figure 26

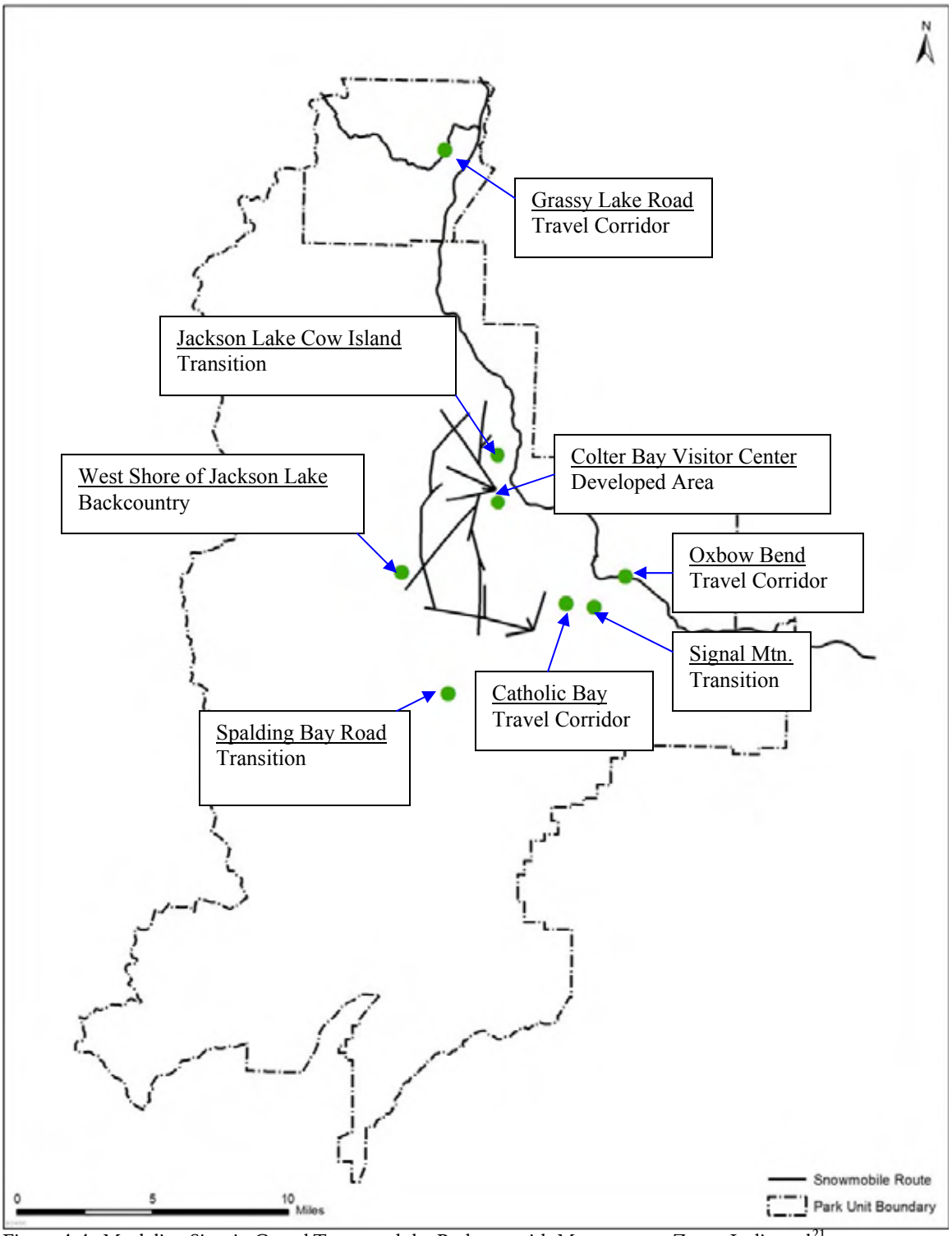

Figure 4-4: Modeling Sites in Grand Teton and the Parkway with Management Zones Indicated[21]

[21] Updated from Volpe Report Figure 27

Alternative 1

Percent Time Audible in Yellowstone National Park

This discussion of alternative 1 impacts is derived from modeled results as shown in tables and figures in the general impacts section above (see Table 4-49 and Table 4-50). In this alternative, over an average 8-hour period, oversnow vehicles were modeled as audible over 448 square miles of the park's area (12.9% of the park). This compares to the current use condition wherein oversnow vehicles were modeled as audible over 499 square miles (14.4% of the park), and the historic condition of 582 square miles (16.8% of the park). The area in which oversnow vehicles were modeled as audible 50 percent of the time, in this alternative, is 76 square miles (2.2% of the park). This compared to audibility 50% of the time over less than one square mile of the park in the current condition and 324 square miles historically, as modeled. Figure 4-5 below shows levels of audibility within the park for the average day between 9 a.m. and 10 a.m. This alternative would require about the same amount of road grooming as the present conditions require, resulting in approximately the same amount of groomer noise. Note that experimental closure of the Gibbon Canyon or other road segments for management experiment purposes (relative to bison use of groomed roads) under this alternative would decrease the percent time audible on the affected road segment(s).

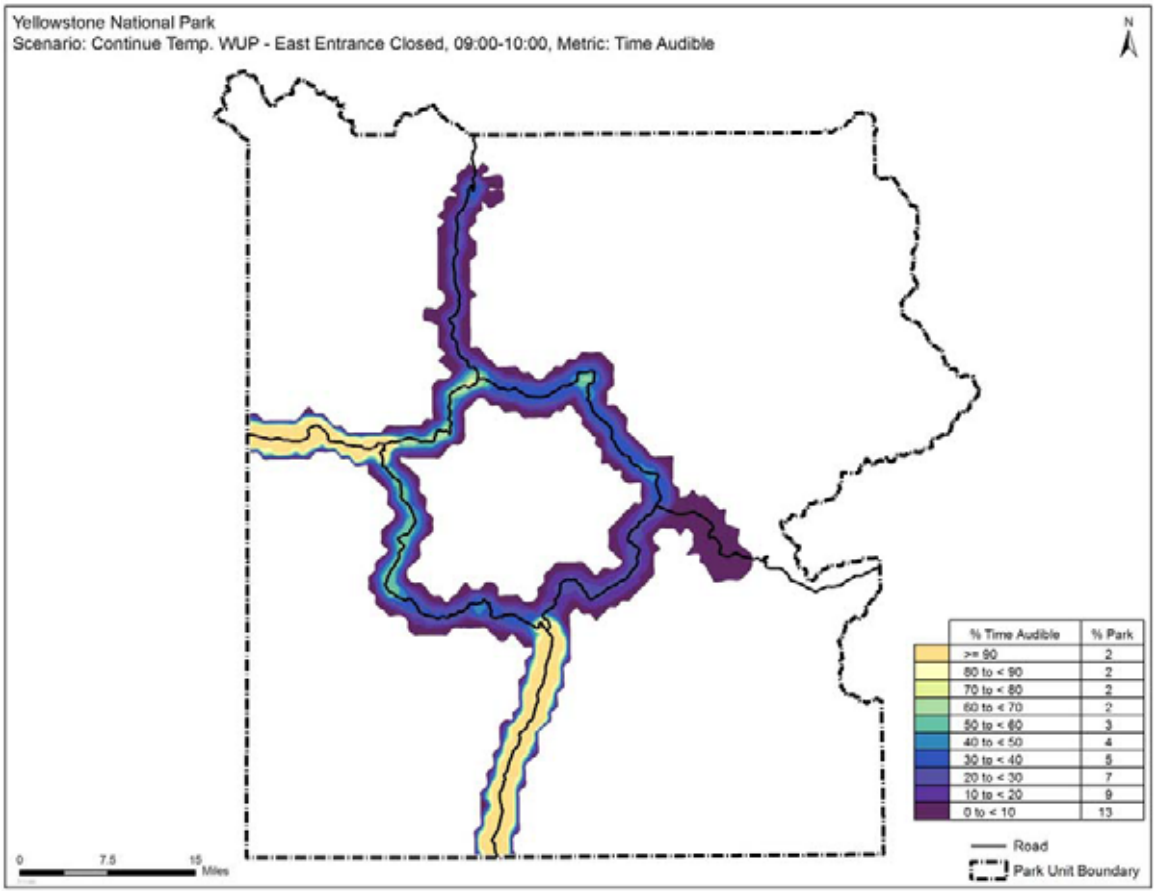

Figure 4-5: Audibility Contours in Yellowstone, Alternative 1 (Volpe Report Fig. 61)

Percent Time Audible in Grand Teton National Park and the Parkway

This discussion of alternative 1 impacts is derived from modeled results as shown in tables and figures in the general impacts section above (see especially Table 4-51 and Table 4-52). In this alternative, over an average 8-hour period, oversnow vehicles were modeled as audible over 99 square miles of the park's area (19% of the park). This compared to the current use condition, wherein oversnow vehicles were modeled as audible over 57 square miles (11% of the park), and the historic condition of audibility over 121 square miles (16.8% of the park as modeled). Oversnow vehicles were modeled as audible 20 percent of the time over 8.2 square miles, which compares to zero in the current condition and 48 square miles historically (as modeled). Figure 4-6 below shows levels of audibility within the park for the average day from 9 a.m. to 10 a.m.

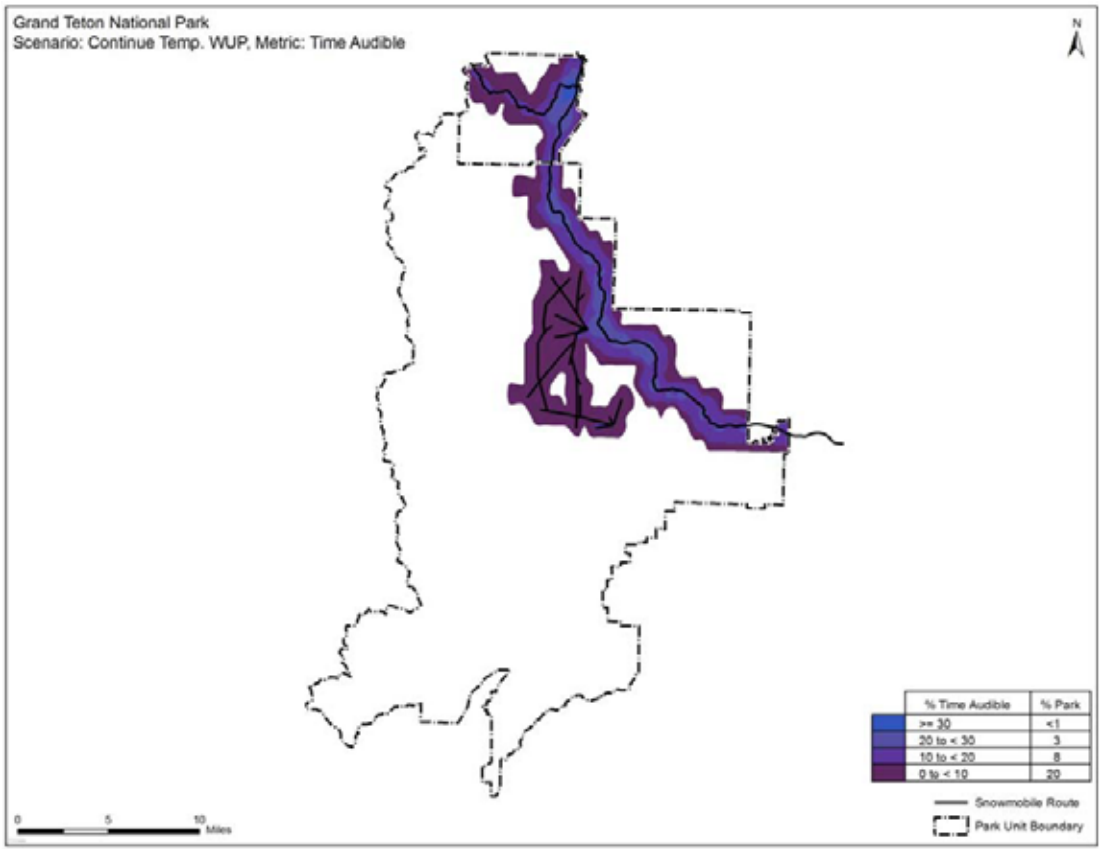

Figure 4-6: Audibility Contours in Grand Teton and the Parkway, Alternative 1 (Volpe Report Fig. 99)

Sound Level at Selected Sites in Yellowstone

Table 4-53 below shows the percent of time that sound levels from oversnow vehicles were audible, as modeled, in decibel level increments for the 9 a.m. to 10 a.m. hour at 13 sites in Yellowstone, for alternative 1. These sites are a mix of backcountry, developed and transportation corridor locations, as shown in Figure 4-3 above. No above-zero sound levels from OSV were modeled at Heart Lake, Shoshone Geyser, or Sylvan Lake. Sound levels were modeled at less than 5 dBA for less than 5% of the hour at Snow Pass, a backcountry site. Oversnow vehicle sounds were modeled as highest at Madison Junction, for 100% of the hour over the range of decibel levels from 20 to 50. Levels at Mary Mountain Trailhead and Mud Volcano, both travel corridor sites, were modeled as similar to each other, ranging from

0.1 to 30 dBA for nearly 60% of the hour. At the developed area of West Thumb, vehicle sound levels from 10 to 35 dBA during 9 a.m. – 10 a.m. occurred 100% of the time, according to the modeling.

Relative to modeled soundscape impacts in both the current and historic conditions, this alternative would represent a beneficial impact on the natural soundscape for the eastern portion of the park.

Table 4-53: Sound Level in Yellowstone, Alternative 1

	Yellowstone: Alternative 1B, 09:00 to 10:00											
% in dB Range	0 to < 5	5 to < 10	10 to < 15	15 to < 20	20 to < 25	25 to < 30	30 to < 35	35 to < 40	40 to < 45	45 to < 50	50 to < 55	55 to < 60
Fairy Falls	5.0	1.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Heart Lake	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lone Star Geyser	8.3	7.7	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Madison Jct. 2.3	0.0	0.0	0.0	0.0	16.0	26.2	19.1	15.2	14.9	8.6	0.0	0.0
Mary Mt. 4000'	21.3	14.6	8.1	2.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mary Mt. 8000'	13.7	3.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mary Mt. Trailhead	20.8	13.1	8.9	6.9	6.9	3.4	0.0	0.0	0.0	0.0	0.0	0.0
Mud Volcano	14.5	10.2	7.6	6.3	4.7	3.9	1.4	0.0	0.0	0.0	0.0	0.0
Old Faithful	31.6	21.3	15.0	8.6	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Shoshone Geyser	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Snow Pass	3.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sylvan Lake	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
West Thumb	0.0	0.0	24.4	34.5	28.9	11.1	1.1	0.0	0.0	0.0	0.0	0.0

Sound Level at Selected Sites in Grand Teton and the Parkway

Table 4-54 below shows the modeled percent of time that sound from oversnow vehicles occurred in decibel level increments for the 9 a.m. to 10 a.m. hour at 8 sites in Grand Teton, for alternative 1. These sites are a mix of backcountry, developed, and transportation corridor locations, as shown in Figure 4-4 above. There were modeled to be no above-zero sound levels from oversnow recreation vehicles at Spalding and none above 5dBA at Catholic Bay, a travel corridor site. Modeled sound levels were below 20 dBA for Colter Bay Visitor Center, a developed area, and Jackson Lake Cow Island (shown as Jackson in Table 4-54 and for similar tables in alternatives 2-7) for 46 and 41 percent of the hour, respectively. At Signal Mountain and Jackson Lake West (shown as West in Table 4-54 and for similar tables in alternatives 2-7), a backcountry site, sound levels were lower than 15 dBA for about 10% of the hour, as modeled. Levels at Oxbow Bend, a travel corridor site, were the highest, where decibel levels would range from 50 to 75 dBA but for short durations of 0.5 percent of the time (3 minutes), as modeled. Both the Oxbow and Grassy Lake sites had oversnow vehicles sounds modeled at a range of decibel levels from 0.1 to 60, but for different durations during the hour: about 20% of the time for the former and 73% for the latter (see Volpe Report Appendix F).

Table 4-54: Sound Level in Grand Teton and the Parkway, Alternative 1

	Grand Teton: Alternative 1																
% Hr in dB Range	0 to < 5	5 to < 10	10 to < 15	15 to < 20	20 to < 25	25 to < 30	30 to < 35	35 to < 40	40 to <45	45 to < 50	50 to < 55	55 to < 60	60 to <65	65 to < 70	70 to < 75	75 to < 80	80 to < 85
Catholic	3.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Colter	23.6	16.9	5.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Grassy	26.7	20.0	10.3	4.2	3.2	2.4	1.8	0.9	0.9	0.7	0.5	0.4	0.0	0.0	0.0	0.0	0.0
Jackson	17.9	12.6	7.8	2.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Oxbow	8.8	3.9	2.1	1.4	0.9	0.7	0.6	0.3	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.0	0.0
Signal	4.5	3.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Spalding	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
West	7.7	2.7	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Audibility at Selected Sites in Yellowstone

Modeling for percent time audible at selected sites indicated 70% time audible for modeled travel corridors and 78% for the developed area at West Thumb. This compared to 45% for modeled travel corridors and 35% for the developed area at West Thumb under current conditions and 100% time audible for most travel corridors and some developed areas in historic conditions.

Audibility at Selected Sites in Grand Teton and the Parkway

Modeling for percent time audible at selected sites indicated 17% time audible for modeled travel corridors and 8% for the developed area at Colter Bay. This compared to 3% time audible for modeled travel corridors and zero audibility for the developed area at Colter Bay under current conditions and 34% time audible for most travel corridors and some developed areas in historic conditions.

Cumulative Effect

The area considered for cumulative impact assessment is natural soundscapes within the boundaries of the three park units. Because individual sources of sound are generally transient and short lived, the potential cumulative impact on the winter soundscape are those sounds occurring during the winter season. Sounds other than those that naturally occur in the park units during the winter include the sound of wheeled vehicular traffic along roads, the sound of oversnow vehicles on groomed routes, aircraft overflights, and sounds coming from the facilities in developed areas.

Along travel corridors, backcountry areas, and in developed areas, the natural soundscape is affected. There are areas in the parks where the total cumulative effect from OSV activities and facilities (buildings, utilities, etc.) is such that it masks the natural soundscape for most of a winter day. Conversely, particularly in transition zones, unoccupied road corridors, and in the backcountry, natural sounds such as wind, bird calls, or thermal activity dominates. The level of effect is generally defined by the number and types of vehicles allowed in each alternative. Improved snowmobile and snowcoach technologies should lead to lower sound levels over time as manufacturers and operators improve the performance of their vehicles.

Sound sources from outside the park may contribute to the sound environment in the parks, particularly near park boundaries. These influences may include motorized uses on adjacent lands, including the town of West Yellowstone and some USFS lands. In addition, the following may contribute to the cumulative effects on soundscapes in the parks:

- The GYA has been experiencing rapid population growth for the last twenty years. Such growth can lead to more demand for recreation (especially snowmobiling, cross-country skiing, and snowshoeing), with more recreationists in and near the parks.
- Various planning efforts are under way for the National Forests surrounding the parks. These plan revisions could contribute to or decrease sounds near park boundaries, depending on technology requirements and route designations or area closures:
    - Shoshone National Forest master plan revision.
    - Bridger-Teton National Forest master plan revision.
    - Beaverhead-Deerlodge National Forest travel plan revision.
    - Gallatin National Forest Travel Plan revision. The USFS recently completed the travel plan for this national forest; the plan has been

appealed.

- Beartooth District of Custer National Forest travel management plan revision.

During the winter, the Yellowstone natural soundscape is relatively unimpacted by sources of non-natural sound other than oversnow vehicles. Except for aircraft overflights, which are audible between 5-10% of the average day (NPS unpublished data), the total cumulative impact is composed of snowmobiles, snowcoaches, snow groomers, and other administrative OSV traffic. Where roads are plowed in the northern portion of the park, most human-caused sound is from wheeled vehicles – but this source lies outside the primary area of concern. Without recreational OSV use, other sources of non-natural sound would greatly diminish with the reduced need for administrative travel, grooming, and other support.

In Grand Teton, the sound of oversnow vehicles would be additive to other considerable sources including aircraft overflights, aircraft arriving to and departing from Jackson Hole Airport within the middle and southern portion of the park, and highway traffic along US 191 from Jackson Hole north to Flagg Ranch and US 26 from Moran Junction to the park's east boundary. As a portion of the cumulative human-caused sounds in the park, OSV use would be a smaller component than in Yellowstone. However, it would be a substantial component affecting the total cumulative impact materially, depending upon the alternative.

Conclusion

As modeled for Yellowstone, in about 13% of the park over the average day, oversnow vehicles would be audible at some level. From the overall park perspective, this would constitute a moderate, adverse, short-term, and direct impact. In Grand Teton, in nearly 20% of the park over the average day oversnow vehicles would be audible at some level according to the modeling. From the overall park perspective, this would constitute a moderate, adverse, short-term, and direct impact. Impacts due to percent time audible would be major (YNP) to minor (GTNP), adverse, and short-term impacts. Impacts due to maximum sound levels would be minor, adverse, short-term (YNP and GTNP).

This alternative would be beneficial in Yellowstone and adverse in Grand Teton compared to current use and beneficial in both parks compared to the historic condition. While the comparison to current conditions in Yellowstone may seem counterintuitive given this alternative's higher snowmobile numbers, the comparison is accurate because the implementation of snowcoach BAT substantially reduces overall OSV audibility. Impairment of park resources would not occur; the level of OSV sound under alternative 1 would not harm the integrity of park resources and values. Closure of road segments for management experiments regarding bison use of groomed roads would provide a beneficial impact to the natural soundscape on that road segment.

In terms of cumulative effects, the minor to major, adverse, short-term impacts resulting from direct and indirect actions described in this alternative would contribute a minor to major, adverse, and short-term impact to past, present, and foreseeable actions and impacts on soundscapes.

Alternative 2

Percent Time Audible in Yellowstone

This discussion of alternative 2 impacts is derived from modeled results as shown in tables and figures in the general impacts section above. In this alternative, over an average 8-hour period, oversnow vehicles were modeled as audible over 351 square miles of the park's area (10.2%). This compared to the current use condition wherein oversnow vehicles were

audible in the modeling over 499 square miles (14.4%), and the historic condition of 582 square miles (16.8% of the park). The area in which oversnow vehicles were modeled to be audible 50 percent of the time, in this alternative, was 35 square miles (1.0%). This compared to 50 percent time audible over 21.3 square miles in the current condition and 324 square miles historically, according to the modeling. Figure 4-7 below shows levels of audibility within the park for the average day between 9 a.m. and 10 a.m. (see Volpe Report Appendix E) as modeled. This alternative would require about the same amount of road grooming as the present conditions require, resulting in approximately the same amount of groomer noise.

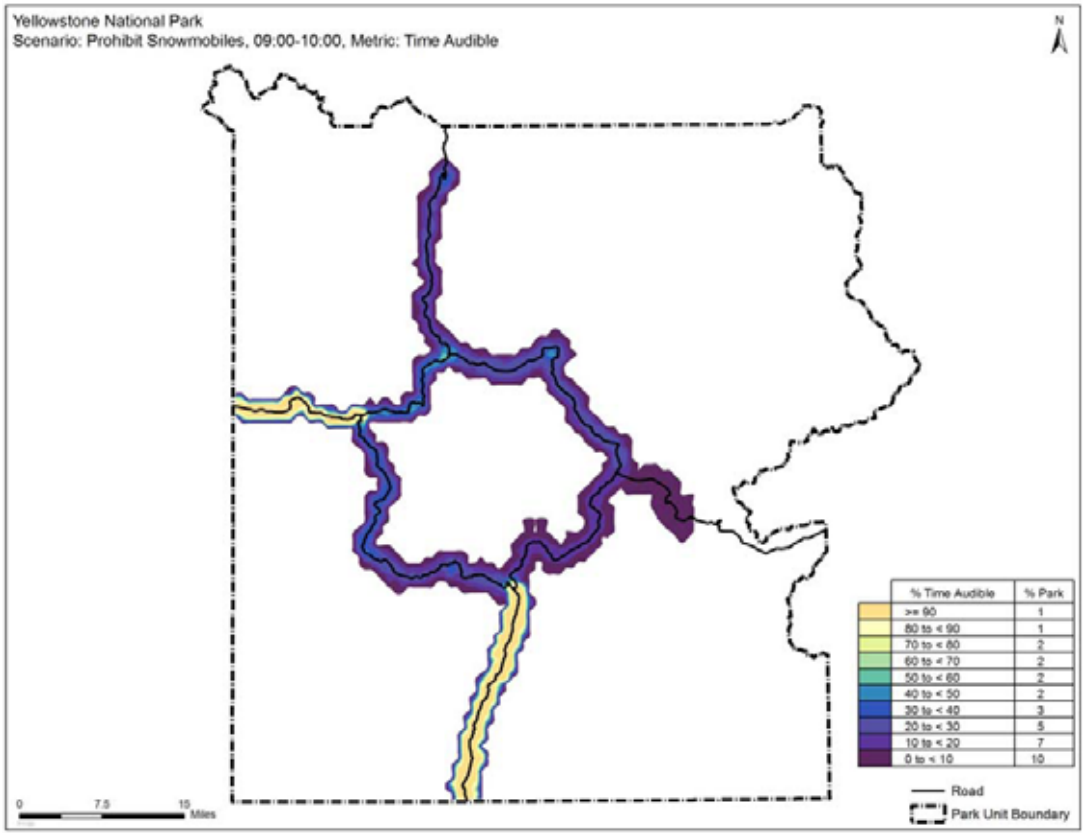

Figure 4-7: Audibility Contours in Yellowstone, Alternative 2 (Volpe Report Fig. 70)

Percent Time Audible in Grand Teton National Park and the Parkway

This discussion of alternative 2 impacts is derived from modeled results as shown in tables and figures in the general impacts section above. In this alternative, there were no impacts on the natural soundscape from recreational oversnow vehicles according to the modeling.

Sound Level at Selected Sites in Yellowstone

Table 4-55 below shows the percent of time that sound from oversnow vehicles were modeled to be evident in decibel level increments for the 9 a.m. to 10 a.m. hour at 13 sites in Yellowstone, for alternative 2. These sites are a mix of backcountry, developed, and transportation corridor locations, as shown in Figure 4-3 above. Sound of oversnow recreation vehicles were modeled to be not at all measurable, or only negligibly so, at six sites: Fairy Falls, Heart Lake, Mary Mountain 8000', Shoshone Geyser, Snow Pass and

Sylvan Lake. They were modeled to be measurable at up to 15 dBA for less than 5% of the hour at Lone Star Geyser. Oversnow vehicle sound levels were modeled to be highest at Madison Junction, for the longest period of time, and audible over 100% of the hour. Sound levels at Old Faithful, Mary Mountain Trailhead, and Mud Volcano were relatively intermediate, ranging from 0 to 30 dBA between 32 and 43% of the hour, according to the modeling. At West Thumb, vehicle sounds were modeled to be present 100% of the time over a range of decibel levels from 5 to 35. For nearly 50% of the hour, decibel levels were between 15 and 35 (see Volpe Report Appendix F).

Table 4-55: Sound Level in Yellowstone, Alternative 2

	Yellowstone: Alternative 2, 09:00 to 10:00											
% in dB Range	0 to < 5	5 to < 10	10 to < 15	15 to < 20	20 to < 25	25 to < 30	30 to < 35	35 to < 40	40 to < 45	45 to < 50	50 to < 55	55 to < 60
Fairy Falls	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Heart Lake	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lone Star Geyser	2.3	0.9	1.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Madison Jct. 2.3	0.0	0.0	0.0	10.1	27.5	18.4	14.4	29.6	0.0	0.0	0.0	0.0
Mary Mt. 4000'	11.7	8.7	4.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mary Mt. 8000'	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mary Mt. Trailhead	13.5	8.1	6.5	5.1	6.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mud Volcano	9.1	6.8	5.3	4.5	3.1	2.8	0.0	0.0	0.0	0.0	0.0	0.0
Old Faithful	16.2	12.8	12.1	2.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Shoshone Geyser	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Snow Pass	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sylvan Lake	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
West Thumb	0.0	21.2	30.6	26.1	20.8	0.9	0.4	0.0	0.0	0.0	0.0	0.0

Sound Level at Selected Sites in Grand Teton and the Parkway

Sounds from oversnow recreation vehicles were modeled to be not evident at all at the 8 reference sites in Grand Teton in alternative 2.

Audibility at Selected Sites in Yellowstone

Modeling for percent time audible at selected sites indicated 70% time audible for modeled travel corridors and 78% for the developed area at West Thumb. This compared to 45% for modeled travel corridors and 35% for the developed area at West Thumb under current conditions and 100% time audible for most travel corridors and some developed areas in historic conditions.

Audibility at Selected Sites in Grand Teton and the Parkway

This metric was not modeled for this alternative because all use would be via wheeled vehicles in Grand Teton and the Parkway.

Cumulative Effect

Please refer to the introductory commentary for cumulative impact assessment under alternative 1, above. Within that context, alternative 2 in Yellowstone would have the second lowest direct and cumulative impact, considering park-wide audibility, compared to the other alternatives. In Grand Teton, OSV use would contribute the least to the total cumulative impact because no OSV use would be present.

Conclusion

As modeled for Yellowstone, in about 10% of the park over the average day oversnow vehicles were audible at some level. From the overall park perspective, this would constitute a moderate, adverse, short-term, and direct impact. Impacts due to percent time audible would be major, adverse, and short-term impacts (YNP). Impacts due to maximum sound levels would be minor, adverse, and short-term (YNP). There were no modeled impacts on Grand Teton in this alternative. This alternative would be beneficial compared to current use in the parks and even more beneficial compared to the historic condition. Impairment of park resources would not occur; the level of OSV sound under alternative 2 would not harm the integrity of park resources and values.

In terms of cumulative effects, the minor to major, adverse, short-term impacts resulting from direct and indirect actions described in this alternative would contribute a minor to major, adverse, short-term impact to past, present, and foreseeable actions and impacts on soundscapes.

Alternative 3

Percent Time Audible in Yellowstone

This discussion of alternative 3 impacts is derived from modeled results as shown in tables and figures in the general impacts section above. In this alternative, over an average 8-hour period, oversnow vehicles were modeled to be audible over 122 square miles of the park's area (3.5%). This compares to the current use condition wherein oversnow vehicles were modeled to be audible over 499 square miles (14.4%), and the historic condition of 582 square miles (16.8% of the park). The area in which oversnow vehicles were modeled to be audible 50 percent of the time or more, in this alternative, is 28 square miles (<1%). This compared to audibility 50% of the time over 21.3 square miles in the current condition and 324 square miles historically, according to the modeling. From Table 4-49, above, in 3 to 4% of the park during the average day oversnow vehicles were modeled to be audible at some level. Figure 4-8, below shows modeled levels of audibility by location within the park for the average day between the hours of 9 a.m. and 10 a.m. In the variation of this alternative (3B) that represents no action, the above impact would be eliminated. This alternative would require substantially less road grooming than the present conditions, resulting in a corresponding decrease in groomer noise.

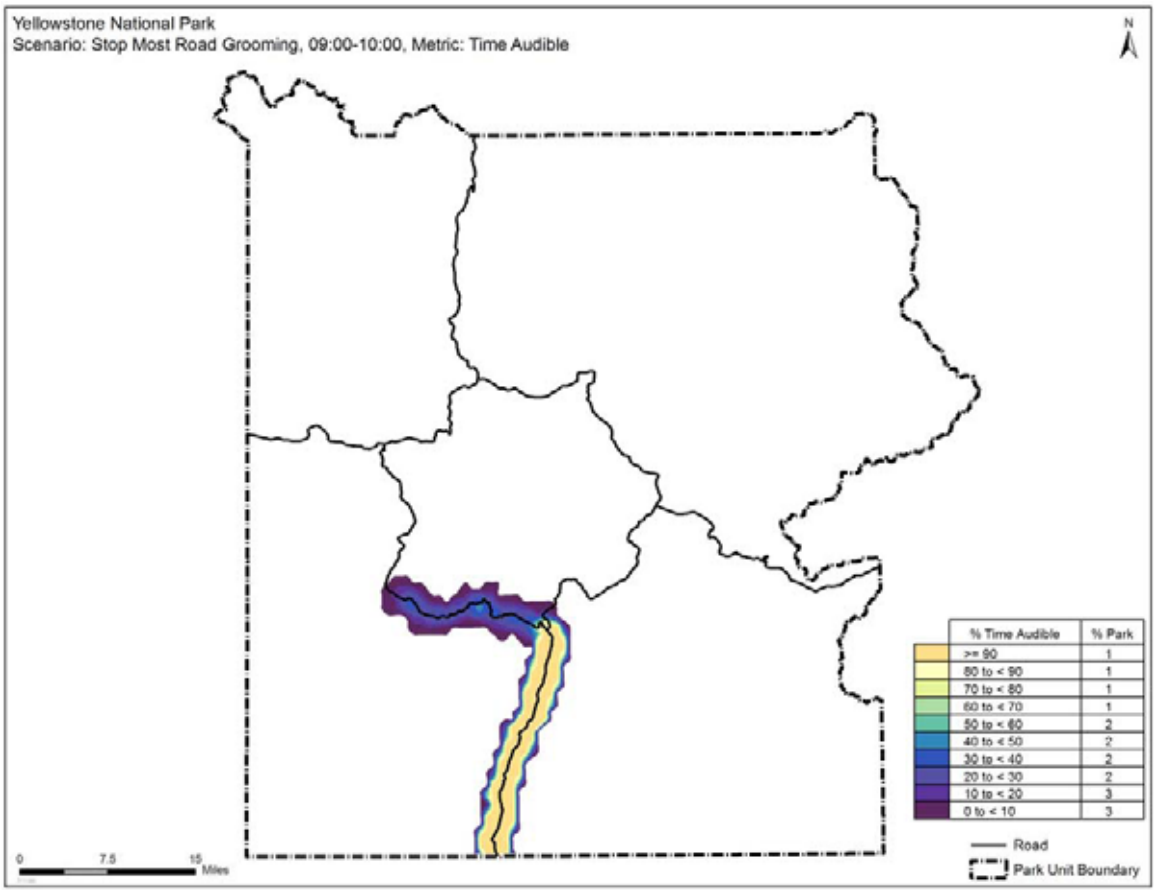

Figure 4-8: Audibility Contours in Yellowstone, Alternative 3A (Volpe Report Fig. 73)

Percent Time Audible in Grand Teton National Park and the Parkway

This discussion of alternative 3 impacts is derived from modeled results as shown in tables and figures in the general impacts section above. In this alternative, over an average 8-hour period, oversnow vehicles were modeled to be audible over 19.8 square miles of the park's area (3.8%). This compared to the current use condition, wherein oversnow vehicles were modeled as audible over 57 square miles, and the historic condition of audibility over 121 square miles (23.3% of the park). In this alternative, oversnow recreation vehicles were not modeled to be audible more than 10 percent of the time. In the modeled historical condition, vehicles were modeled to be audible 20% of the time on 48 square miles (9.2%). Figure 4-9, below shows levels of audibility by location within the park for the average day from 9 a.m. to 10 a.m. as modeled. In the variation of this alternative (3B) that represents no action, the above impact would be eliminated (see Volpe Report Appendix E).

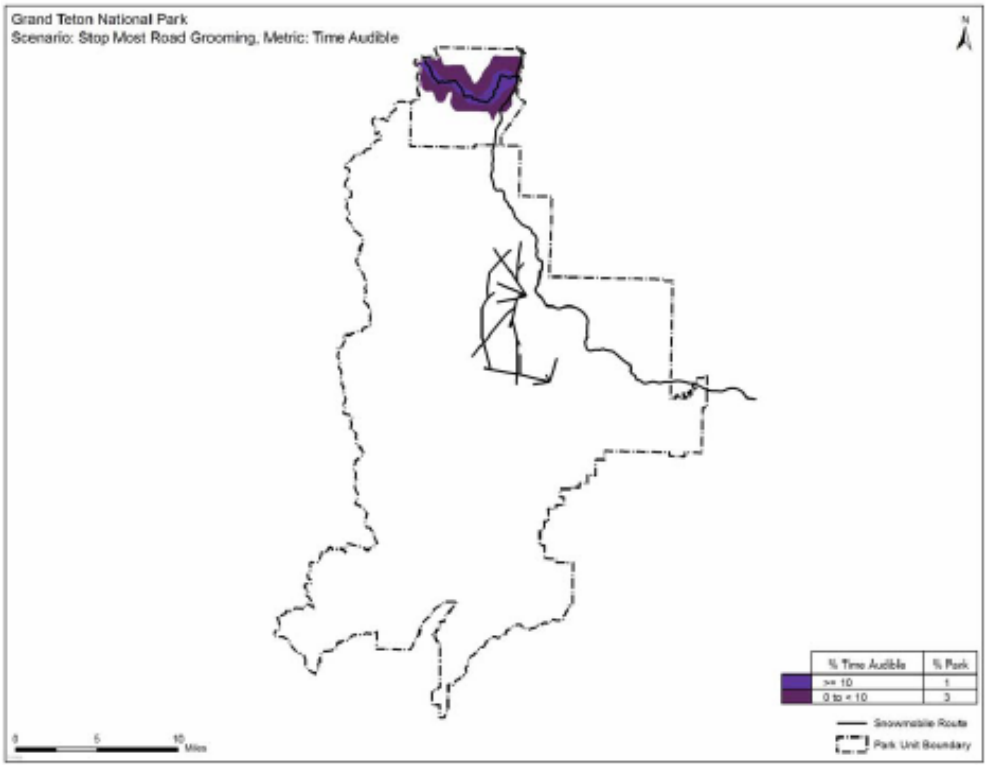

Figure 4-9: Audibility Contours in Grand Teton and the Parkway, Alternative 3A (Volpe Report Fig. 101)

Sound Level at Selected Sites in Yellowstone

Table 4-56 below shows the percent of an hour that OSVs occurred in decibel level increments for the 9 a.m. to 10 a.m. hour at 13 sites in Yellowstone, for alternative 3, according to the modeling. These sites are a mix of backcountry, developed and transportation corridor locations, as shown in Figure 4-3. Oversnow recreation vehicles did not produce above zero sound levels at 10 of the sites according to the modeling. At Lone Star Geyser, they were audible at less than 15 dBA for 18.6% of the hour according to the modeling, with fifteen percent of the hour at 10 dBA or less. Oversnow vehicle sound levels were modeled to be highest at West Thumb, over the range of decibel levels from 10 to 30 for the entire hour. Levels at Old Faithful were modeled to be in the range from 0.1 to 25 dBA over 27% of the hour. In the variation of this alternative (3B) that represents no action, the above impact would be eliminated (see Volpe Report Appendix F).

Table 4-56: Sound Level in Yellowstone, Alternative 3

	Yellowstone: Alternative 3, 09:00 to 10:00											
% in dB Range	0 to < 5	5 to < 10	10 to < 15	15 to < 20	20 to < 25	25 to < 30	30 to < 35	35 to < 40	40 to < 45	45 to < 50	50 to < 55	55 to < 60
Fairy Falls	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Heart Lake	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lone Star Geyser	7.6	7.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Madison Jct. 2.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mary Mt. 4000'	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mary Mt. 8000'	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mary Mt. Trailhead	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mud Volcano	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Old Faithful	8.3	6.6	6.4	4.8	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Shoshone Geyser	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Snow Pass	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sylvan Lake	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
West Thumb	0.0	0.0	33.6	30.6	25.9	9.9	0.0	0.0	0.0	0.0	0.0	0.0

Sound Level at Selected Sites in Grand Teton and the Parkway

Table 4-57 below shows the percent of time that sound from oversnow vehicles was modeled to be evident in decibel level increments for the 9 a.m. to 10 a.m. hour at 8 sites in Grand Teton, for alternative 3. These sites are a mix of backcountry, developed and transportation corridor locations, as shown in Figure 4-4 above. As modeled, sound from oversnow recreation vehicles was not present at any of the sites but Grassy Lake. At that location, the sound from oversnow recreation vehicles was modeled to be evident over a range of decibel levels from 0.1 to 60. For 40 percent of the hour, sound levels were below 25 dBA, but for an additional 8% of the time they ranged from 25 to 60 dBA. In alternative 3B (no action), the above impact would be eliminated (see Volpe Report Appendix F).

Table 4-57: Sound Level in Grand Teton and the Parkway, Alternative 3

	Grand Teton: Alternative 3																
% Hr in dB Range	0 to < 5	5 to < 10	10 to < 15	15 to < 20	20 to < 25	25 to < 30	30 to < 35	35 to < 40	40 to <45	45 to < 50	50 to < 55	55 to < 60	60 to <65	65 to < 70	70 to < 75	75 to < 80	80 to < 85
Catholic	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Colter	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Grassy	15.9	9.6	6.4	4.4	3.4	2.6	1.8	1.0	0.9	0.7	0.6	0.4	0.0	0.0	0.0	0.0	0.0
Jackson	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Oxbow	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Signal	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Spalding	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
West	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Audibility at Selected Sites in Yellowstone

Modeling for percent time audible at selected sites indicated 73% time audible for the developed area at West Thumb. This compared to 45% for modeled travel corridors and 35% for the developed area at West Thumb under current conditions, and 100% time audible for most travel corridors and some developed areas in historic conditions, according to the modeling.

Audibility at Selected Sites in Grand Teton and the Parkway

Modeling for percent time audible at selected sites indicated 22% time audible for modeled travel corridors and zero percent for the developed area at Colter Bay. This compared to 3% time audible for modeled travel corridors and zero audibility for the developed area at Colter Bay under current conditions, and 33% time audible for most travel corridors and some developed areas in historic conditions, according to the modeling.

Cumulative Effect

Please refer to the introductory commentary for cumulative impact assessment under alternative 1, above. Within that context, alternative 3A in Yellowstone would have the smallest direct and cumulative impact, considering park-wide audibility. Its total impact would be less than one-half to one-fourth that of the other alternatives. In Grand Teton, alternative 3 OSV use would contribute the least to the total cumulative impact, after alternative 2. Its total impact, considering park-wide audibility, would be one-third to one-seventh the impact of other alternatives. Implementation of alternative 3B would contribute to the least cumulative impact of all the alternatives for both park units.

Conclusion

As modeled for Yellowstone, in about 3 to 4% of the park over the average day oversnow vehicles would be audible at some level. From the overall park perspective, this would constitute a negligible impact. In Grand Teton, in 3 to 4% of the park over the average day oversnow vehicles would be audible at some level (mostly less than 20% of the time) according to the modeling. From the overall park perspective, this would constitute a negligible impact. Impacts due to percent time audible would be moderate, adverse, and short-term (YNP) and negligible for GTNP. Impacts from maximum sound levels would be negligible (YNP and GTNP). In alternative 3B, which would eliminate all oversnow vehicle traffic, there would be no impact from the sound of recreational oversnow vehicles. This alternative would be beneficial compared to current use, and even more beneficial compared to the historic condition. Impairment of park resources would not occur; the level of OSV sound under alternative 3 would not harm the integrity of park resources and values.

In terms of cumulative effects, the negligible to moderate, adverse, short-term impacts resulting from direct and indirect actions described in this alternative would contribute a negligible to moderate, adverse, short-term impact to past, present, and foreseeable actions and impacts on soundscapes.

Alternative 4

Percent Time Audible in Yellowstone

This discussion of alternative 4 impacts is derived from modeled results as shown in tables and figures in the general impacts section above; see Tables 4-49 and 4-50. In this alternative, over an average 8-hour period, oversnow vehicles were modeled as audible over about 483 square miles of the park's area (13.9%). This compared to the current use condition wherein OSVs were modeled to be audible over 499 square miles (14.4%) and the historic condition of 582 square miles (16.8% of the park). The area in which oversnow vehicles were modeled to be audible 50 percent of the time in this alternative is 132 square miles (3.8%). This compared to audibility 50% of the time over 21 square miles in the current condition and 324 square miles historically according to modeling. Figure 4-10 below shows modeled levels of audibility by location within the park for an average day between 9 a.m. and 10 a.m. (see Volpe Report Appendix E). Due to the higher number of snowmobiles this alternative would allow, it would require more road grooming than the present conditions, resulting in a corresponding increase in groomer noise.

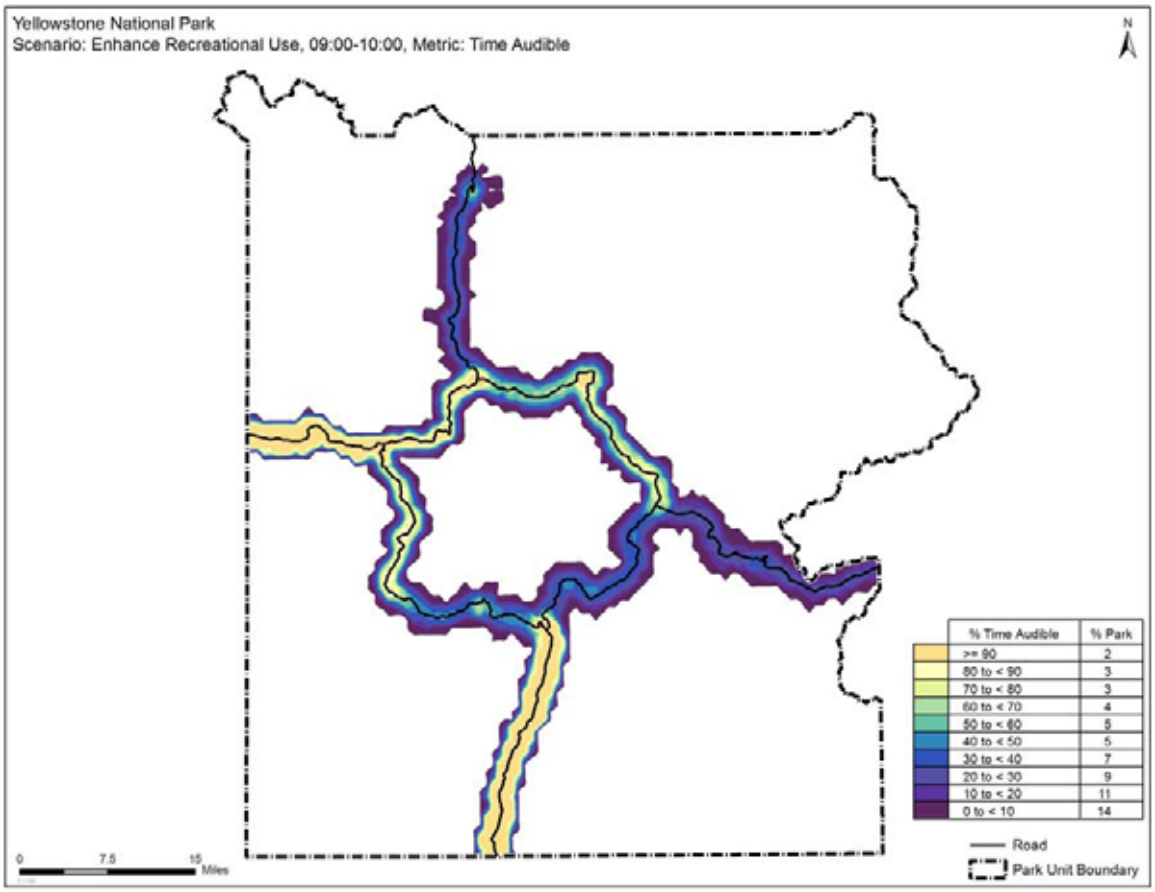

Figure 4-10: Audibility Contours in Yellowstone, Alternative 4 (Volpe Report Fig. 77)

Percent Time Audible in Grand Teton National Park and the Parkway

This discussion of alternative 4 impacts is derived from modeled results as shown in tables and figures in the general impacts section above; see Tables 4-51 and 4-52. In this alternative, over an average 8-hour period, oversnow vehicles were modeled as audible over 113 square miles of the park's area (21.7%). This compared to the current use condition, wherein oversnow vehicles were modeled as audible over 57 square miles (11% of the park) and the historic condition of audibility over 121 square miles (23.3% of the park). The area in which oversnow vehicles were modeled to be audible 50 percent of the time or more in this alternative is zero. Oversnow vehicles were modeled to be audible 20 percent of the time over 43.4 square miles (8.3% of the park), compared to zero in the current condition and 48 square miles historically. Figure 4-11 below shows modeled levels of audibility by location within the park for the average day from 9 a.m. to 10 a.m. (see Volpe Report Appendix F).

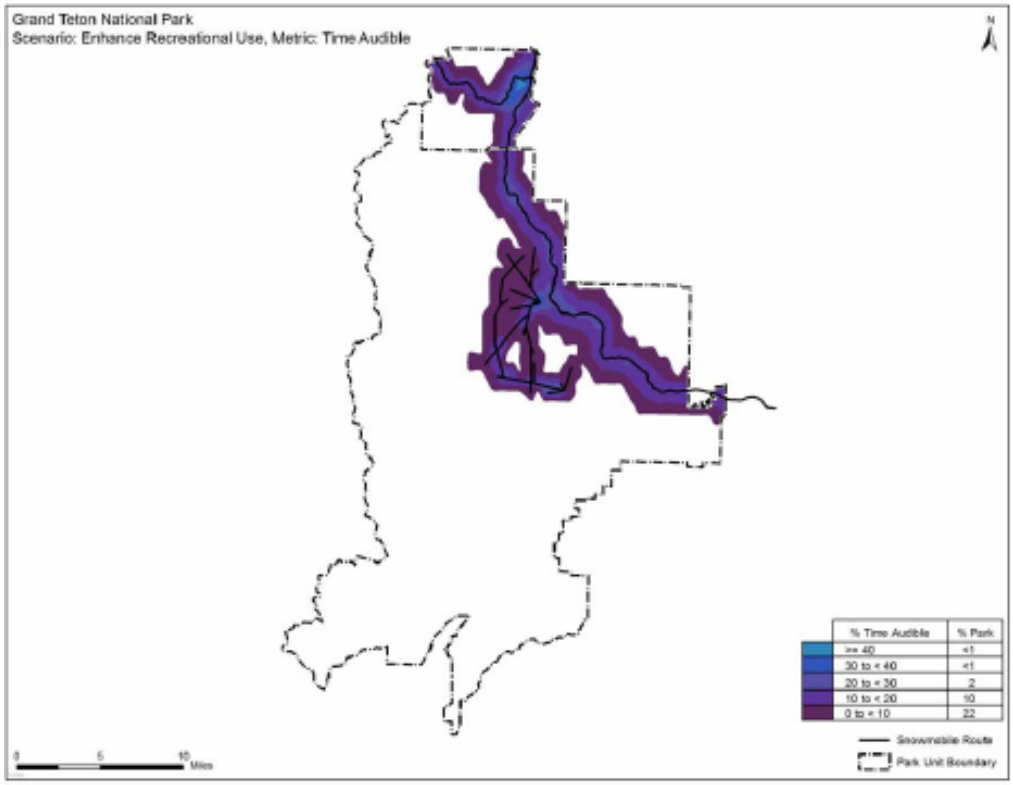

Figure 4-11: Audibility Contours in Grand Teton and the Parkway, Alternative 4 (Volpe Report Fig. 102)

Sound Level at Selected Sites in Yellowstone

Table 4-58 below shows the modeled percent of time that sound from oversnow vehicles were evident in decibel level increments for the 9 a.m. to 10 a.m. hour at 13 sites in Yellowstone, for alternative 4. These sites are a mix of backcountry, developed and transportation corridor locations, as shown in Figure 4-3 above. As modeled, sound from oversnow recreation vehicles was not present at all at two backcountry sites, Heart Lake or Shoshone Geyser, and for 4% of the hour at Snow Pass. Modeled sound levels were audible at 10 dBA or less for Mary Mountain 8000' and Fairy Falls, over 23.7% of the hour for the former and 9% of the hour for the latter. Sound levels at up to 15 dBA were modeled at Mary Mountain 4000' for 56% of the hour, and at Lone Star Geyser for about 28% of the time. OSVs were modeled as loudest at Sylvan Lake, up to 60 dBA, but for short durations with sound levels evident about 44% of the hour (mostly at 0.1 to 25 dBA). At Mary Mountain Trailhead, Mud Volcano, Old Faithful, and West Thumb, sound levels were modeled at up to 35 dBA for more than 90% of the hour. OSV sound levels at Old Faithful and West Thumb were modeled at 100% of the hour, mostly below 20 dBA at the former and 10-30 dBA at the latter. The highest sustained oversnow vehicle sound was modeled to be from the Madison Junction site, where sound levels would range between 25 and 50 dBA over 100% of the hour (see Volpe Report Appendix F).

Table 4-58: Sound Level in Yellowstone, Alternative 4

	Yellowstone: Alternative 4, 09:00 to 10:00											
% in dB Range	0 to < 5	5 to < 10	10 to < 15	15 to < 20	20 to < 25	25 to < 30	30 to < 35	35 to < 40	40 to < 45	45 to < 50	50 to < 55	55 to < 60
Fairy Falls	7.2	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Heart Lake	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lone Star Geyser	11.9	11.3	4.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Madison Jct. 2.3	0.0	0.0	0.0	0.0	0.0	20.4	26.4	21.8	20.7	10.7	0.0	0.0
Mary Mt. 4000'	33.2	22.6	12.7	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mary Mt. 8000'	20.0	3.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mary Mt. Trailhead	31.9	19.8	13.7	10.9	11.1	4.4	0.0	0.0	0.0	0.0	0.0	0.0
Mud Volcano	28.0	20.0	15.1	12.4	9.5	7.8	1.9	0.0	0.0	0.0	0.0	0.0
Old Faithful	34.9	30.5	23.7	10.3	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Shoshone Geyser	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Snow Pass	3.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sylvan Lake	10.3	7.7	5.7	3.9	2.8	2.0	1.6	1.1	0.8	0.7	0.6	0.1
West Thumb	0.0	0.0	13.7	41.2	34.2	9.4	1.5	0.0	0.0	0.0	0.0	0.0

Sound Level at Selected Sites in Grand Teton and the Parkway

Table 4-59 below shows the percent of time that sound from oversnow vehicles was modeled to be evident in decibel level increments for the 9 a.m. to 10 a.m. hour at 8 sites in Grand Teton, for alternative 4. These sites are a mix of backcountry, developed and transportation corridor locations, as shown in Figure 4-4 above. Sound from oversnow recreation vehicles was not modeled as present at all at Spalding. At Catholic Bay, sound levels were modeled to be mostly less than 5 dBA for just over 5% of the hour. Sound levels were modeled to be evident at less than 20 dBA for Colter Bay Visitor Center and Cow Island, respectively, for 87 and 51 percent of the hour. Signal Mountain and West Jackson Lake sound levels were modeled to be at less than 15 dBA, Signal for just over 5% of the time and West Jackson for 27% of the hour. Oxbow Bend sound levels were modeled to be the highest, where decibel levels ranged from 50 to 75 dBA but for a short duration of 0.5 percent of the time (18 seconds each hour). Both the Oxbow and Grassy sites experienced oversnow vehicles at a range of decibel levels from 0.1 to 60, but for different durations; about 24% of the hour for Oxbow and 88% for Grassy (see Volpe Report Appendix F), according to the modeling.

Table 4-59: Sound Level in Grand Teton and the Parkway, Alternative 4

	Grand Teton: Alternative 4																
% Hr in dB Range	0 to < 5	5 to < 10	10 to < 15	15 to < 20	20 to < 25	25 to < 30	30 to < 35	35 to < 40	40 to <45	45 to < 50	50 to < 55	55 to < 60	60 to <65	65 to < 70	70 to < 75	75 to < 80	80 to < 85
Catholic	5.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Colter	49.8	31.3	5.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Grassy	33.6	19.3	13.9	6.1	4.6	3.4	2.5	1.4	1.2	1.0	0.8	0.5	0.0	0.0	0.0	0.0	0.0
Jackson	28.4	13.5	5.7	3.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Oxbow	9.1	5.7	3.3	1.9	1.2	0.9	0.7	0.6	0.3	0.2	0.1	0.2	0.1	0.0	0.1	0.0	0.0
Signal	3.3	2.0	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Spalding	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
West	19.1	6.7	1.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Audibility at Selected Sites in Yellowstone

Modeling for percent time audible at selected sites indicated 91% time audible for modeled travel corridors and 87% for the developed area at West Thumb. This compared to 45% for modeled travel corridors and 35% for the developed area at West Thumb under current

conditions, and 100% time audible for most travel corridors and some developed areas in historic conditions, according to the modeling.

Audibility at Selected Sites in Grand Teton and the Parkway

Modeling for percent time audible at selected sites indicated 31% time audible for modeled travel corridors and 18% for the developed area at Colter Bay. This compared to 3% time audible for modeled travel corridors and zero audibility for the developed area at Colter Bay under current conditions and 33% time audible for most travel corridors and some developed areas in historic conditions, according to the modeling.

Cumulative Effect

Please refer to the introductory commentary for cumulative impact assessment under alternative 1, above. Within that context, alternative 4 in Yellowstone would have more direct and cumulative impact, considering park-wide audibility, compared to the other alternatives. In Grand Teton, OSV use would contribute more to the total cumulative impact than would any of the other alternatives.

Conclusion

As modeled for Yellowstone, oversnow vehicles would be audible at some level in about 14% of the park over the average day. From the overall park perspective, this would constitute a moderate, adverse, short-term, direct impact. In Grand Teton and the Parkway, oversnow vehicles would be audible at some level in 22% of the park over the average day, according to the modeling. From the overall park perspective, this would constitute a major, adverse, short-term, direct impact. Impacts due to percent time audible would be major (YNP) to moderate (GTNP), adverse, and short-term. Impacts due to maximum sound levels would be minor, adverse, short-term (YNP and GTNP).

In Yellowstone, this alternative would be beneficial compared to both current and historic conditions. While the comparison to current conditions may seem counterintuitive given this alternative's higher snowmobile numbers, the comparison is accurate because the implementation of snowcoach BAT substantially reduces overall OSV audibility. In Grand Teton and the Parkway, it would be adverse compared to the current condition and beneficial compared to historic snowmobile use conditions in that park. Impairment of park resources would not occur; the level of OSV sound under alternative 4 would not harm the integrity of park resources and values.

In terms of cumulative effects, the minor to major, adverse, short-term impacts resulting from direct and indirect actions described in this alternative would contribute a minor to major, adverse, short-term impact to past, present, and foreseeable actions and impacts on soundscapes.

Alternative 5

Percent Time Audible in Yellowstone

This discussion of alternative 5 impacts is derived from modeled results as shown in tables and figures in the general impacts section above, see Tables 4-49 and 4-50. In this alternative, over an average 8-hour period, oversnow vehicles were modeled to be audible over 483 square miles of the park's area (13.9%). This compared to the current use condition wherein oversnow vehicles were modeled to be audible over 499 square miles (14.4%) and the historic condition of 582 square miles (16.2% of the park). The area in which oversnow vehicles were modeled to be audible 50 percent of the time or more in this alternative was 83 square miles (2.4%). This compared to modeled audibility 50% of the time over 21.3 square

miles in the current condition and 324 square miles historically. Figure 4-12 below shows modeled levels of audibility by location within the park for the average day between 9 a.m. and 10 a.m. (see Volpe Report Appendix E). This alternative would require about the same amount of road grooming as the present conditions require, resulting in approximately the same amount of groomer noise.

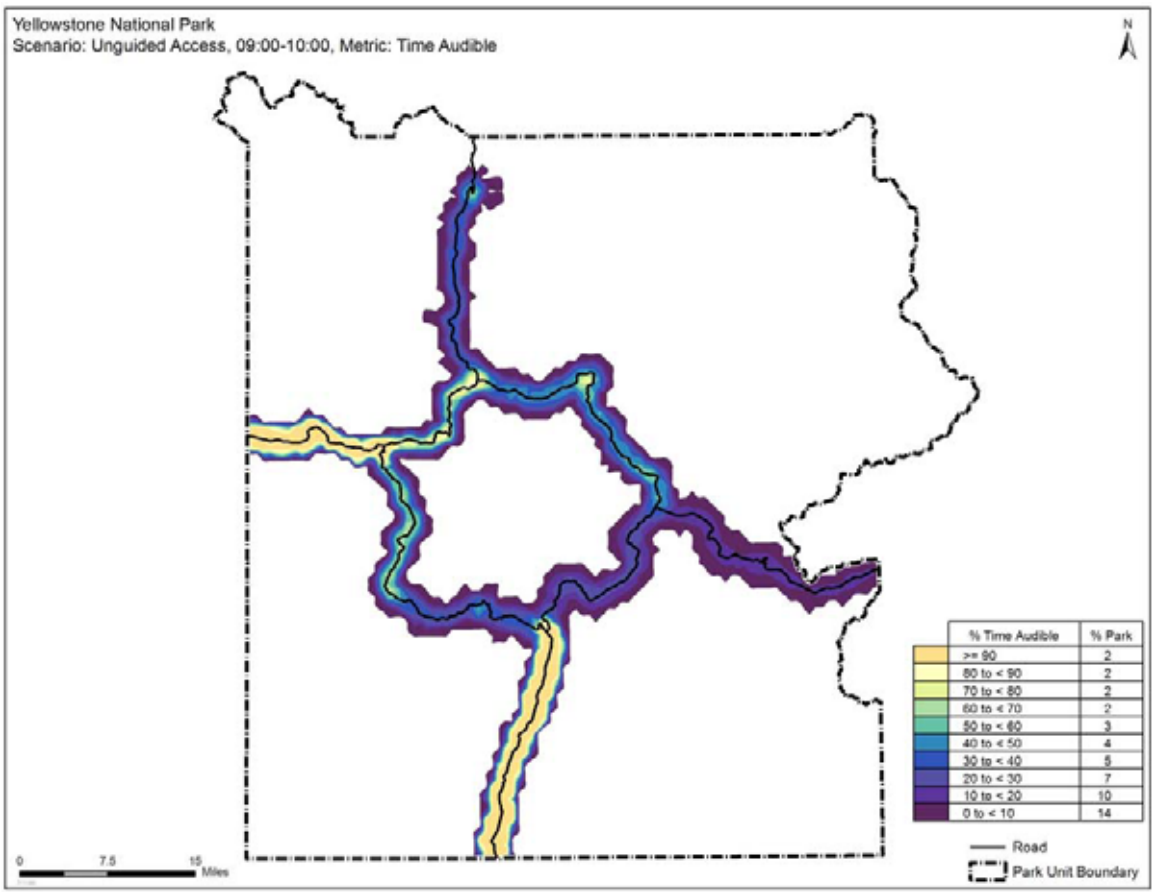

Figure 4-12: Audibility Contours in Yellowstone, Alternative 5 (Volpe Report Fig. 83)

Percent Time Audible in Grand Teton National Park and the Parkway

This discussion of alternative 5 impacts is derived from modeled results as shown in tables and figures in the general impacts section above, see Tables 4-51 and 4-52. In this alternative, over an average 8-hour period, oversnow vehicles were modeled to be audible over 99 square miles of the park's area (19.0%). This compared to the current use condition, wherein OSVs were modeled to be audible over 57 square miles, and the historic condition of audibility over 121 square miles (23.3% of the park). Oversnow vehicles were modeled as audible 30 percent of the time over 2.3 square miles (0.5% of the park), as compared to zero for current conditions and 5% of the park for historic conditions. Figure 4-13 below shows modeled levels of audibility by location within the park for the average day from 9 a.m. to 10 a.m. (see Volpe Report Appendix E).

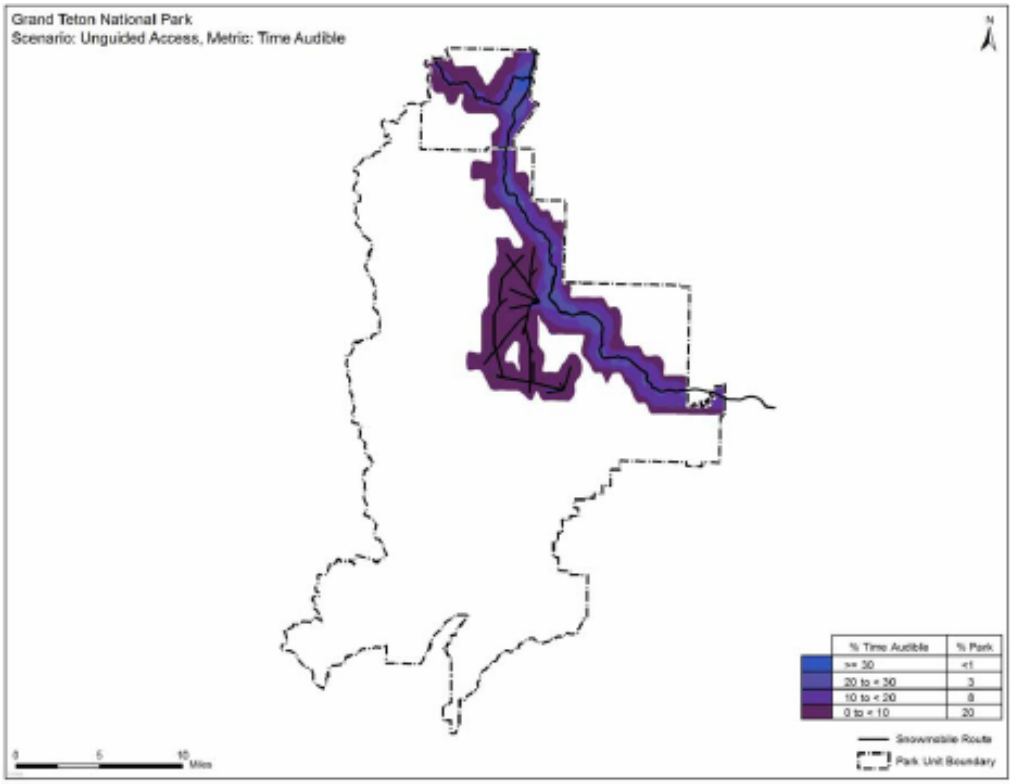

Figure 4-13: Audibility Contours in Grand Teton and the Parkway, Alternative 5 (Volpe Report Fig. 103)

Sound Level at Selected Sites in Yellowstone

Table 4-60 below shows the percent of time that sound from oversnow vehicles was modeled to be evident in decibel level increments for the 9 a.m. to 10 a.m. hour at 13 sites in Yellowstone for alternative 5. These sites are a mix of backcountry, developed and transportation corridor locations, as shown in Figure 4-3 above. Modeled sound from oversnow recreation vehicles was not present at Heart Lake or Shoshone Geyser. Sound levels were modeled to be at 10 dBA or less for Mary Mountain 8000' and Fairy Falls, but for 15.7% of the hour for the former and less than 6% of the hour for the latter. Modeled sound levels at up to 20 dBA were found at Mary Mountain 4000' for 50% of the hour, and at Lone Star Geyser for about 20% of the hour. Oversnow vehicle sound levels were modeled to be highest at Sylvan Lake, at up to 60 dBA, but for short durations. At that site, sound levels were modeled at 19.3% of the hour mostly at 0.1 to 45 dBA. At Mary Mountain Trailhead, Mud Volcano, and West Thumb, modeled sound levels reached up to 35 dBA for 68, 62, and 100% of the hour respectively. Modeled sound levels ranged from 0.1 to 25 dBA at Old Faithful, but mostly below 15 dBA, for about 80% of the time. The highest sustained oversnow vehicle sound were modeled at the Madison Junction site, where sound levels ranged between 20 and 50 dBA over 100% of the hour (see Volpe Report Appendix F).

Table 4-60: Sound Level in Yellowstone, Alternative 5

	Yellowstone: Alternative 5, 09:00 to 10:00											
% in dB Range	0 to < 5	5 to < 10	10 to < 15	15 to < 20	20 to < 25	25 to < 30	30 to < 35	35 to < 40	40 to < 45	45 to < 50	50 to < 55	55 to < 60
Fairy Falls	4.9	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Heart Lake	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lone Star Geyser	8.6	8.3	3.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Madison Jct. 2.3	0.0	0.0	0.0	0.0	15.5	26.0	19.3	15.9	15.2	8.1	0.0	0.0
Mary Mt. 4000'	23.7	15.8	8.6	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mary Mt. 8000'	13.3	2.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mary Mt. Trailhead	22.5	14.1	9.9	7.8	8.2	2.7	0.0	0.0	0.0	0.0	0.0	0.0
Mud Volcano	18.2	13.1	9.9	8.2	8.6	2.6	1.2	0.0	0.0	0.0	0.0	0.0
Old Faithful	34.6	21.5	17.0	7.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Shoshone Geyser	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Snow Pass	4.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sylvan Lake	5.3	4.0	3.0	2.0	1.5	1.0	0.8	0.6	0.4	0.4	0.2	0.1
West Thumb	0.0	0.0	36.6	30.6	26.2	5.6	1.0	0.0	0.0	0.0	0.0	0.0

Sound Level at Selected Sites in Grand Teton and the Parkway

Table 4-61 below shows the percent of time that modeled sound from oversnow vehicles was evident in decibel level increments for the 9 a.m. to 10 a.m. hour at 8 sites in Grand Teton, for alternative 5. These sites are a mix of backcountry, developed and transportation corridor locations, as shown in Figure 4-4 above. Modeled sound from oversnow recreation vehicles was not present at all at Spalding, and was close to zero at Catholic Bay. Modeled sound levels did not exceed 15 dBA for Colter and Jackson Lake West, respectively for 46 and 11 percent of the hour. Signal Mountain modeled sound levels were at less than 10 dBA for about 8% of the hour. At Cow Island, modeled sound levels ranged from 0.1 to 20 dBA over 40% of the time. Oxbow sound levels were modeled to be the highest, at 50 to 75 dBA, but for a short duration of 0.5 percent of the time (3 minutes). Both the Oxbow and Grassy sites had modeled oversnow vehicle sounds at a range of decibel levels from 0.1 to 50, but for different durations during the hour: about 19% of the time for the former and 71% for the latter (see Volpe Report Appendix F).

Table 4-61: Sound Level in Grand Teton and the Parkway, Alternative 5

	Grand Teton: Alternative 5																
% Hr in dB Range	0 to < 5	5 to < 10	10 to < 15	15 to < 20	20 to < 25	25 to < 30	30 to < 35	35 to < 40	40 to <45	45 to < 50	50 to < 55	55 to < 60	60 to <65	65 to < 70	70 to < 75	75 to < 80	80 to < 85
Catholic	3.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Colter	23.6	16.9	5.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Grassy	26.7	20.0	10.3	4.2	3.2	2.4	1.8	0.9	0.9	0.7	0.5	0.4	0.0	0.0	0.0	0.0	0.0
Jackson	17.9	12.6	7.8	2.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Oxbow	8.8	3.9	2.1	1.4	0.9	0.7	0.6	0.3	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.0	0.0
Signal	4.5	3.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Spalding	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
West	7.7	2.7	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Audibility at Selected Sites in Yellowstone

Modeling for percent time audible at selected sites indicated 74% time audible for modeled travel corridors and 79% for the developed area at West Thumb. This compared to 45% for modeled travel corridors and 35% for the developed area at West Thumb under current conditions, and 100% time audible for most travel corridors and some developed areas in historic conditions, according to the modeling.

Audibility at Selected Sites in Grand Teton and the Parkway

Modeling for percent time audible at selected sites indicated 17% time audible for modeled travel corridors and 8% for the developed area at Colter Bay. This compared to 3% time audible for modeled travel corridors and zero audibility for the developed area at Colter Bay under current conditions and 33% time audible for most travel corridors and some developed areas in historic conditions, according to the modeling.

Cumulative Effect

Please refer to the introductory commentary for cumulative impact assessment under alternative 1, above. Within that context, alternative 5 in Yellowstone would have the second most direct and cumulative impact, considering park-wide audibility, compared to the other alternatives. In Grand Teton, OSV use would contribute to the second most cumulative impact compared to the other alternatives.

Conclusion

As modeled for Yellowstone, oversnow vehicles would be audible at some level in about 14% of the park over the average day. From the overall park perspective, this would constitute a moderate, adverse, short-term, direct impact. In Grand Teton and the Parkway, in 20% of the park over the average day oversnow vehicles would be audible at some level, according to the modeling. From the overall park perspective, this would constitute a moderate, adverse, short-term, direct impact. Impacts due to percent time audible would be major (YNP) to minor (GTNP), adverse, and short-term. Impacts due to maximum sound levels would be minor, adverse, and short-term (YNP and GTNP).

In Yellowstone, this alternative would be beneficial compared to current use largely due to the implementation of improved BAT and snowcoach BAT requirements. It would also be beneficial compared to the historic condition. In Grand Teton and the Parkway, alternative 5 would be adverse compared to both current conditions there but beneficial compared to historic conditions. Impairment of park resources would not occur; the level of OSV sound under alternative 5 would not harm the integrity of park resources and values.

In terms of cumulative effects, the minor to major, adverse, short-term impacts resulting from direct and indirect actions described in this alternative would contribute a minor to major, adverse, short-term impact to past, present, and foreseeable actions and impacts on soundscapes.

Alternative 6

Percent Time Audible in Yellowstone

This discussion of alternative 6 impacts is derived from modeled results as shown in tables and figures in the general impacts section above, see Tables 4-49 and 4-50. In this alternative, over an average 8-hour period, oversnow and wheeled vehicles were modeled to be audible over 361 square miles of the park's area (10.4%). This compared to the current use condition wherein only oversnow vehicles were modeled to be audible over 499 square miles (14.4%), and the historic condition of 582 square miles (16.2% of the park). The area in which oversnow and wheeled vehicles were modeled to be audible 50 percent of the time or more, in this alternative, was 73 square miles (2.1%). This compared to modeled audibility 50% of the time over 21 square miles in the current condition and 324 square miles historically. From Figure 4-1, above, in just over 10% of the park over the average day oversnow and wheeled vehicles were modeled to be audible at some level. Figure 4-14, below shows modeled levels of audibility by location within the park for the average day between 9 a.m. and 10 a.m. (see Volpe Report Appendix E).

This alternative would require substantially less road grooming than the present conditions, resulting in a corresponding decrease in groomer noise. While there would be some additional noise from plows on the plowed road stretches, the faster speed at which plows move relative to groomers and their quieter overall noise levels would be more than compensated for by the reduction in grooming on those road stretches.

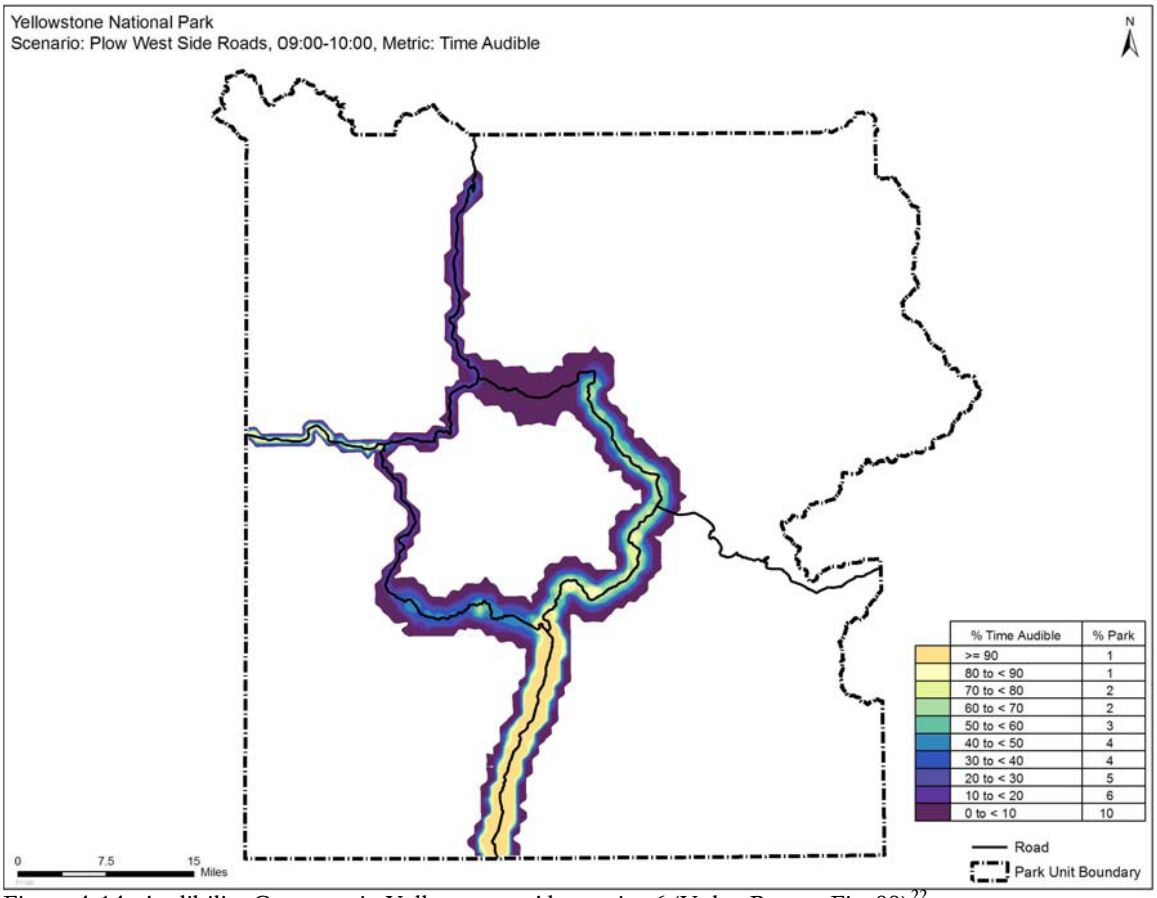

Figure 4-14: Audibility Contours in Yellowstone, Alternative 6 (Volpe Report Fig. 88)[22]

Percent Time Audible in Grand Teton National Park and the Parkway

This discussion of alternative 6 impacts is derived from modeled results as shown in tables and figures in the general impacts section above, see Tables 4-51 and 4-52. In this alternative, over an average 8-hour period, oversnow vehicles were modeled to be audible over 54.6 square miles of the park's area (10.5%). This compared to the current use condition, wherein oversnow vehicles were modeled as audible over 57 square miles (11% of the park) and the historic condition of audibility over 121 square miles (23.3%). The area in which oversnow vehicles were modeled to be audible 20 percent of the time or more, in this alternative, is 3% of the park compared to zero in the current condition and 48 square miles (9%) historically. Figure 4-15, below shows modeled levels of audibility by location within the park for the average day from 9 a.m. to 10 a.m. (see Volpe Report Appendix E).

[22] Alternative 6 includes the closure of the outer eastern portion of the East Entrance Road. The road segment from Fishing Bridge to Lake Butte would experience some OSV operations, but these were inadvertently not included in the model run. Audibility would not increase appreciably due to these small numbers along a relatively short road segment. The NPS has elected not to run the model again.

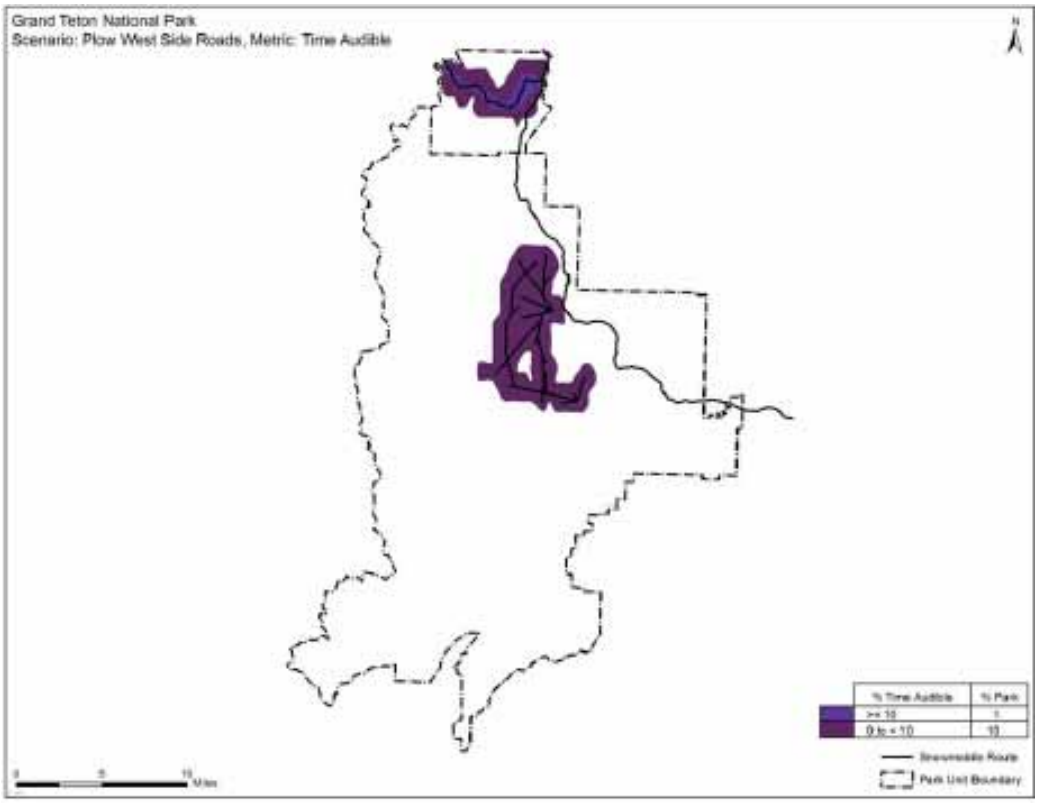

Figure 4-15: Audibility Contours in Grand Teton and the Parkway, Alternative 6 (Volpe Report Fig. 104)

Sound Level at Selected Sites in Yellowstone

Table 4-62 below shows the percent of time that modeled sound from oversnow and wheeled vehicles were evident in decibel level increments for the 9 a.m. to 10 a.m. hour at 13 sites in Yellowstone, for alternative 6. These sites are a mix of backcountry, developed, and transportation corridor locations, as shown in Figure 4-3 above. Sound from oversnow and wheeled vehicles was not modeled as evident at Fairy Falls, Heart Lake, Mary Mountain 8000', Shoshone Geyser, Snow Pass, or Sylvan Lake. Sound levels were modeled to be less than 5 dBA for 6% of the hour at Mary Mountain 4000'. Modeled oversnow and wheeled vehicle sound levels ranged from 0.1 to 20 at Lone Star Geyser and Mary Mountain Trailhead over about 25% of the hour. Modeled sound levels were highest at Madison Junction, for 100% of the hour over the range of decibel levels from 10 to 40. Modeled levels at Mud Volcano ranged from 0.1 to 35 dBA for 78% of the hour. At West Thumb, vehicle sound was modeled to be evident 100% of the time over a range of decibel levels from 10 to 35 (see Volpe Report Appendix F).

Table 4-62: Sound Level in Yellowstone, Alternative 6

	Yellowstone: Alternative 6, 09:00 to 10:00											
% in dB Range	0 to < 5	5 to < 10	10 to < 15	15 to < 20	20 to < 25	25 to < 30	30 to < 35	35 to < 40	40 to < 45	45 to < 50	50 to < 55	55 to < 60
Fairy Falls	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
Heart Lake	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
Lone Star Geyser	*11.4*	*10.6*	*4.5*	*0.1*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
Madison Jct. 2.3	*0.0*	*0.0*	*11.2*	*26.9*	*19.6*	*14.8*	*15.1*	*12.4*	*0.0*	*0.0*	*0.0*	*0.0*
Mary Mt. 4000'	*6.2*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
Mary Mt. 8000'	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
Mary Mt. Trailhead	*8.8*	*6.7*	*6.8*	*2.3*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
Mud Volcano	*22.8*	*16.7*	*12.8*	*10.6*	*8.0*	*6.5*	*1.1*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
Old Faithful	*20.2*	*9.7*	*9.9*	*6.9*	*0.1*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
Shoshone Geyser	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
Snow Pass	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
Sylvan Lake	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
West Thumb	*0.0*	*0.0*	*22.1*	*34.1*	*29.3*	*12.0*	*2.5*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*

Sound Level at Selected Sites in Grand Teton and the Parkway

Table 4-63 below shows the percent of time that sound from oversnow vehicles was modeled as evident in decibel level increments for the 9 a.m. to 10 a.m. hour at 8 sites in Grand Teton, for alternative 6. These sites are a mix of backcountry, developed and transportation corridor locations, as shown in Figure 4-4 above. Sound from oversnow recreation vehicles was not modeled to be present at Spalding, Signal Mountain, or Oxbow Bend, and only very marginally at Catholic Bay. Modeled sound levels were measurable at less than 15 dBA for Colter and Jackson Lake West, respectively for 20 and 11 percent of the hour. Cow Island sound levels were modeled at less than 10 dBA for about 8.5% of the hour. Grassy Lake was the site with the highest modeled sound levels, at which decibel levels ranged from 50 to 60 dBA but for a short duration of 0.9 percent of the time. This site had oversnow vehicles at a range of decibel levels mostly from 0.1 to 50, about 44% of the time (see Volpe Report Appendix F), according to the modeling.

Table 4-63: Sound Level in Grand Teton and the Parkway, Alternative 6

	Grand Teton: Alternative 6																
% Hr in dB Range	0 to < 5	5 to < 10	10 to < 15	15 to < 20	20 to < 25	25 to < 30	30 to < 35	35 to < 40	40 to <45	45 to < 50	50 to < 55	55 to < 60	60 to <65	65 to < 70	70 to < 75	75 to < 80	80 to < 85
Catholic	1.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Colter	16.9	10.8	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Grassy	15.1	9.1	6.1	4.2	3.2	2.4	1.8	0.9	0.9	0.7	0.5	0.4	0.0	0.0	0.0	0.0	0.0
Jackson	6.5	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Oxbow	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Signal	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Spalding	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
West	7.7	2.7	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Audibility at Selected Sites in Yellowstone

Modeling for percent time audible at selected sites indicated 40% time audible for modeled travel corridors and 90% for the developed area at West Thumb. This compared to 45% for modeled travel corridors and 35% for the developed area at West Thumb under current conditions and 100% time audible for most travel corridors and some developed areas in historic conditions, according to the modeling.

Audibility at Selected Sites in Grand Teton and the Parkway

Modeling for percent time audible at selected sites indicated 21% time audible for modeled travel corridors. This compared to 3% time audible for modeled travel corridors and zero audibility for the developed area at Colter Bay under current conditions and 33% time audible for most travel corridors and some developed areas in historic conditions, according to the modeling.

Cumulative Effect

Please refer to the introductory commentary for cumulative impact assessment under alternative 1, above. Within that context, alternative 6 in Yellowstone would have the third lowest direct and cumulative impact (but not substantially different than alternative 2), considering park-wide audibility, compared to the other alternatives. In Grand Teton, OSV use would contribute to the second lowest cumulative impact compared to the other alternatives.

Conclusion

As modeled for all three parks, oversnow and wheeled vehicles would be audible at some level in about 10% of the park over the average day. From the overall park perspective, this would constitute a moderate, adverse, short-term, direct impact. Impacts due to percent time audible would be moderate, adverse, and short-term (YNP) to negligible (GTNP). Impacts due to maximum sound levels would be negligible (YNP and GTNP). In all three parks, this alternative would be beneficial compared to both current use and the historic condition. Impairment of park resources would not occur; the level of oversnow and wheeled vehicle sound under alternative 6 would not harm the integrity of park resources and values.

In terms of cumulative effects, the negligible to moderate, adverse, short-term impacts resulting from direct and indirect actions described in this alternative would contribute a negligible to moderate, adverse, short-term impact to past, present, and foreseeable actions and impacts on soundscapes.

Alternative 7

Percent Time Audible in Yellowstone National Park

This discussion of alternative 7 impacts is derived from modeled results as shown in tables and figures in the general impacts section above (see Table 4-49 and Table 4-50). In this alternative, over an average 8-hour period, oversnow vehicles were modeled as audible over 479.5 square miles of the park's area (13.8% of the park). This compares to the current use condition wherein oversnow vehicles were modeled as audible over 499 square miles (14.4% of the park), and the historic condition of 582 square miles (16.8% of the park). The area in which oversnow vehicles were modeled as audible 50 percent of the time, in this alternative, is 62.7 square miles (1.8% of the park). This compared to audibility 50% of the time over less than one square mile of the park in the current condition and 324 square miles historically, as modeled. Figure 4-16 below shows modeled levels of audibility within the park for the average day between 9 a.m. and 10 a.m. This alternative would require about the same amount of road grooming as the present conditions require, resulting in approximately the same amount of groomer noise. Note that the Madison-Norris road segment was modeled as closed to reflect management experiments investigating the bison-groomed road relationship.

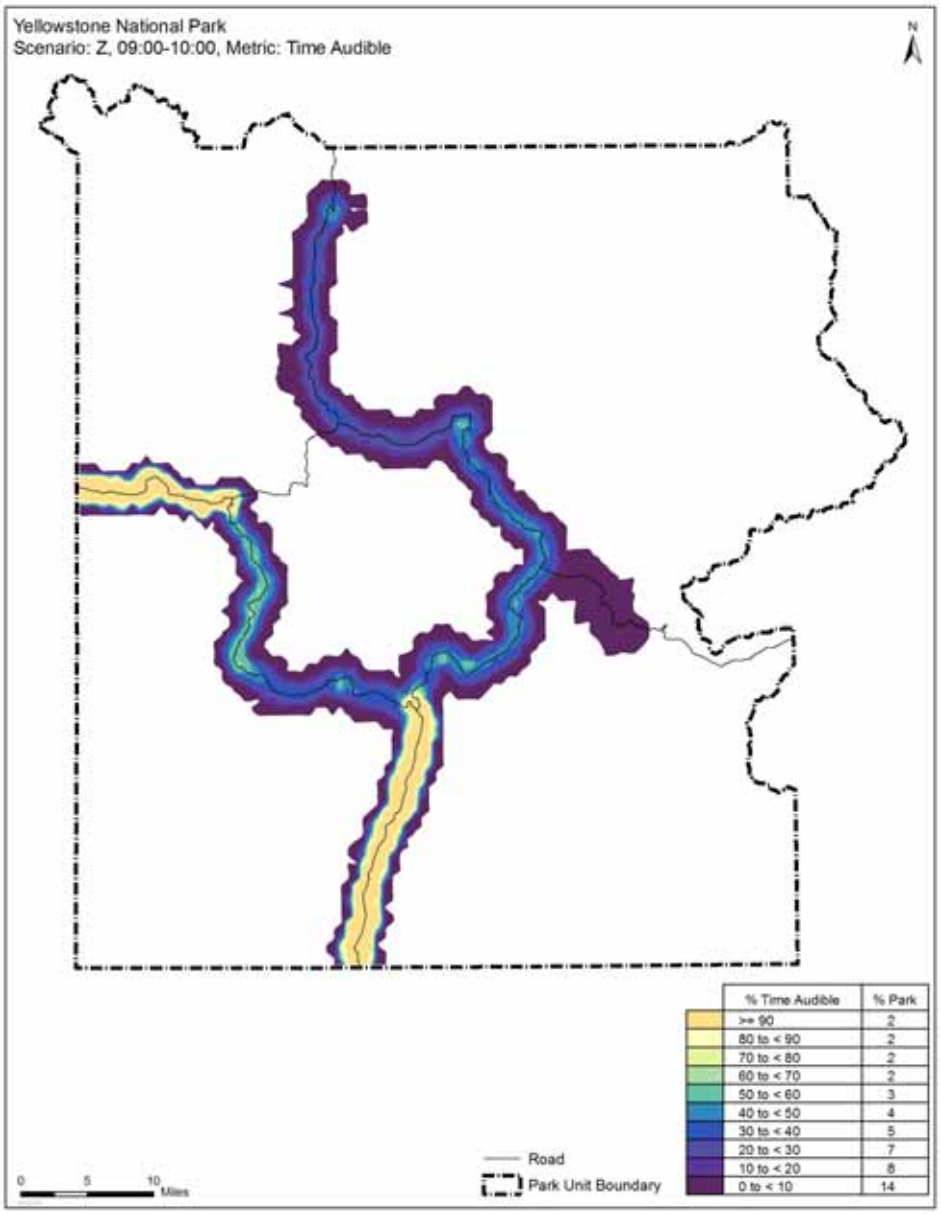

Figure 4-16 Audibility Contours in Yellowstone, Alternative 7 (Volpe Report Fig. Z 09)

Percent Time Audible in Grand Teton National Park and the Parkway

This discussion of alternative 7 impacts is derived from modeled results as shown in tables and figures in the general impacts section above (see especially Table 4-51 and Table 4-52), as well as from the modeling report itself. In this alternative, over an average 8-hour period, oversnow vehicles were modeled as audible over 101.6 square miles of the park's area (17.7% of the park). This compared to the current use condition, wherein oversnow vehicles were modeled as audible over 57 square miles (11% of the park) and the historic condition of audibility over 121 square miles (16.8% of the park as modeled). Oversnow vehicles were modeled as not being audible 20 percent of the time, which compares to zero in the current condition and 48 square miles historically (as modeled). Figure 4-17 below shows levels of audibility within the park for the average day based on an earlier modeling scenario that

closely approximate the conditions one would expect with implementation of alternative 7. Note, however, that the modeling scenario shown depicts 50 rather than 25 snowmobiles per day on the Grassy Lake Road. Therefore, expected impacts for the Grassy Lake Road under alternative 7 would be less than those shown in figure 4-17.

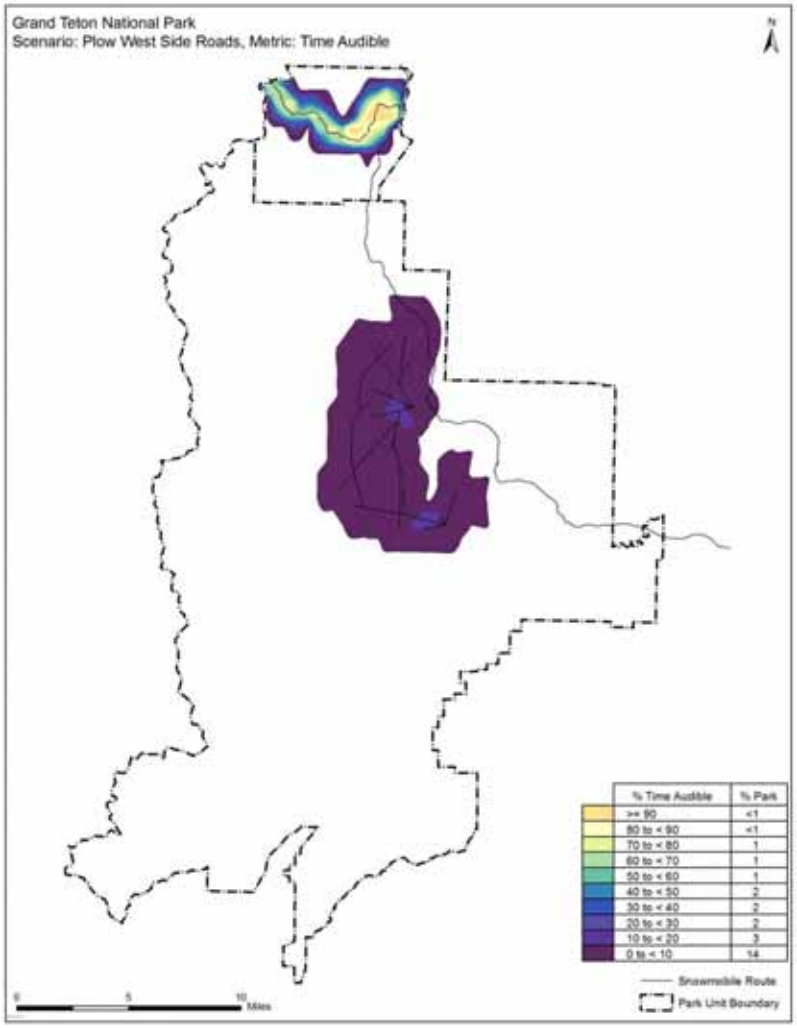

Figure 4-17: Audibility Contours in Grand Teton and the Parkway, Alternative 7 (Volpe Report Fig. 163)

Sound Level at Selected Sites in Yellowstone

Table 4-64 below shows the modeled percent of time that sound levels from oversnow vehicles were audible in decibel level increments for the 9 a.m. to 10 a.m. hour at 13 sites in Yellowstone, for alternative 7. These sites are a mix of backcountry, developed and transportation corridor locations, as shown in Figure 4-3 above. No above-zero sound levels from OSV were modeled at Heart Lake, Shoshone Geyser, or Sylvan Lake. Sound levels were modeled at less than 5 dBA for less than 3% of the hour at Snow Pass, a backcountry site. Oversnow vehicle sounds were modeled as highest at Madison Junction and West Thumb, for 100% of the hour over the range of decibel levels from 5 to 50. Levels at Mary Mountain Trailhead and Mud Volcano, travel corridor sites, were modeled as similar to each other, ranging from 0.1 to 35 dBA for 50-60% of the hour. At the developed area of Old Faithful,

modeled vehicle sound levels from 0.1 to 25 dBA during 9 a.m. – 10 a.m. occurred 80% of the time.

Relative to soundscape impacts in both the current and historic conditions, this alternative would represent a beneficial impact on the natural soundscape for the eastern portion of the park.

Table 4-64 Sound Level in Yellowstone, Alternative 7

	Yellowstone: Alternative 7, 09:00 to 10:00											
% Hour in dB range	0 to < 5 dB	5 to < 10 dB	10 to < 15 dB	15 to < 20 dB	20 to < 25 dB	25 to < 30 dB	30 to < 35 dB	35 to < 40 dB	40 to < 45 dB	45 to < 50 dB	50 to < 55 dB	55 to < 60 dB
Fairy Falls	4.1	1.0	0	0	0	0	0	0	0	0	0	0
Heart Lake	0	0	0	0	0	0	0	0	0	0	0	0
Lone Star G.	9.5	8.8	3.7	0.1	0	0	0	0	0	0	0	0
Mad. Jct. 2.3	0	0	0	0	21.6	24.4	18.1	14.8	14.4	6.7	0	0
Mary Mt. 4000'	21.9	14.9	8.0	2.0	0	0	0	0	0	0	0	0
Mary Mt. 8000'	13.1	2.5	0	0	0	0	0	0	0	0	0	0
Mary Mt. Trhd.	20.9	12.9	8.9	7.1	7.1	2.9	0.1	0	0	0	0	0
Mud Volcano	15.3	11.3	8.6	7.2	5.3	4.5	0.5	0	0	0	0	0
Old Faithful	33.9	21.4	16.4	8.5	0.1	0	0	0	0	0	0	0
Shoshone G.	0	0	0	0	0	0	0	0	0	0	0	0
Snow Pass	3.1	0	0	0	0	0	0	0	0	0	0	0
Sylvan Lake	0	0	0	0	0	0	0	0	0	0	0	0
West Thumb	0	1.2	35.7	28.6	24.5	8.5	1.5	0	0	0	0	0

Sound Level at Selected Sites in Grand Teton and the Parkway

Table 4-65 below shows the percent of time that sound from oversnow vehicles occurred in decibel level increments for the 9 a.m. to 10 a.m. hour at 8 sites in Grand Teton, for alternative 7, according to the modeling. These sites are a mix of backcountry, developed and transportation corridor locations, as shown in Figure 4-4 above. There were modeled to be no above-zero sound levels from oversnow recreation vehicles at Spalding and none above 5 dBA at Catholic Bay, a travel corridor site. Modeled sound levels were below 15 dBA for Colter Bay Visitor Center, a developed area and below 20 dBA for Jackson for 40 and 31 percent of the hour, respectively. At Signal Mountain and Jackson Lake West, a backcountry site, audible sound levels were lower than 15 dBA for about 3 and 10 percent of the hour respectively, as modeled. Levels at Oxbow Bend, a travel corridor site, were the highest, where decibel levels would range from 50 to 75 dBA for short durations of 0.7 percent of the hour, as modeled. Both the Oxbow and Grassy Lake sites had oversnow vehicles sounds modeled at a range of decibel levels from 0.1 to 75, but for different durations during the hour: about 25% of the hour for the former and 72% (at maximum of 55 dBA) for the latter (see Volpe Report Appendix F).

Table 4-65: Sound Level in Grand Teton and the Parkway, Alternative 7

	Grand Teton: Alternative 7																
% Hour in dB range	0 to < 5 dB	5 to < 10 dB	10 to < 15 dB	15 to < 20 dB	20 to < 25 dB	25 to < 30 dB	30 to < 35 dB	35 to < 40 dB	40 to < 45 dB	45 to < 50 dB	50 to < 55 dB	55 to < 60 dB	60 to < 65 dB	65 to < 70 dB	70 to < 75 dB	75 to < 80 dB	80 to < 85 dB
Catholic	0.9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Colter	29.1	10.8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grassy	30.6	17.2	7.5	5.4	3.9	2.7	1.8	1.3	0.9	0.5	0.2	0	0	0	0	0	0
Jackson	19.3	9.1	2.8	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oxbow	7.8	5.1	3.4	2.4	1.7	1.3	0.9	0.6	0.5	0.3	0.2	0.2	0.1	0.1	0.1	0	0
Signal	2.8	0.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Spalding	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
West	8.0	2.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Audibility at Selected Sites in Yellowstone

Modeling for percent time audible at selected sites indicated 69% time audible for modeled travel corridors and 83% for the developed area at West Thumb. This compared to 45% for modeled travel corridors and 35% for the developed area at West Thumb under current conditions and 100% time audible for most travel corridors and some developed areas in historic conditions.

Audibility at Selected Sites in Grand Teton and the Parkway

Modeling for percent time audible at selected sites indicated 7% time audible for modeled travel corridors and zero percent for the developed area at Colter Bay. This compared to 3% time audible for modeled travel corridors and zero audibility for the developed area at Colter Bay under current conditions and 34% time audible for most travel corridors and some developed areas in historic conditions.

Cumulative Effect

During the winter, the Yellowstone natural soundscape is relatively unimpacted by sources of non-natural sound other than oversnow vehicles. Except for aircraft overflights, which are audible between 5-10% of the average day (NPS unpublished data), the total cumulative impact is composed of snowmobiles, snowcoaches, snow groomers, and other administrative OSV traffic. Where roads are plowed in the northern portion of the park, most human-caused sound is from wheeled vehicles – but this source lies outside the primary area of concern. Without recreational OSV use, other sources of non-natural sound would greatly diminish with the reduced need for administrative travel, grooming, and other support. As modeled, alternative 7 in Yellowstone would have the third greatest direct and cumulative impact, considering park-wide audibility, compared to the other alternatives. This impact is modeled as less than the impact modeled for current conditions.

In Grand Teton, the sound of oversnow vehicles would be additive to other considerable sources including aircraft overflights, aircraft arriving to and departing from Jackson Hole Airport within the middle and southern portion of the park, and highway traffic along US 191 from Jackson Hole north to Flagg Ranch and US 26 Moran Junction to the park's east boundary. As a portion of the cumulative human-caused sounds in the park, OSV use would be a smaller component than in Yellowstone. However, it would be a substantial component affecting the total cumulative impact materially depending upon the alternative. In GRTE for alternative 7, OSV use would contribute to the fourth greatest cumulative impact compared to the other alternatives.

Conclusion

As modeled for Yellowstone, in about 13.8% of the park over the average day, oversnow vehicles would be audible at some level. From the overall park perspective, this would constitute a moderate, adverse, short-term, and direct impact. In Grand Teton, in about 17.7% of the park over the average day, oversnow vehicles would be audible at some level according to the modeling. From the overall park perspective, this would constitute a moderate, adverse, short-term, and direct impact. Impacts due to percent time audible would be major (YNP) to moderate (GTNP), adverse, and short-term impacts. Impacts due to maximum sound levels would be minor, adverse, and short-term (YNP and GTNP).

This alternative would be beneficial in Yellowstone and adverse in Grand Teton compared to current use and beneficial in both parks compared to the historic condition. While the comparison to current conditions in Yellowstone may seem counterintuitive given this alternative's higher snowmobile and snowcoach numbers, the comparison is accurate because the implementation of snowcoach BAT substantially reduces overall OSV audibility. Closure of the East Entrance and Madison to Norris road segments also removes OSV operations that would otherwise contribute to sound impacts. Impairment of park resources would not occur; the level of OSV sound under alternative 7 would not harm the integrity of park resources and values.

In terms of cumulative effects, the minor to major, adverse, short-term impacts resulting from direct and indirect actions described in this alternative would contribute a minor to major, adverse, short-term impact to past, present, and foreseeable actions and impacts on soundscapes.

Conclusions

Percent Time Audible and Potential Mitigation

Based on the audibility contours developed through modeling (audibility maps for each alternative), several general observations can be made. First, sounds produced by OSVs were generally audible within corridors around road segments, according to the modeling. These corridors of audibility were typically between 3.5 and 5 miles wide. Second, bends in the road segments increased the modeled percent time audible in the area due to an increase in the exposure time as the vehicles traverse the curved region. Third, the percent time audible was modeled to be 100% near road segments with high numbers of hourly operations. Last, when 100% modeled audibility was reached, the contour formed a plateau extending about 0.5 to 1.5 miles on either side of the road and then sharply dropping to zero over a short distance.

Yellowstone Ranking

Figure 4-1 shows the percent of Yellowstone which had "any audibility" during the 8-hour day based on modeling results. In order to understand the rankings, it is constructive to consider some of the significant factors for each alternative. It can be seen that alternative 3A had the lowest park area affected for "any audibility," because the modeling for this alternative included the closure of most road segments. Alternative 2 showed relatively low modeled audibility due to the exclusion of snowmobiles and the use of only BAT snowcoaches. Similar to alternative 3A, alternative 6 included the closure of road segments, specifically the outer portion of the east entrance road. Alternatives 4 and 5 both had the East Entrance open. However, some of the group sizes were smaller, five per group, resulting in lower modeled source levels for some pass-by events, thus shortening the sound propagation distance. Modeling for the preferred alternative, alternative 7, indicates somewhat lower audibility than under current conditions. Overall, all alternatives affected smaller park areas than in the historical condition for Yellowstone, according to the modeling.

Grand Teton and the Parkway Ranking

Figure 4-2 shows the percent of Grand Teton which has "any audibility" over the 8-hour day based on modeling results. As with Yellowstone, a quick summary of significant factors is constructive. Because many of the alternatives in Grand Teton involved closing various OSV routes, either the Grassy Lake road, the CDST, or Jackson Lake, the areas open to snowmobile use was an important factor. Alternative 2 did not allow any snowmobile use in Grand Teton, and since wheeled vehicle travel was not modeled, there was no impact. Alternative 3 had only the Grassy Lake road open to use, so it had the smallest park area affected by OSVs. Alternative 6 did not allow travel along the CDST. This is a long road, and its exclusion substantially reduced the park area affected by audible events, according to the modeling. The alternatives with highest modeled audibility included use on all three travel areas in Grand Teton (Grassy Lake Road, the CDST, and Jackson Lake). Operations allowed in alternatives 1 and 5 would be lower than historic conditions and alternative 4. Alternative 4 had the second highest modeled audibility due in part to the inclusion of larger group sizes (11 per group), and therefore higher sound source levels, along the CDST. Finally, modeling for the preferred alternative, alternative 7, indicates somewhat lower audibility than under all alternatives other than 3 and 6.

The following figures are included to assist in comparing modeling results among the alternatives to both the current and historic winter use conditions. A summary impact comparison table, Table 4-66, follows these figures.

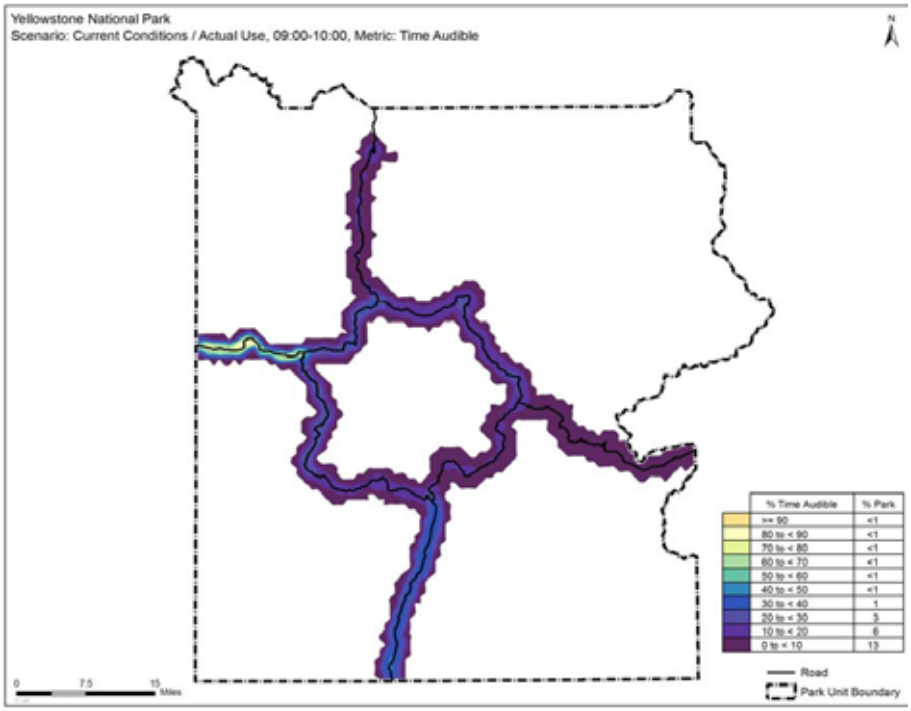

Figure 4-18: Audibility Contours in Yellowstone for Current Conditions (Volpe Fig. 91)

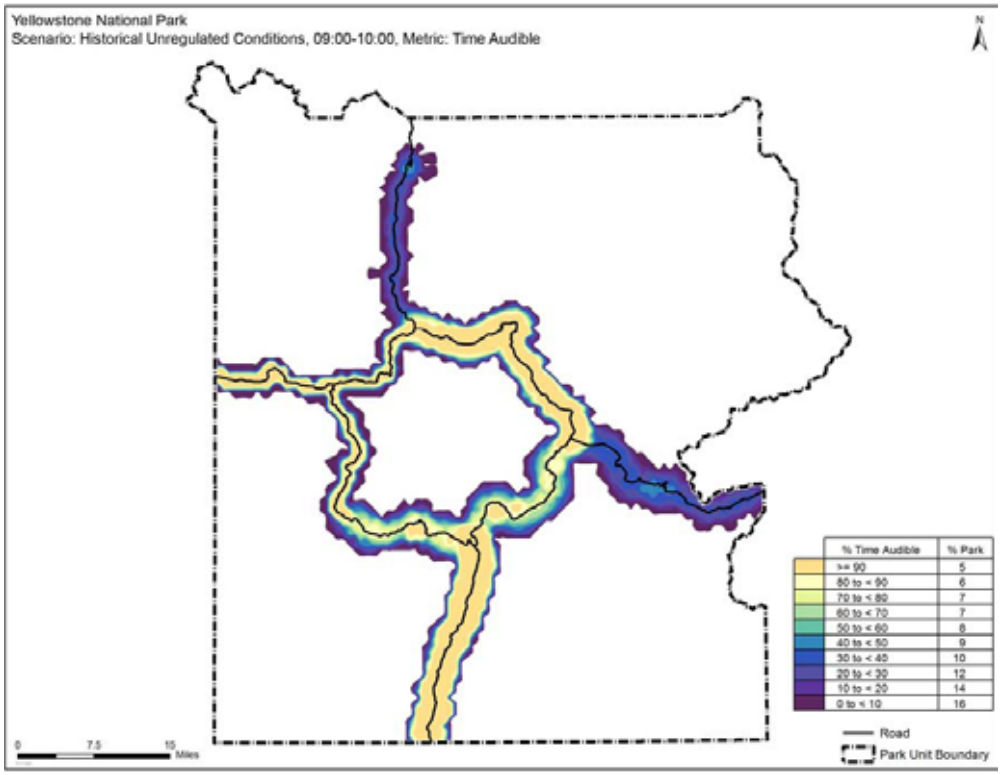

Figure 4-19: Audibility Contours in Yellowstone for Historic Conditions (Volpe Fig. 95)

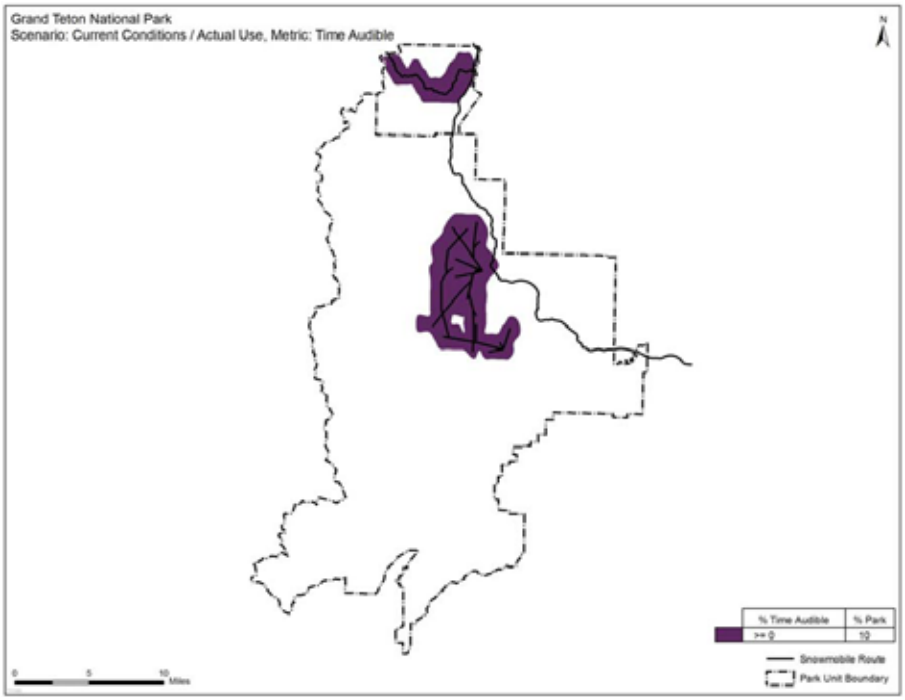

Figure 4-20: Audibility Contours in Grand Teton and the Parkway for Current Conditions (Volpe Rep. Fig. 105)

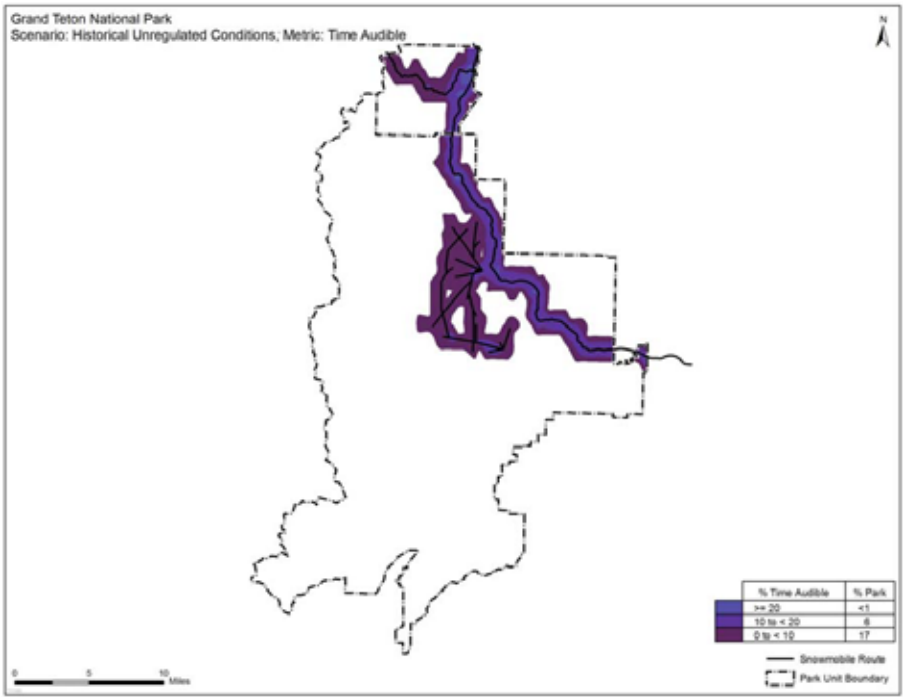

Figure 4-21: Audibility Contours in Grand Teton and the Parkway for Historic Conditions (Volpe Rep.Fig. 106)

Table 4-66: Park-wide Soundscape Impacts Conclusions

Alternative	Level of Adverse Impact[‡] Park-wide Audibility (oversnow vehicles audible at all)	Relative Comparison to Current Conditions (14.4% in YNP and 11.0% in GTNP and the Parkway) change in % area audible at all[1]	Relative Comparison to Historic Condition (16.8% in YNP and 23.3% in GTNP and the Parkway) change in % area audible at all[1]	Impairment
Alternative 1				
Yellowstone	12.9% (moderate)	-1.5%	-3.9%	No
Grand Teton	19.0% (major)	+8.0%	-4.3%	
Alternative 2				
Yellowstone	10.2% (moderate)	-4.2%	-6.6%	No
Grand Teton	None	-11.0%	-23.3%	
Alternative 3A*				
Yellowstone	3.5% (negligible)	-10.9%	-13.3%	No
Grand Teton	3.8% (negligible)	-7.2%	-19.5%	
Alternative 4				
Yellowstone	13.9% (moderate)	-0.5%	-2.9%	No
Grand Teton	21.7% (major)	+10.7%	-1.6%	
Alternative 5				
Yellowstone	13.9% (moderate)	-0.5%	-2.9%	No
Grand Teton	19.8% (major)	+8.0%	-4.3%	
Alternative 6				
Yellowstone	10.4% (moderate)	-4.0%	-6.4%	No
Grand Teton	10.5% (moderate)	-0.5%	-12.8%	
Alternative 7				
Yellowstone	13.8% (moderate)	-0.6%	-3.0%	No
Grand Teton	17.7% (major)	+6.7%	-5.6%	

‡ As determined from impact definitions, Table 4-48 (Percent of total park in which OSV sound is audible).
[1] As determined from Tables 4-50 and 4-51, where the 'zero' row indicates >0 percent time audible.
* In the no action variation of this alternative (3B), there would be no soundscape impacts for either park unit.

4.2.7 Effects on Visitor Access and Circulation

Assumptions and Methods

While NPS policies for Yellowstone and Grand Teton have tended to emphasize visitor experiences based on the quality of park resources rather than the mode of transport used to access them, the mode of travel that a visitor prefers is not necessarily related to intrinsic park values. The modes of travel include snowmobile, snowcoach, and wheeled vehicle access. This section therefore addresses the impact of changes in mode of access and the places in the parks that are accessible separately from impacts relating specifically to visitor experience.

Definition of Impacts

Table 4-67: Definition of Impacts for Visitor Access and Circulation

Impact Category	Definition
Negligible	Changes in the modes of transportation (snowmobile, snowcoach, wheeled vehicles) and in the areas accessible (as compared to historic or current conditions) affect small areas of the parks and are imperceptible to most visitors.
Minor	Changes in the modes of transportation and in the areas accessible (as compared to historic or current conditions) affect a few areas of the parks and are noticeable to many visitors.
Moderate	Changes in the mode of transportation and in the areas accessible (as compared to historic and current conditions) affect a number of areas of the parks and are evident to most visitors.
Major	Changes in the mode of transportation and in the areas accessible (as compared to historic and current conditions) affect a majority of the parks and are evident to virtually all visitors.

Impacts Common to All Alternatives

Wheeled vehicle access from Yellowstone's North Entrance to Mammoth Hot Springs and to the Northeast Entrance and Cooke City would occur under all alternatives, as would wheeled vehicle access in Grand Teton National Park from the South Entrance to Moran Junction and to Flagg Ranch.

Should Gibbon Canyon, which is the only direct route from Madison Junction to Norris Junction, be closed for research purposes, visitors would no longer be able to tour the Lower Loop in one day. Additionally, visitors would find travel between West Yellowstone and Mammoth or Canyon, and between Old Faithful and Mammoth, more difficult as they would have to travel around the park's eastern side. Due to these difficulties, a small number of visitors may be displaced to the South Entrance (under all alternatives) or the East Entrance (under alternatives 4 and 5), because travel from these entrances to the popular Canyon and Old Faithful areas would not be affected by this closure.

Effects by Alternative

Alternative 1

Direct and Indirect Effects

Some people for whom the experience of traveling independently (that is, without a guide) on a snowmobile is important may choose not to visit the parks because the type of access and experience they prefer is not available. The impact of this alternative would be adverse for these potential visitors.

Some visitors who would prefer to visit by snowmobile but are unable to do so because of the daily entry limits may choose instead to visit by snowcoach. Although these people would still have access to the park, they may be adversely affected because the snowcoach tour was not their preference. Some people may opt instead to visit the park on a less busy day, travel to a different entrance where the daily snowmobile limit has not been reached (although the driving distance between the park entrances in the winter would make this impractical in most cases), or decide not to visit the park at all.

For visitors who prefer to visit the park without snowmobiles present, the number of snowmobiles permitted under alternative 1 may be a deterrent to their visit, and the impact of this alternative on those visitors' access would be adverse.

Because this alternative would close Sylvan Pass, those visitors that would otherwise tour this route by OSV will be displaced to other entrances or unable to tour Yellowstone. This would be an adverse impact for these visitors. Cross-country skiing and snowshoeing in the vicinity of Yellowstone's East Entrance would still be possible; non-motorized and motorized uses may be possible for a distance of about four miles west of the entrance.

With the exception of the East Entrance, most park roads (as identified in section 2.6.1) would remain open under alternative 1. The East Entrance Road would remain open from the Fishing Bridge intersection to as far east as Lake Butte Overlook, providing visitors with access to views of Yellowstone Lake. Otherwise, visitors would continue to have access to the park's major features, and visitor circulation through the parks would remain largely unchanged from current conditions. As compared to current conditions, more side roads would be open to snowmobiles through temporal zoning, providing access to more park features. The Cave Falls Road would be designated open for snowmobile use, making the Cave Falls feature accessible.

In Grand Teton and the Parkway, visitors would continue to be able to use snowmobiles on the CDST, Grassy Lake Road, and the frozen surface of Jackson Lake. Opportunities for ice fishing would remain the same on the lake as in previous winters and Flagg Ranch would also continue to be accessible by motorized vehicles.

Cumulative Effects

The parks are one component of the GYA, which includes several national forests, wildlife refuges, and communities such as Jackson and Cody, Wyoming; West Yellowstone and Gardiner, Montana; and Island Park and Ashton, Idaho. Visits to the parks are often combined with visits to a wide variety of destinations elsewhere in the region and the three-state area. Opportunities to snowmobile abound on the public lands around the parks, with both on-and off-trail access available at a variety of skill levels. Forest and/or travel planning are underway in some of the national forests around the park, but these plans are in process and it cannot be predicted how they may affect oversnow travel in the region. The USFS has begun implementation of the Gallatin National Forest Travel Plan, with varying effects around Yellowstone. While some motorized trails will be lost, others are being formalized, and non-motorized opportunities are being strengthened as well. Opportunities to ride a snowcoach are generally limited to the parks, because snowcoaches are, for the most part, restricted from using forest trails (while snowcoaches are allowed on Idaho forest trails, the state has not yet seen a request for such use, at least commercially).

The effects of these actions on visitor access and circulation in the parks, or effects in the reverse direction, are difficult to predict. As indicated in the Chapter IV Socioeconomics discussion, use of the parks and surrounding lands does not always correlate. Some outside

areas have observed decreases in use in recent years, but not at the same rate or magnitude as the parks.

Population growth through the GYA, rural land subdivision and reduction of public land access, changing demographics, improving snowmobile technologies, and increasing outfitter/guide activity may all influence visitor access and circulation in various ways. It is very difficult to predict how any one of these trends, or the interactive effects of more than one or all of them together, will influence visitor access and circulation. In general, though, the effects of these trends on park access and circulation will be indirect, at least as compared to the actual guidance provided under each of the alternatives in this EIS.

New or rehabilitated visitor centers with greatly improved exhibits and interpretation are underway (Canyon opened August 2005, the Craig Thomas Discovery and Visitor Center and the Laurance S. Rockefeller Plan Preserve both recently opened, and Old Faithful is proposed). A new West Entrance Station and improved facilities at the West Yellowstone Interagency Visitor Center are being constructed in Yellowstone. Road improvements may eventually widen the underlying snow roads from Norris to Mammoth and Grant Village to South Entrance (and complete the East Entrance Road) in Yellowstone and the Togwotee Pass Highway as well. Completion of the Grand Teton Transportation and Teton Pathways plans may improve non-motorized access in the Jackson/Grand Teton area, as will Rendezvous Ski Trail planning in West Yellowstone. These projects will improve access in the parks through enhanced interpretation and better facilities.

Conclusion

The effects of alternative 1 on visitor access and circulation would be long-term, minor, adverse, direct, and localized (to the East Entrance area). In Yellowstone, 720 snowmobiles per day would be near the historic average; therefore, on busy days some visitors desiring to snowmobile would not be able to access the parks. The closure of East Entrance affects direct access for a small number of visitors on one road segment of Yellowstone.

In terms of cumulative effects, the long-term, minor, adverse impacts resulting from direct and indirect actions described in this alternative would contribute a minor, long-term, adverse impact to past, present, and foreseeable actions and impacts on visitor access and circulation.

Alternative 2

Direct and Indirect Effects

Some people for whom the experience of traveling independently on a snowmobile is important may choose not to visit the parks because the type of access they prefer is no longer available. The impact of alternative 2 would be adverse for these potential visitors compared to historical conditions. Compared to current conditions, for those people who wish to use a guided snowmobile to access Yellowstone (versus a guided snowcoach), that mode of access would not be available and the impact of implementing alternative 2 would be adverse. Similarly, some potential visitors to Grand Teton National Park and the Parkway would be adversely affected because they would no longer have the opportunity to travel on the CDST or Grassy Lake Road, or access Jackson Lake by snowmobile. Finally, because this alternative would close Sylvan Pass, those visitors that would otherwise tour this route by OSV will be displaced to other entrances or unable to tour Yellowstone. This would be an adverse impact for these visitors. Cross-country skiing and snowshoeing in the vicinity of Yellowstone's East Entrance would still be possible; non-motorized and motorized uses may be possible for a distance of about four miles west of the entrance.

Snowcoaches are generally reliable but usually slower than snowmobiles. Consequently, the pace of a typical Yellowstone visit would be slower and visitors may not be able to tour as much of the park in a single day as is possible by snowmobile. However, snowcoach operators offer full-day tours that are nearly identical to the most popular snowmobile tours and visitors could travel to the same attractions such as Old Faithful and the Lower Falls. The East Entrance would be closed to through travel, but snowcoach access would be available as far as Lake Butte Overlook from the west. The Cave Falls Road would be closed to snowmobiles, eliminating oversnow vehicle access to the falls.

For Grand Teton National Park and the Parkway, the use of snowmobiles would be prohibited on both the CDST and the Grassy Lake Road. Since the route of the CDST follows the shoulder of U.S. 26/287 and U.S. 89/287, visitors could still access this area by wheeled vehicles on the plowed road surface. The frozen surface of Jackson Lake and Grassy Lake Road could only be visited by non-motorized travel. Opportunities for ice fishing on Jackson Lake would be lessened compared to current conditions.

Cumulative Effects

Past, present, and foreseeable actions occurring within and around the parks which could affect visitor access and circulation are the same as those for alternative 1.

The cumulative effects of alternative 2 would be similar to alternative 1, except the lack of recreational snowmobile access in the parks may displace snowmobilers to the surrounding lands. Fewer snowmobile-oriented visitors might travel to the Greater Yellowstone Area in the absence of snowmobile opportunities in the parks. Conversely, the lack of snowmobiles may attract other visitors who will recreate in other ways on the surrounding lands as part of their visit.

Conclusion

The effects of alternative 2 on visitor access and circulation would be long-term, major, adverse, and across all three park units for snowmobile users. For those visitors that prefer access by snowcoach, alternative 2 would be long-term, major, and beneficial in Yellowstone. For visitors to the East Entrance, there would be long-term, minor, adverse, and direct impacts due to closure of the pass. Access would be limited to one mode of transportation in Yellowstone, snowcoaches. Snowmobiles would be prohibited in Grand Teton and the Parkway (access would be via wheeled vehicles or non-motorized).

In terms of cumulative effects, the impacts resulting from direct and indirect actions described in this alternative would contribute a minor, long-term, adverse impact to past, present, and foreseeable actions and impacts on visitor access and circulation.

Alternative 3

Direct and Indirect Effects

This alternative limits oversnow access in Yellowstone to the South Entrance to Old Faithful road segment. While visitors would still have their choice of oversnow transportation modes on that stretch of roadway (except for unguided snowmobile access), all other oversnow roads would be closed to oversnow vehicle and non-motorized access. In Grand Teton and the Parkway, the Grassy Lake road would be open to snowmobiles, but Jackson Lake and the CDST would be closed. Except for visitors wishing to access Old Faithful from the south via guided snowmobile or snowcoach, the balance of the park would not be accessible to oversnow travel. The Cave Falls Road would be closed to oversnow vehicle access. Backcountry non-motorized use would be limited in Yellowstone to groomed ski routes and boardwalks (including trails accessible from the Gardiner – Cooke City Road and between

South Entrance and Old Faithful). The balance of the park's backcountry would be closed to non-motorized travel. The effects of alternative 3 on visitor access and circulation would be long-term, direct, major, adverse, and across all three park units because of the highly restricted nature of the access.

For Grand Teton National Park and the Parkway, the use of snowmobiles would be prohibited on both the CDST and Jackson Lake, while the Grassy Lake Road would remain open for snowmobiling. Since the route of the CDST follows the shoulder of U.S. 26/287 and U.S. 89/287, visitors could still access this area by wheeled vehicles on the plowed road surface. The frozen surface of Jackson Lake could only be visited by non-motorized travel, so opportunities for ice fishing on Jackson Lake would be lessened compared to current conditions.

Alternative 3B, which prohibits all recreational oversnow vehicle access in Yellowstone, Grand Teton, and the Parkway, would have a major adverse impact on visitors wishing to access the parks via oversnow vehicles in the winter. Some of those desiring non-motorized experiences would benefit, as the parks would remain open for these activities. However, accessing non-motorized trails within Yellowstone's interior would be difficult for most skiers and snowshoers.

Cumulative Effects

Past, present, and foreseeable actions occurring within and around the parks which could affect visitor access and circulation are the same as those for alternative 1. The cumulative effects would be similar to those in alternative 1, except the limited snowmobile and snowcoach access may displace all variety of winter users to the surrounding lands. Fewer visitors might travel to the Greater Yellowstone Area with the reduced oversnow access opportunities in the parks. The variation of this alternative eliminating snowmobile and snowcoach access (3B No action) may create even larger effects on the surrounding lands. Fewer visitors might travel to the Greater Yellowstone Area with the absence of oversnow access opportunities in the parks.

Conclusion

The effects of alternative 3 on visitor access and circulation would be long-term, major, adverse, and direct and across all three park units because of the highly restricted nature of the access.

In terms of cumulative effects, the long-term, major, adverse impacts resulting from direct and indirect actions described in this alternative would contribute a major, long-term, adverse impact to past, present, and foreseeable actions and impacts on visitor access and circulation.

Alternative 4

Direct and Indirect Effects

For those who value the experience of traveling independently (that is, without a guide) on a snowmobile, this alternative offers the most opportunity to visit the parks. However, unguided or non-commercially guided access would be limited to a small percentage of snowmobiles, so some snowmobilers who wish to travel without a guide may still not be able to do so. Some visitors who would prefer to visit by snowmobile but are unable to do so because of the daily entry limits may choose instead to visit by snowcoach. Although these people would still have access to the park, they may be adversely affected because the snowcoach tour was not their preference. Others may opt instead to visit the park on a less busy day, travel to a different entrance where the daily snowmobile limit has not been

reached (although the driving distance between the park entrances in the winter would make this impractical in most cases), or decide not to visit the park at all.

For visitors who prefer to visit the park without snowmobiles present, the number of snowmobiles permitted under alternative 4 may be a deterrent to their visit, and the impact of this alternative on those visitors would be adverse.

All park roads would remain open under these alternatives (including most side roads), so visitors would continue to have access to the park's major features and visitor circulation through the parks would remain largely unchanged from historic conditions. The Cave Falls Road would be open to snowmobiles. Under most mitigation scenarios (except perhaps snow sheds), Sylvan Pass may remain a problematic route within the park, depending on the methods of avalanche control (see section 2.6.4). Extended closures are expected to continue to occur under this alternative in order to ensure visitor and employee safety.

In Grand Teton and the Parkway, visitors would continue to be able to use snowmobiles on the CDST, Grassy Lake Road, and the frozen surface of Jackson Lake. Because more snowmobiles would be allowed on Jackson Lake than are currently, opportunities to ice fish would increase. Flagg Ranch would also continue to be accessible by motorized vehicles.

Cumulative Effects

Past, present, and foreseeable actions occurring within and around the parks which could affect visitor access and circulation are the same as those for alternative 1. The cumulative effects of alternative 4 would be similar to alternative 1, except the greater volume of recreational snowmobile and snowcoach access in the parks may result in increased use of the surrounding lands as more snowmobile-oriented visitors may travel to the Greater Yellowstone Area. Conversely (and despite the increase in snowcoach numbers), the increase in snowmobiles may discourage other visitors from coming to the GYA.

Conclusion

The effects of alternative 4 on visitor access and circulation would be long-term, negligible, and park-wide because only modest changes would occur as compared to both current and historic conditions (1025 snowmobiles is above historic averages, unguided access would be allowed, and side roads would open to snowmobiles). For those who prefer to visit with snowmobile numbers reduced or eliminated, the effects of this alternative would be long-term, moderate, park-wide, and adverse.

In terms of cumulative effects, the long-term, adverse, negligible impacts resulting from direct and indirect actions described in this alternative would contribute a negligible, adverse, long-term impact to past, present, and foreseeable actions and impacts on visitor access and circulation.

Alternative 5

Direct and Indirect Effects

For people for whom the experience of traveling independently (that is, without a guide) on a snowmobile is important, this alternative offers that type of opportunity to visit the parks. However, unguided or non-commercially guided access would be limited to a small percentage of snowmobiles, so some snowmobilers who wish to travel without a guide may still not be able to do so. Some visitors who would prefer to visit by snowmobile but are unable to do so because of the daily entry limits may choose instead to visit by snowcoach. Although these people would still have access to the park, they may be adversely affected because the snowcoach tour was not their preference. Some people may opt instead to visit the park on a less busy day, travel to a different entrance where the daily snowmobile limit

has not been reached (although the driving distance between the park entrances in the winter would make this impractical in most cases), or decide not to visit the park at all.

Because of the lower daily limit on snowmobiles, visitors for whom access to the park by snowcoach would be their only choice might find this alternative satisfactory. Similarly, those who desire reduced numbers of snowmobiles may also find this alternative preferable; others may still be dissatisfied that any snowmobiles are present.

Because of the seasonal limit on snowmobiles, if guides and outfitters utilize their allocation before the end of the winter season, snowmobile access may be eliminated for that remaining portion of the winter season. If the seasonal allocation is used up, those visitors who prefer snowcoach access may find those days attractive to visit Yellowstone, although those preferring to snowmobile late the season may be unable to do so.

All park roads would remain open under alternative 5. Visitors would continue to have access to the park's major features, and visitor circulation through the parks would remain largely unchanged from current conditions. As compared to current conditions, more side roads would be open to snowmobiles through temporal zoning, providing access to more park features. Under most mitigation scenarios (except perhaps snow sheds), Sylvan Pass may remain a problematic route within the park, depending on the methods of avalanche control (see section 2.6.5). Extended closures are expected to continue to occur under this alternative in order to ensure visitor and employee safety.

The Cave Falls Road would be designated as open for snowmobile use.

In Grand Teton and the Parkway, visitors would continue to be able to use snowmobiles on the CDST, Grassy Lake Road, and the frozen surface of Jackson Lake. Opportunities for ice fishing would remain the same on the lake as in previous winters and Flagg Ranch would continue to be accessible by motorized vehicles.

Cumulative Effects

Past, present, and foreseeable actions occurring within and around the parks which could affect visitor access and circulation are the same as those for alternative 1. The cumulative effects of alternative 5 would be similar to alternative 1, except the lower volume of recreational snowmobile use in the parks may result in decreased use of the surrounding lands. This may be offset by the unguided component, which could draw more snowmobile-oriented visitors to the Greater Yellowstone Area. The lower number of snowmobiles (and increase in snowcoach numbers) may encourage other visitors to visit the GYA.

Conclusion

The effects of alternative 5 on visitor access and circulation would be long-term, minor, adverse, and park-wide because all current routes would be open to oversnow vehicle travel. The number of snowmobiles allowed would be less than current conditions, but 20% could be self-guided.

In terms of cumulative effects, the long-term, minor, adverse impacts resulting from direct and indirect actions described in this alternative would contribute a long-term, minor, adverse impact to past, present, and foreseeable actions and impacts on visitor access and circulation.

Alternative 6

Direct and Indirect Effects

For those visitors wishing to access the interior of Yellowstone in the most cost-effective way possible, alternative 6 would provide the least expensive way to access features such as Old

Faithful and Norris Geyser Basin because tours on commercial wheeled vehicles would probably cost less than either snowcoach or snowmobile tours. For visitors wishing to have purely oversnow experience (versus wheeled vehicle), their access would be limited to the South Entrance as a starting point. Visitors could switch from wheeled vehicles to oversnow vehicles (or vice versa) at Norris Junction and at Old Faithful, which would be a benefit for visitors who want multi-mode access.

For visitors wishing to access the park on an unguided snowmobile, alternative 6 would not provide that opportunity.

For visitors desiring conditions with fewer snowmobiles, this alternative would have some attractions, because no OSV use would occur on the park's western side.

Because this alternative would close Sylvan Pass, those visitors that would otherwise tour this route will be displaced to other entrances or unable to tour Yellowstone. This would be an adverse impact for these visitors. Cross-country skiing and snowshoeing in the vicinity of Yellowstone's East Entrance would still be possible; non-motorized and motorized uses may be possible for a distance of about four miles west of the entrance.

In Grand Teton and the Parkway, visitors would continue to be able to use snowmobiles on the Grassy Lake Road and the frozen surface of Jackson Lake. Opportunities for ice fishing would remain the same on the lake as in previous winters and Flagg Ranch would continue to be accessible by motorized vehicles. Although visitors would no longer be able to snowmobile the CDST, they could either trailer their machines from the Moran area to Flagg Ranch or would be able to tour this stretch of road by wheeled vehicle.

Cumulative Effects

Past, present, and foreseeable actions occurring within and around the parks which could affect visitor access and circulation are the same as those for alternative 1. The cumulative effects of alternative 6 would be similar to alternative 1, and the change in the nature of winter access (especially from the west and north entrances in Yellowstone) may result in decreased use of the surrounding lands. Conversely, the probable lower cost to visit Yellowstone in the winter via wheeled vehicle may attract more visitors who wish to spend other parts of their trip in the Greater Yellowstone Area.

Conclusion

The effects of alternative 6 on visitor access and circulation would be long-term, moderate, park-wide, and adverse or beneficial depending on a visitor's preferred access, because the way of accessing the most heavily traveled the west side roads in Yellowstone would change to wheeled vehicles (instead of oversnow) and the East Entrance road would close to through travel. Within Grand Teton and the Parkway, access would be similar to current conditions.

In terms of cumulative effects, the long-term, moderate, park-wide, and adverse or beneficial impacts resulting from direct and indirect actions described in this alternative would contribute a moderate, long-term, adverse or beneficial (depending on a visitor's preferred mode of transportation) impact to past, present, and foreseeable actions and impacts on visitor access and circulation.

Alternative 7

Direct and Indirect Effects

Snowmobilers who wish to travel without a guide would not be able to do so under this alternative. Some visitors who would prefer to visit by snowmobile but are unable to do so

because of the daily entry limits may choose instead to visit by snowcoach. Although these people would still have access to the park, they may be adversely affected because the snowcoach tour was not their preference. Some people may opt instead to visit the park on a less busy day, travel to a different entrance where the daily snowmobile limit has not been reached (although the driving distance between the park entrances in the winter would make this impractical in most cases), or decide not to visit the park at all.

Because of the lower daily limit on snowmobiles, visitors who desire snowmobiles to be reduced or eliminated might find this alternative satisfactory. Others may still be dissatisfied that any snowmobiles are present.

Because this alternative would close Sylvan Pass, those visitors that would otherwise tour this route will be displaced to other entrances or unable to tour Yellowstone. This would be an adverse impact for these visitors. Cross-country skiing and snowshoeing in the vicinity of Yellowstone's East Entrance would still be possible; non-motorized and motorized uses may be possible for a distance of about four miles west of the entrance.

All other park roads would remain open under alternative 5. Visitors would continue to have access to the park's major features, and visitor circulation through the parks would remain largely unchanged from current conditions. As compared to current conditions, more side roads would be open to snowmobiles through temporal zoning, providing access to more park features. The Cave Falls Road would be designated open for snowmobile use.

In Grand Teton and the Parkway, visitors would continue to be able to use snowmobiles on the Grassy Lake Road and the frozen surface of Jackson Lake. Opportunities for ice fishing would remain the same on the lake as in previous winters and Flagg Ranch would continue to be accessible by motorized vehicles. Although visitors would no longer be able to snowmobile the CDST, they could either trailer their machines from the Moran area to Flagg Ranch or would be able to tour this stretch of road by wheeled vehicle. Further, visitors would have access to the Grassy Lake Road with destinations in and/or beyond the Targhee National Forest available to snowmobilers regardless of the type of machine they use.

Cumulative Effects

Past, present, and foreseeable actions occurring within and around the parks which could affect visitor access and circulation are the same as those for alternative 1. The cumulative effects of alternative 7 would be similar to alternatives 5 and 1, except the lower volume of recreational snowmobile use in the parks may result in decreased use of the surrounding lands. The lower number of snowmobiles (and increase in snowcoach numbers) may encourage other visitors to visit the GYA.

Conclusion

The effects of alternative 7 on visitor access and circulation would be long-term, minor, adverse, and park-wide because all current routes would be open to oversnow vehicle travel, but the East Entrance would be closed. The number of snowmobiles allowed would be less than current conditions.

In terms of cumulative effects, the long-term, minor, adverse, and park-wide impacts resulting from direct and indirect actions described in this alternative would contribute a long-term, minor, adverse impact to past, present, and foreseeable actions and impacts on visitor access and circulation.

Visitor Access and Circulation Conclusions

The range of alternatives analyzed in this EIS provides for a range of visitor access and circulation, both within and across the alternatives. Impacts range from major adverse to

major beneficial. Most alternatives would change visitor access and circulation relative to historic conditions and would maintain or improve visitor access and circulation relative to current conditions. Because the no-action alternative would close the park to most visitor uses, the remaining alternatives provide for a broad range of visitor access and circulation opportunities.

4.2.8 Effects on Visitor Experience

The area of analysis for visitor experience is the three parks. This section includes an analysis of quality opportunities to view and experience park resources in a minimally affected environment, with comparisons to the no-action alternative and to current and historic conditions. Resources considered in the analysis include: opportunities to view wildlife and scenery, the safe behavior of others, quality of road surfaces, availability of information, quiet and solitude, clean air, and stakeholder values. Visitor access was separately analyzed in the foregoing section. Table 4-68 defines overall levels of impacts to the visitor experience.

Assumptions and Methods

To evaluate the level of impact to the visitor experience for each alternative, the following types of information were used:

- Visitor surveys
- Assessment of visitation patterns
- Assessment of opportunities currently available under the Temporary Plan
- Assessment of opportunities historically available

Definition of Impacts

Table 4-68: Definition of Impacts to the Visitor Experience

Impact Category	Definition
Negligible	Visitors have quality opportunities to view and experience the parks in a minimally-affected environment, with safe and comfortable touring conditions, ready availability to information, good opportunities to view wildlife and scenery, and easy access to quiet, solitude, and clean air.
Minor	The impact to visitor experience is slight, without appreciably limiting or enhancing critical characteristics of the experience. Although visitors may have slight difficulties finding safe and comfortable touring conditions, ready availability to information, good opportunities to view wildlife and scenery, and/or easy access to quiet, solitude, and clean air, their visits remain high quality with a high degree of satisfaction.
Moderate	The impact to visitor experience is noticeable and may be measurable, changing critical characteristics of the desired experience, or reducing or increasing the number of visitors. Visitors will occasionally have some difficulty finding safe and comfortable touring conditions, ready availability to information, good opportunities to view wildlife and scenery, and/or easy access to quiet, solitude, and clean air. Their visits are good quality with generally good degrees of satisfaction.
Major	The impact to visitor experience is substantial and measurable, eliminating, detracting from, or greatly enhancing multiple critical characteristics of the desired experience, or greatly reducing or increasing visitation. Visitors will frequently have substantial difficulty finding safe and comfortable touring conditions, ready availability to information, good opportunities to view wildlife and scenery, and/or easy access to quiet, solitude, and clean air. Their visits are fair quality with fair degrees of satisfaction.

Effects by Alternative

Alternative 1

The requirements to use commercial guides and BAT vehicles under this alternative would offer good opportunities to view wildlife and scenery, generally safe touring conditions, ready availability of information, good opportunities for quiet and solitude, and clean air, similar to the conditions that have prevailed in the parks under the temporary winter use plan currently in effect. 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. Because guided groups travel together and because most such groups adhere to schedules which leave large periods of time free from OSV noise, periods of quiet and opportunities for solitude will remain. Additionally, the requirement to use BAT technology will continue to mean the parks will have generally clean air. Finally, although OSV travel may somewhat degrade the quality of groomed surfaces, most visitors would experience the parks on roads that are well-groomed on a regular basis.

If the road through Gibbon Canyon is closed as part of the bison-groomed road research proposal, visitors would be unable to tour this section of road. Those visitors wishing to tour the Canyon area from West Yellowstone or the Old Faithful area from Mammoth would have to undergo longer journeys to reach their destinations. By traveling more road stretches via OSVs, they would be more likely to encounter rough touring conditions, although they would tour more of the park in so doing (perhaps against their will).

This alternative would result in few changes to the visitor experience in Grand Teton because the rules for that park would remain substantially the same.

Some generalizations regarding the values-based responses of visitors to the rules under this alternative are possible. Using the characterizations of the two main values groups provided by Borrie, Freimund, and Davenport (2002),[23] adherents to "recreation and tourism resource values" may find the guiding requirement to be burdensome, although other adherents to this perspective will be satisfied that basic motorized park access is available. Adherents to "natural values" may be discouraged at the continued use of snowmobiles in the parks, although other adherents to this view will be pleased at the clean air, quiet conditions, orderly and safe visitor behavior, and information availability which would prevail under this alternative.

Compared to current conditions, this alternative would slightly improve the visitor experience because all snowcoaches would be required to meet sound and air emissions requirements, which would improve air quality and opportunities for silence. Compared to historic conditions, this alternative would significantly improve the visitor experience because visitor behavior and road surface quality would be much improved and because

[23] The values characterization provided by Borrie, Freimund, and Davenport seems to be most useful for this analysis because they specifically examined the value orientations of Yellowstone winter visitors, while both Layzer (2006) and Yochim (2004) focused more on the conflicts between and among stakeholder interest groups and federal land management agencies along with the value orientations of those groups. Note as well that Borrie, Freimund, and Davenport identified two other sets of values (Heritage and Symbolic Values and Personal Growth and Development Values), but these two sets do not seem to drive this controversy as much as the other two sets, as suggested by their absence in Layzer and Yochim. Consequently, the discussion in this text focuses on affects on Natural Values and Recreation and Tourism Resource Values. Finally, it is important to realize that adherents to these sets of values express them in different ways and that any given individual may adhere to either or both sets of values.

opportunities to obtain information and to experience quiet, solitude, clean air, and wildlife viewing are increased, although visitors desiring unguided opportunities would not be able to observe wildlife and scenery as preferred. Compared to the no-action alternative, this alternative would offer a significantly better visitor experience (except for the small minority who could ski the long distances between park attractions under the no-action alternative) since it would allow motorized access to the parks to continue.

Because this alternative would close Sylvan Pass, those visitors that would otherwise tour this route by OSV will be displaced to other entrances or unable to tour Yellowstone. This would be an adverse impact for these visitors, although the exposure to unsafe conditions sometimes present at Sylvan Pass would disappear. Cross-country skiing and snowshoeing in the vicinity of Yellowstone's East Entrance would still be possible; non-motorized and motorized uses may be possible for a distance of about six miles west of the entrance.

Mitigation of Effects

As discussed in the actions common to all alternatives, monitoring of many aspects of the visitor experience will continue (such as air quality, sound, and wildlife). The NPS will use the adaptive management plan presented in the appendices to remedy any impacts that would arise under this plan.

The use of guides and BAT technology are also mitigations for the visitor experience. As discussed above, these provisions significantly improve the visitor experience for many visitors.

Cumulative Effects

The area considered for cumulative impact assessment is that within the boundaries of the three park units along with those trends, projects, and actions in the region which may influence a visitor's experience.

The parks are one component of the GYA, which includes several national forests, wildlife refuges, and communities such as Jackson and Cody, Wyoming; West Yellowstone and Gardiner, Montana; and Island Park and Ashton, Idaho. Visits to the parks are often combined with visits to a wide variety of destinations elsewhere in the region and the three-state area. Opportunities to snowmobile abound on the public lands around the parks, with both on-and off-trail access available at a variety of skill levels. As indicated in the Chapter IV Socioeconomics discussion, use of the parks and surrounding lands does not always correlate. Some areas have observed decreases in use in recent years, but the relationship of such declines to park visitation is unclear.

Completion of the NPS visitor centers at Old Faithful, Canyon, and Moose, and the Laurance S. Rockefeller Preserve will improve (or are already improving) the visitor experience for many. Similarly, further reclamation of the abandoned mines above Cooke City would improve the experience for visitors, some of whom snowmobile or ski in that area.

Actions taken by the U.S. Forest Service on national forest lands outside the parks may alter opportunities for snow-based recreation. The increase or decrease in these opportunities may add to or diminish the quality of the visitor experience that park visitors may have. Changes in current activities outside the park may be included in revisions to the forest plans and/or travel plans being contemplated by many of the surrounding national forests. While most of those changes are unknown at this time, with uncertain effects on visitor experience, the national forests have all amended their forest plans for grizzly bear and lynx conservation. These amendments may affect visitor experience indirectly, because the forests may be less able to respond to changing recreation trends than they would otherwise be.

Regional population growth, rural land subdivision/reduction of public land access, changing demographics, and increasing outfitter/guide activity may also affect visitor experience. Population growth and changing demographics may lead to increased demand for recreation in finite areas, with rural land subdivision also possibly limiting the availability of public land. Some visitors may enjoy the increased outfitter and guide activity (particularly the ability to learn from knowledgeable guides).

Conclusion

Under Alternative 1, visitors will continue to be able to view and experience the parks in a natural setting, enjoying good access to information through their guides and the new and existing visitor centers. Opportunities to view wildlife and scenery will abound and access to quiet, solitude, and clean air will be abundant. However, OSV roads could be rough at times under this alternative, so the overall effects of this alternative on the visitor experience would be minor, adverse, long-term, and direct. This alternative would result in no unacceptable impacts to the visitor experience.

In terms of cumulative effects, the minor, adverse, short-term impacts resulting from direct and indirect actions described in this alternative would contribute a minor, adverse, short-term impact to past, present, and foreseeable actions and impacts on visitor experience.

Alternative 2

The requirements to use only snowcoaches (all of them BAT) would offer good opportunities to view wildlife and scenery and availability of information. Snowcoach drivers are familiar with typical wildlife viewing locations and routinely make impromptu stops to view wildlife and park scenery. They usually provide informative commentary to their clients; other information would continue to be available at warming huts, contact stations, visitor centers, and entrance stations. However, due to the generally slower speed of coaches, visitors may not be able to see as much of the park as they desire and those desiring unguided tours would not have such opportunities. Safe and comfortable touring conditions, opportunities for quiet and solitude, and cleaner air would be present because all snowcoaches would be BAT (leading to cleaner air and quieter conditions) and because the fewer number of them on the roads would mean generally safer and smoother travel conditions. Grooming efforts may need modification from current conditions to account for coach-specific ruts.

In Grand Teton as in Yellowstone, all snowmobile use would be disallowed. While this restriction would have little impact upon the park resources one might otherwise experience from the CDST (because it is immediately adjacent to a road which would remain plowed and open to visitors), it would mean that the frozen surface of Jackson Lake (along with some fishing opportunities) and the Grassy Lake Road would not be accessible to motorized visitors. Although there is little wildlife visible from these two roadways, there is good scenery. Consequently, this alternative would mean that the scenery visible from these two areas and some Jackson Lake fishing would be more difficult for most people to access. Conversely, because snowmobiles would be banned from the parks, there would be increased opportunities for quiet and solitude and clean air. Information availability would be unaffected.

Regarding values-based responses of visitors to the rules under this alternative, adherents to recreation and tourism resource values would likely find the snowcoach-only requirement to be burdensome. However, some adherents to this perspective will be satisfied that basic motorized park access is still possible. Some adherents to natural values would likely be encouraged by the elimination of snowmobiles from the parks and most adherents to this

view would likely be pleased at the clean air, quiet conditions, orderly and safe visitor behavior, and ready information availability which would prevail under this alternative.

Compared to current conditions, this alternative would improve air quality, opportunities to enjoy silence and solitude, and safe and comfortable touring conditions. While some visitors would not enjoy snowcoach travel, others would enjoy the ready availability of information and ability to view wildlife and scenery. Compared to historic conditions, this alternative would significantly improve the visitor experience because visitor behavior and road surface quality would be much improved and because opportunities to obtain information and to experience quiet, solitude, clean air, and wildlife viewing would be increased. However, due to the generally slower speed of coaches, visitors may not be able to tour as much of the park as they desire, being restricted to group tours. Compared to the no-action alternative, this alternative would offer a significantly better visitor experience (except for the small minority who could ski the long distances between park attractions under the no-action alternative) since it would allow basic motorized access to the parks to continue.

Because this alternative would close Sylvan Pass, those visitors that would otherwise tour this route by OSV will be displaced to other entrances or unable to tour Yellowstone. This would be an adverse impact for these visitors, although the exposure to unsafe conditions sometimes present at Sylvan Pass would disappear. Cross-country skiing and snowshoeing in the vicinity of Yellowstone's East Entrance would still be possible; non-motorized and motorized uses may be possible for a distance of about four miles west of the entrance.

Mitigation of Effects

As discussed in the actions common to all alternatives, monitoring of many aspects of the visitor experience will continue (such as air quality, sound, and wildlife). The NPS will use the adaptive management plan presented in the appendices to remedy any impacts that would arise under this plan.

The use of BAT snowcoaches is also mitigation for aspects of the visitor experience such as cleaner air and quieter conditions. However, some visitors will not enjoy the lack of touring freedom association with coaches, although drivers' habits of stopping for wildlife and scenery viewing would mitigate this problem, as would their tendency to provide commentary. As discussed above, these provisions would improve the visitor experience for many visitors.

Cumulative Effects

Past, present, and foreseeable actions occurring within and around the parks which could affect visitor experience are the same as those for alternative 1. The cumulative effects of this alternative would be similar to those of alternative 1.

Conclusion

Under this alternative, visitors will continue to be able to view and experience the parks in a natural setting, enjoying good access to information through their snowcoach driver/guides and the new and existing visitor centers. Opportunities to view wildlife and scenery will abound and access to quiet, solitude, and clean air will be more abundant than under most other alternatives, especially once snowcoach BAT is implemented. However, some parts of Grand Teton National Park would become more difficult to access, snowcoaches would tour Yellowstone at slower speeds than snowmobile tours, and snowcoach ruts could be a problem. Consequently, implementation of snowcoach-only access under this alternative would result in minor, adverse, long-term, and direct impacts to the visitor experience. This alternative would result in no unacceptable impacts to the visitor experience.

In terms of cumulative effects, the impacts resulting from direct and indirect actions described in this alternative would contribute a minor, long-term, adverse, impact to past, present, and foreseeable actions and impacts on visitor experience.

Alternative 3

For the one road that would be open under this alternative, the effects on the visitor experience would be the same as those under alternative 1. The closure of most of the park, however, would have substantial effects upon the visitor experience. Visitors would not be able to enjoy the wildlife, scenery, silence, solitude, clean air, or information on those roads (some visitor contact stations would have to close). Additionally, the only road open under 3A has little wildlife, compounding the visitor's inability to view wildlife. Also, concentrating all visitor use on that one route would result in fewer opportunities to experience silence and solitude in that area. Safety and touring comfort on the only road open would be generally good.

In Grand Teton, the Grassy Lake Road would remain open but both Jackson Lake and the CDST would be closed. While this restriction would have little impact upon the park resources one can experience from the CDST (because it is immediately adjacent to a road which would remain plowed and open to visitors), it would mean that the frozen surface of Jackson Lake would no longer be accessible to motorized visitors, along with associated fishing opportunities. Although there is little wildlife visible from these two areas, there is good scenery. Consequently, this alternative would mean that the scenery visible from these two areas would be more difficult for most people to access as well as some Jackson Lake fishing opportunities. Conversely, because snowmobiles would be banned from the frozen lake surface, there would be increased opportunities for quiet and solitude and clean air for those visitors able to ski or snowshoe there. Information availability would be unaffected. Opportunities for safe and comfortable touring conditions would remain generally unchanged from the present on the Grassy Lake Road.

Regarding values-based responses of visitors to the rules under this alternative, adherents to recreation and tourism resource values would likely find these rules to be quite burdensome because most of the parks would be closed. However, a few adherents to this perspective would be satisfied that motorized access to Old Faithful is still possible under 3A. Some adherents to natural values would likely be encouraged by the reduction or elimination of snowmobiles from the parks and other adherents to this view would likely be pleased at the clean air, quiet conditions, and orderly and safe visitor behavior which would prevail under this alternative. However, some adherents to natural values would regret the lack of access possible and reduced information availability under this alternative.

Compared to both current and historic conditions, this alternative's effects upon the visitor experience would be adverse and substantial. Most of the parks would be closed, eliminating any possible experience for most visitors (skiers and snowshoers could still use the park under 3B). The one open road has little wildlife and could see visitor use more concentrated than it is currently (but still less than it was historically).

Mitigation of Effects

As discussed in the actions common to all alternatives, monitoring of many aspects of the visitor experience would continue (such as air quality, sound, and wildlife). The NPS would use the adaptive management plan presented in the appendices to remedy any impacts that would arise under this plan.

The use of guides and BAT are also mitigations for the visitor experience. As discussed above, these provisions significantly improve the visitor experience for many visitors. However, the

closure of much of the parks to visitor access would have substantial impacts upon the visitor experience, impacts not easily mitigated.

Cumulative Effects

Past, present, and foreseeable actions occurring within and around the parks which could affect visitor experience are the same as those for alternative 1. When added to the potential actions of other agencies adjacent to Yellowstone or within the park which would act to restrict access, this alternative could have the effect of dramatically and adversely affecting the visitor experience.

Conclusion

Closure of the majority of Yellowstone park roads and Jackson Lake and the CDST to OSV travel would mean that visitors would not be able to enjoy the wildlife, scenery, silence, solitude, clean air, or information on those roads. Therefore, the effects of implementing this alternative on the visitor experience would be major, adverse, long-term, and direct. This alternative would result in no unacceptable impacts to the visitor experience (many other national parks close almost completely in the winter).

In terms of cumulative effects, the major, adverse, long-term impacts resulting from direct and indirect actions described in this alternative would contribute a moderate, adverse, long-term impact to past, present, and foreseeable actions and impacts on visitor experience.

Alternative 4

The increased numbers of snowmobiles and coaches allowed under this alternative would provide ample opportunities to view wildlife and scenery. However, travel corridors could be fairly busy, causing some wildlife to move away from the roadsides. The 80% of park visitors who would take a guided tour and/or a snowcoach tour would also enjoy ready availability of information; the 20% who would not would still have access to visitor contact stations. Some visitors would enjoy the provision for some non-commercial access, being able to spend as much time as they would like observing wildlife and scenery. Guides, though, accommodate such wishes as much as possible and know which areas wildlife tend to frequent. Safe and comfortable touring conditions would be present, but the large number of visitors allowed under this alternative would result in bumpy road conditions at times and the unguided visitors could result in reduced safety. Although most groups would be guided and all visitors would have to use BAT machines, resulting in better access to clean air, silence, and solitude than was possible historically, the high numbers of OSVs allowed under this alternative would result in objectionable levels of some air pollutants (though still well below NAAQS) and sometimes difficult access to silence and solitude.

In Grand Teton, the effects of implementing this alternative on visitor experience would be similar to those of Yellowstone. Because snowmobiles used on the Grassy Lake Road would be exempt from BAT regulations, air quality would diminish in that area.

Regarding values-based responses of visitors to the rules under this alternative, adherents to recreation and tourism resource values may find the provision for some unguided touring to be attractive. Most adherents to this perspective would be satisfied that motorized park access is readily available. Adherents to natural values might be discouraged at the continued use of snowmobiles in the parks, the large numbers of them, difficulty (at times) in finding safe and comfortable touring conditions, possible air pollution, and occasional difficulty finding silence and solitude. Some other adherents to this view would be pleased at the generally clean air and ready information availability which would prevail under this alternative.

Compared to current conditions, this alternative would generally decrease the quality of the visitor experience because the higher number of snowmobiles it allows would result in bumpier roads, diminished air quality, reduced opportunity to enjoy silence and solitude and wildlife, and less safe conditions. Information availability would be similar, and opportunities to view scenery could be enhanced with the provision for non-commercially guided access. Relative to historic conditions, this alternative would have generally opposite effects: improved air quality, improved opportunity to enjoy silence and solitude and wildlife, safer conditions, and improved information availability. Road quality could decline, since this alternative would allow more snowmobiles than occurred historically (an average of 795 per day). Compared to the no action alternative which would end motorized OSV use in the parks, this alternative has much improved visitor experience for all but the minority of skiers that could still access Yellowstone.

Mitigation of Effects

As discussed in the actions common to all alternatives, monitoring of many aspects of the visitor experience would continue (such as air quality, sound, and wildlife). The NPS would use the adaptive management plan presented in the appendices to remedy any impacts that would arise under this plan.

The use of guides and BAT are also mitigations for the visitor experience. As discussed above, these provisions improve the visitor experience for many visitors.

Cumulative Effects

Past, present, and foreseeable actions occurring within and around the parks which could affect visitor experience are the same as those for alternative 1. The effects of this alternative, when added to the potential actions of other agencies adjacent to Yellowstone or within the park which would act to increase motorized vehicle access, could have the effect of adversely affecting the experience of the non-motorized visitor. This alternative would be expected to have cumulative impacts similar to those of alternative 1.

Conclusion

Under this alternative, visitors will continue to be able to view and experience the parks in a natural setting, enjoying good access to information through their snowcoach driver/guides and the new and existing visitor centers. However, the use of some non-BAT snowmobiles could degrade air quality and result in less safe conditions, and the high numbers of snowmobiles could result in bumpy road conditions, less available wildlife viewing, reduced air quality, and reduced access to quiet and solitude. Consequently, implementation of this alternative would have moderate, adverse, long-term, and direct effects upon the visitor experience. No unacceptable impacts would occur to the visitor experience.

In terms of cumulative effects, the moderate, adverse, and long-term impacts resulting from direct and indirect actions described in this alternative would contribute a minor, adverse, long-term impact to past, present, and foreseeable actions and impacts on visitor experience.

Alternative 5

The effects of implementing alternative 5 on the visitor experience would be similar to those of implementing alternative 1. The primary differences would be that alternative 5 would allow fewer snowmobiles; some could be unguided; Sylvan Pass would not be closed; and snowmobiles would have to use improved BAT. The provisions for lower snowmobile numbers and improved BAT would mean that opportunities for quiet and solitude and clean air would be even more available along with safe and comfortable touring conditions. The provision for some unguided visitors could result in improved scenery viewing but less safe

conditions, although all such visitors would have to undergo pre-trip training. The ability to travel over Sylvan Pass would enhance the visitor experience for some, although the frequent closures necessary to maintain safe travel over the pass would inconvenience some and the ongoing risk of an avalanche accident or fatality would be an ongoing safety concern.

Regarding values-based responses of visitors to the rules under this alternative, adherents to recreation and tourism resource values may find the guiding requirement to be burdensome, although other adherents to this perspective would be satisfied that basic motorized park access is available and that some unguided tours are possible. Adherents to natural values may be discouraged at the continued use of snowmobiles in the parks, although other adherents to this view would be pleased at the clean air, quiet conditions, orderly and safe visitor behavior, and ready information availability which would prevail under this alternative.

Compared to current conditions, this alternative would offer very similar conditions, except during peak periods when increased OSV travel could reduce opportunities for quiet and solitude and clean air. Compared to historic conditions, this alternative would have substantial benefits for the visitor experience, with improved access to clean air, quiet and solitude, information availability, safe and comfortable touring conditions, and wildlife and scenery viewing. Compared to the no action alternative which would prohibit motorized OSV access to most of Yellowstone, this alternative also offers substantial benefits for the visitor experience.

Mitigation of Effects

As discussed in the actions common to all alternatives, monitoring of many aspects of the visitor experience would continue (such as air quality, sound, and wildlife). The NPS would use the adaptive management plan presented in the appendices to remedy any impacts that would arise under this plan.

The use of guides, BAT, and improved BAT are also mitigations for the visitor experience. As discussed above, these provisions significantly improve the visitor experience for many visitors.

Cumulative Effects

Past, present, and foreseeable actions occurring within and around the parks which could affect visitor experience are the same as those for alternative 1. The cumulative effects of this alternative would be similar to those of alternative 1.

Conclusion

Under this alternative, visitors will continue to be able to view and experience the parks in a natural setting, enjoying good access to information through their snowcoach driver/guides and the new and existing visitor centers. Opportunities to view wildlife and scenery will abound and access to quiet, solitude, and clean air will be more abundant than under most other alternatives, mainly due to the improved BAT requirement. Overall, implementation of this alternative would have minor, adverse, long-term, and direct effects upon the visitor experience due to the provision for some unguided access, but that would be balanced by the improved BAT and lower overall OSV numbers. No unacceptable impacts would occur to the visitor experience.

In terms of cumulative effects, the minor, adverse, and long-term impacts resulting from direct and indirect actions described in this alternative would contribute a minor, adverse, long-term impact to past, present, and foreseeable actions and impacts on visitor experience.

Alternative 6

The effects of implementing alternative 6 on the visitor experience would be similar to those of implementing alternative 1. The primary differences would be that alternative 6 would provide for commercial wheeled vehicle access on Yellowstone's mid-elevation west-side roads, which would be plowed. Such tours would be less expensive than either snowmobile or snowcoach rentals, allowing a wider cross-section of visitors to tour Yellowstone. Because buses can carry more people, this alternative would allow the greatest number of people to visit Yellowstone in winter (which could make crowding a possibility at Old Faithful, given the small number of facilities open there in winter). Just as with snowcoaches, bus drivers/guides would be familiar with likely wildlife locations and would stop when possible to observe them and the park's scenery. Additionally, the sophisticated emissions control equipment on modern buses and vans will mean the parks will have clean, pristine air quality, although the road sanding necessary for their safe usage could result in minor, temporary visibility degradation.

In Grand Teton and the parkway, effects and comparisons would be similar to those in Yellowstone, except for the fact that the CDST would be closed. While that closure would make one form of motorized touring unavailable in that area, the plowed road parallel to the CDST would mean that the scenery and wildlife viewing available there would remain open to visitors.

Regarding values-based responses of visitors to the rules under this alternative, adherents to recreation and tourism resource values may find the guiding requirement and the provision for wheeled vehicle access to be burdensome, although other adherents to this perspective would be satisfied that basic motorized park access is available and that a diversity of touring options are possible. Adherents to natural values may be discouraged at the continued use of snowmobiles in the parks, although other adherents to this view would be pleased at the clean air, quiet conditions, orderly and safe visitor behavior, and information availability which would prevail under this alternative, especially on Yellowstone's west side.

Compared to current conditions, this alternative would offer very similar conditions, with the primary difference being the substitution of commercial buses and vans for snowcoaches and snowmobiles on Yellowstone's west side. The various measures of visitor satisfaction, however, would likely remain similar, such as clean air and access to quiet and solitude. Compared to historic conditions, this alternative would have substantial benefits for the visitor experience, with improved access to clean air, quiet and solitude, information availability, safe and comfortable touring conditions, and wildlife and scenery viewing. Compared to the no action alternative which would prohibit motorized OSV access to most of Yellowstone, this alternative also offers substantial benefits for the visitor experience.

Because this alternative would close Sylvan Pass, those visitors that would otherwise tour this route by OSV will be displaced to other entrances or unable to tour Yellowstone. This would be an adverse impact for these visitors, although the exposure to unsafe conditions sometimes present at Sylvan Pass would disappear. Cross-country skiing and snowshoeing in the vicinity of Yellowstone's East Entrance would still be possible; non-motorized and motorized uses may be possible for a distance of about four miles west of the entrance.

Mitigation of Effects

As discussed in the actions common to all alternatives, monitoring of many aspects of the visitor experience would continue (such as air quality, sound, and wildlife). The NPS would use the adaptive management plan presented in the appendices to remedy any impacts that would arise under this plan.

The use of guides, BAT, and wheeled vehicles on the west side of Yellowstone are also mitigations for the visitor experience. As discussed above, these provisions significantly improve the visitor experience for many visitors.

Cumulative Effects

Past, present, and foreseeable actions occurring within and around the parks which could affect visitor experience are the same as those for alternative 1. The cumulative effects of this alternative would be similar to those of alternative 1.

Conclusion

Under this alternative, visitors will continue to be able to view and experience the parks in a natural setting, enjoying good access to information through their guides and coach drivers and the new and existing visitor centers. Opportunities to view wildlife and scenery will abound and access to quiet, solitude, and clean air will be abundant, especially for those unable to afford snowmobile or snowcoach access. However, some parts of Grand Teton National Park would become more difficult to access, road sanding could lead to isolated visibility impairment, and the larger numbers of visitors allowed under this alternative could lead to crowding at Old Faithful. Consequently, implementation of this alternative would have minor, adverse, long-term, and direct effects upon the visitor experience. No unacceptable impacts would occur to the visitor experience.

In terms of cumulative effects, the minor, adverse, and long-term impacts resulting from direct and indirect actions described in this alternative would contribute a minor, adverse, long-term impact to past, present, and foreseeable actions and impacts on visitor experience.

Alternative 7

The effects of implementing alternative 7 on the visitor experience would be similar to those of implementing alternative 1. The primary differences would be that alternative 7 would allow fewer snowmobiles, the CDST would be converted to a trailered route from the Moran area to Flagg Ranch, and that five more snowcoaches would be allowed per day in Yellowstone. The provisions for lower snowmobile numbers would mean that opportunities for quiet and solitude and clean air would be more available than currently, along with safe and comfortable touring conditions. The CDST conversion will mean snowmobilers traveling this route will not be able to snowmobile from Moran to Flagg Ranch, but since the plowed road covers the same distance, visitors will still be able to enjoy this area of Grand Teton National Park by wheeled vehicles.

If the road through Gibbon Canyon is closed as part of the bison-groomed road research proposal, visitors would be unable to tour this section of road. Those visitors wishing to tour the Canyon area from West Yellowstone or the Old Faithful area from Mammoth would have to undergo longer journeys to reach their destinations. By traveling more road stretches via OSVs, they would be more likely to encounter rough touring conditions, although they would tour more of the park in so doing (perhaps against their will).

Because this alternative would close Sylvan Pass, those visitors that would otherwise tour this route by OSV will be displaced to other entrances or unable to tour Yellowstone. This would be an adverse impact for these visitors, although the exposure to unsafe conditions sometimes present at Sylvan Pass would disappear. Cross-country skiing and snowshoeing in the vicinity of Yellowstone's East Entrance would still be possible; non-motorized and motorized uses may be possible for a distance of about four miles west of the entrance.

Regarding values-based responses of visitors to the rules under this alternative, adherents to recreation and tourism resource values may find the guiding requirement and CDST

conversion to be burdensome, although other adherents to this perspective would be satisfied that basic motorized park access is available. Adherents to natural values may be discouraged at the continued use of snowmobiles in the parks, although other adherents to this view would be pleased at the clean air, quiet conditions, orderly and safe visitor behavior, and ready information availability which would prevail under this alternative.

Compared to current conditions, this alternative would offer very similar conditions, except during peak periods when increased OSV travel might reduce opportunities for quiet and solitude and clean air. Compared to historic conditions, this alternative would have substantial benefits for the visitor experience, with improved access to clean air, quiet and solitude, information availability, safe and comfortable touring conditions, and wildlife and scenery viewing. Compared to the no action alternative which would prohibit motorized OSV access to most of Yellowstone, this alternative also offers substantial benefits for the visitor experience.

Mitigation of Effects

As discussed in the actions common to all alternatives, monitoring of many aspects of the visitor experience would continue (such as air quality, sound, and wildlife). The NPS would use the adaptive management plan presented in the appendices to remedy any impacts that would arise under this plan.

The use of guides and BAT and the reduction in snowmobile numbers also mitigations for the visitor experience, especially with soundscapes. As discussed above, these provisions significantly improve the visitor experience for many visitors.

Cumulative Effects

Past, present, and foreseeable actions occurring within and around the parks which could affect visitor experience are the same as those for alternative 1. The cumulative effects of this alternative would be similar to those of alternative 1.

Conclusion

Under this alternative, visitors will continue to be able to view and experience the parks in a natural setting, enjoying good access to information through their guides and snowcoach drivers and the new and existing visitor centers. Opportunities to view wildlife and scenery will abound and access to quiet, solitude, and clean air will be abundant, mainly due to the reduced snowmobile numbers. Overall, implementation of this alternative would have minor, adverse, long-term, and direct effects upon the visitor experience due to the closure of Sylvan Pass, but the avalanche risk there would disappear. No unacceptable impacts would occur to the visitor experience.

In terms of cumulative effects, the minor, adverse, and long-term impacts resulting from direct and indirect actions described in this alternative would contribute a minor, adverse, long-term impact to past, present, and foreseeable actions and impacts on visitor experience.

Visitor Experience Conclusions

The range of alternatives analyzed in this EIS provides for a range of visitor experiences, both within and across the alternatives. Impacts range from minor adverse to major adverse, although all alternatives would provide for generally enjoyable, positive visitor experiences. Most alternatives would improve the visitor experience relative to historic conditions and would maintain or improve the visitor experience relative to current conditions. Because the no-action alternative would close the park to most visitor uses, the remaining alternatives would provide for a broad range of visitor experiences to continue.

4.3 Impairment of Park Resources and Values and Unacceptable Impacts on Them

4.3.1 Background

At the beginning of Chapter IV is a discussion of the policy background on impairment and unacceptable impacts. This subject is also discussed under each of the appropriate topics in this chapter. This section reviews the past impairment determinations made in previous winter planning processes and summarizes the impairment and unacceptable impact discussion for the alternatives in this EIS.

The Final EIS ROD (November 22, 2000) concluded that of the seven alternatives evaluated in the Final EIS, only one (alternative G) did not exceed a level of impairment under NPS policy. This was the primary basis for selecting this alternative, as explained in the ROD. Alternative G in the Final EIS, which called for the phase-out of snowmobile use in the parks, was found not to result in impairment of park resources or values whose impacts are disclosed in the Final EIS. In all other Final EIS alternatives, snowmobile use in YNP was found to impair air quality, wildlife, the natural soundscape, and opportunities for enjoyment of the park by visitors. In GTNP, impairment was found to result from snowmobile and snowplane use on the natural soundscape and opportunities for enjoyment of the park. In the Parkway, impairment was found to result from snowmobile use on air quality, the natural soundscape, and opportunities for enjoyment of the park. There is no new evidence contradicting the finding that historically unlimited snowmobile and snowplane use impaired park resources and values.

The Final EIS ROD, based on the information available at the time, found impairment for all alternatives with snowmobile use, including those that would have required phased-in use of cleaner and quieter snowmobiles in accordance with objectives set for sound and air emissions. It was determined that there was no way to mitigate the impairment short of reducing the amount of use as determined by an effective carrying capacity analysis, or by imposing a limit unsupported by such an analysis (ROD, pages 18-19).

The rule implementing Final EIS alternative G, published in the *Federal Register* on January 22, 2001, recognized that "achieving compliance with the applicable legal requirements while still allowing snowmobile use would require very strict limits on the numbers of both snowmobiles and snowcoaches" (*Fed. Reg.* 66 (14): 7562). Thus, through appropriate management actions, the November 2000 ROD and the January 2001 rule recognized that snowmobile and snowcoach use could possibly be accommodated in YNP and GTNP without constituting impairment to park resources and values.

The SEIS and the March 25, 2003, ROD reinforced these conclusions. The SEIS found that alternatives with strict limitations on snowmobile numbers, combined with other restrictions (technology and guiding) and intensive monitoring and adaptive management would not constitute impairment. However, the SEIS also found that winter use alternatives that called for fewer restrictions on numbers, technology, and guiding could result in the types of unacceptable impacts that characterized historic conditions in the parks, and thus would constitute an impairment of park resources and values (NPS 2003: 243-244).

The Temporary EA and Finding of No Significant Impact (2004) came to similar conclusions as the EIS and SEIS regarding impairment resulting from historic conditions.

The analysis for this EIS supports the previous documents' conclusions. New modeling for this EIS also looked at historic (circa 1999) conditions when unlimited and virtually unregulated two-stroke snowmobile use was allowed. At that time, snowmobiles were the

dominate mode of access to the parks. In Yellowstone, an average of 795 snowmobiles and 15 snowcoaches entered the park each day. The new modeling and analysis was conducted to help decision makers understand and compare the alternatives with historic conditions. For example, the new air quality analysis indicates that historic snowmobile use generated 3,045 tons of carbon monoxide per winter, almost 12 times the quantity that is generated by any of the alternatives being considered in this EIS. In addition, the air quality analysis took into consideration EPA regulations regarding snowmobile emissions and looked forward to the year 2010 to help the decision maker understand how those regulations might affect air quality under historic conditions. This additional analysis was conducted with the recognition that technological changes are underway with snowmobiles and a strict return to historic conditions would not occur. After taking into consideration implementation of the EPA regulations, the air quality analysis of "historic conditions circa 2010" indicated that 1,124 tons per year of carbon monoxide would be produced (over four times more than the most polluting alternative under consideration in this EIS).

For wildlife, historic conditions created considerable negative interactions between visitors and wildlife, conditions that were found to constitute impairment of park resources (NPS 2000b). Much of the conflict occurred when wildlife were on or near the groomed roadways and groups of snowmobilers attempted to pass them. Especially with bison, this resulted in situations where animals were trapped between groups of snowmobiles traveling in opposite directions, occasional stampeding bison, and excess energy expenditure by bison to avoid snowmobiles. This situation has markedly changed in the last three years, largely due to the implementation of mandatory guiding. Guides are trained in how to pass wildlife on the groomed roadways with as little stress to the animal as possible. Field rangers in Yellowstone have noticed a pronounced drop in adverse wildlife-visitor interactions upon the roadways (Tabor 2006).

For visitor experience, new analysis indicates that historic conditions created unpleasant touring situations for visitors. Many complained about ubiquitous noise of snowmobiles, with many others complaining about air pollution and inappropriate encounters with wildlife. Present conditions are markedly different. Complaints from visitors about unpleasant touring situations have virtually ceased. While some visitors do not like the mandatory guiding, others enjoy learning from their guides and touring the park with them. Opportunities to enjoy scenery and wildlife are as good as or better than before, in part because guides are familiar with common wildlife locations. Opportunities to enjoy quiet and solitude have improved, as four-stroke snowmobiles are quieter than two-strokes and all snowmobilers travel with guides, leaving long windows of time free of any OSV noise. Traveling with guides has dramatically improved the safety of touring, as guides enforce proper touring behavior such as driving within speed limits. BAT snowmobiles also produce fewer hazardous emissions, reducing the exposure to hazardous air pollutants to acceptable levels.

For soundscapes, new analysis indicates that historic conditions created unacceptable percent time audibility in the parks. Historically, developed areas and travel corridors typically had OSV sounds audible at or near 100% of the time. Transition zones and some backcountry areas experienced more than double the percent time audible under current conditions. As noted under visitor experience, it was difficult to escape the sound of OSV travel.

4.3.2 Alternative 1

When fully implemented, alternative 1 would not impair park resources or values or create unacceptable impacts. The actions described in this alternative do not severely affect a

resource or value whose conservation is 1) necessary to fulfill specific legislative purposes; 2) key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park; or 3) identified as a goal in the parks' general management plan or other relevant NPS planning documents. Similarly, the actions in this alternative also would not 1) be inconsistent with a park's purposes or values; 2) impede the attainment of a park's desired future conditions for natural and cultural resources as identified through the parks' planning processes; 3) create an unsafe or unhealthy environment for visitors or employees; 4) diminish opportunities for current or future generations to enjoy, learn about, or be inspired by park resources or values; or 5) unreasonably interfere with park programs or activities; an appropriate use of the parks; the atmosphere of peace and tranquility; or the natural soundscape maintained in wilderness and natural, historic, or commemorative locations within the parks.

Although adverse impacts could occur under this alternative to wildlife, air quality, noise, and visitor experience, impacts are at acceptable levels and may be mitigated through management actions.

The NPS believes this alternative would not constitute impairment to park resources or values for several reasons. The NPS will continue intensive monitoring of park resources and values, including air quality, natural soundscapes, wildlife, employee health and safety, and visitor experience. This will provide the NPS with ongoing information to assess the impacts of alternative 1 to park resources and values and to make adjustments, as appropriate, in winter use management. Appendix E contains a discussion and table on the Monitoring and Adaptive Management framework. The thresholds within the adaptive management framework are a tool for managers to help them determine if the goals and objectives of the winter use plan are being achieved. They will continue to be employed and evaluated throughout the duration of the regulation ensuing from this EIS. The superintendents of the parks may take emergency actions to protect park resources and values if necessary.

Alternative 1 is an intensively managed approach to prevent unacceptable impacts or impairment of park resources and values through strict requirements on snowmobiles and snowcoaches and comprehensive monitoring. Alternative 1 sets daily entry limits that represent a use level just under the historical average number of snowmobiles entering YNP and which eliminate peak use days experienced in the past. Limits on the numbers of snowmobiles will result in fewer conflicts with wildlife, fewer air and noise emissions, and improved road conditions. Limits on the numbers of snowmobiles also provide park managers with more predictable winter use patterns and an assurance that use cannot increase. Alternative 1 also closes the Sylvan Pass Area to oversnow vehicle travel, thus addressing an important health and safety concern.

The road segment from Madison Junction to Norris Junction through Gibbon Canyon could be closed for bison-groomed road research. As explained earlier, this action would be for the purpose of conducting an experiment on bison movement in the park. This action would severely inconvenience park visitors wishing to travel through that road corridor (from Mammoth to Old faithful or West Yellowstone to Canyon), and probably cause visitors to alter their travel plans. However, the well-known park features would be accessible, albeit at much greater distances and time for some visitors. Similarly, park operations would be hampered because support for NPS and Xanterra operations at Old Faithful is based in Mammoth. Restructuring of how support services are provided would be necessary if the road segment were closed. Also Yellowstone Expeditions (based in West Yellowstone) that has the yurt camp at Canyon would need to alter their operations significantly to continue to support the camp in that location.

This alternative also mandates that all snowmobilers enter the park accompanied by commercial guides. This requirement will reduce conflicts with wildlife along roadways because guides will be trained to deal with such situations. Guided parties tend to be larger in size, which reduces the overall number of encounters with wildlife. Commercial guides are required to be educated in safety and are knowledgeable about park rules. Commercial guides must also have reasonable control over their clientele, which greatly reduces unsafe and illegal snowmobile use. In this way, guides will ensure that park regulations are enforced and will provide a safer experience for visitors.

Finally, this alternative requires that both snowmobiles and snowcoaches entering the park utilize BAT for noise and air emissions. This requirement will ensure that all recreational OSVs operating in the parks employ state of the art emissions control equipment. Currently, BAT snowmobiles are capable of reducing HC by 90% and CO by 70%. Further, BAT snowmobiles and snowcoaches are capable of operating at or below 73 dBA, whereas standard two-stroke snowmobiles operate at 75 to 78 dBA. Currently, BAT snowcoaches are capable of reducing HC emissions by an average of 80%, CO by 93%, and NOx by 55%. Implementation of snowcoach BAT requirements by the winter of 2011-2012 may reduce coach emissions further.

4.3.3 Alternative 2

When fully implemented, alternative 2 would not impair park resources or values or create unacceptable impacts. The actions described in this alternative do not severely affect a resource or value whose conservation is 1) necessary to fulfill specific legislative purposes; 2) key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park; or 3) identified as a goal in the parks' general management plan or other relevant NPS planning documents. The actions in this alternative also would not 1) be inconsistent with a park's purposes or values; 2) impede the attainment of a park's desired future conditions for natural and cultural resources as identified through the parks' planning processes; 3) create an unsafe or unhealthy environment for visitors or employees; 4) diminish opportunities for current or future generations to enjoy, learn about, or be inspired by park resources or values; or 5) unreasonably interfere with park programs or activities; an appropriate use of the parks; the atmosphere of peace and tranquility; or the natural soundscape maintained in wilderness and natural, historic, or commemorative locations within the parks.

The NPS believes this alternative would not constitute impairment to park resources or values for several reasons. The NPS will continue intensive monitoring of park resources and values, including air quality, natural soundscapes, wildlife, employee health and safety, and visitor experience. This will provide the NPS with ongoing information to assess the impacts of alternative 2 to park resources and values and to make adjustments, as appropriate, in winter use management. Appendix E contains a discussion and table on the Monitoring and Adaptive Management framework. The thresholds within the adaptive management framework are a tool for managers to help them determine if the goals and objectives of the winter use plan are being achieved. They will continue to be employed and evaluated throughout the duration of this EIS. The superintendents of the parks may take emergency actions to protect park resources and values if necessary.

Alternative 2 is similar to implementation of the November 22, 2000 ROD. That ROD found that the impacts associated with the actions proposed by alternative 2 would not constitute an impairment of park resources and values. Although adverse impacts could occur under this alternative to wildlife, air quality, and noise from mass transit use, they are at low levels and may be mitigated. Unlike the November 2000 ROD, this alternative proposes that snowcoaches meet BAT requirements for emissions and noise, further reducing air and noise

impacts. In addition, and again unlike the 2000 ROD, alternative 2 places a daily numerical limit and size restriction on snowcoaches to insure that their use will not grow to the point of creating undesirable effects. Also, the Sylvan Pass area would be closed to through travel, thus addressing an important safety and health concern.

4.3.4 Alternative 3

When fully implemented, this alternative would not impair park resources or values or create unacceptable impacts. The actions described in this alternative do not severely affect a resource or value whose conservation is 1) necessary to fulfill specific legislative purposes; 2) key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park; or 3) identified as a goal in the parks' general management plan or other relevant NPS planning documents. The actions in this alternative also would not 1) be inconsistent with a park's purposes or values; 2) impede the attainment of a park's desired future conditions for natural and cultural resources as identified through the parks' planning processes; 3) create an unsafe or unhealthy environment for visitors or employees; 4) diminish opportunities for current or future generations to enjoy, learn about, or be inspired by park resources or values; or 5) unreasonably interfere with park programs or activities; an appropriate use of the parks; the atmosphere of peace and tranquility; or the natural soundscape maintained in wilderness and natural, historic, or commemorative locations within the parks.

The NPS believes this alternative would not constitute impairment to park resources or values for several reasons. This EIS continues intensive monitoring of park resources and values, including air quality, natural soundscapes, wildlife, employee health and safety, and visitor experience. This will provide the NPS with ongoing information to assess the impacts of alternative 3 to park resources and values and to make adjustments, as appropriate, in winter use management. Appendix E contains a discussion and table on the Monitoring and Adaptive Management framework. The thresholds within the adaptive management framework are a tool for managers to help them determine if the goals and objectives of the winter use plan are being achieved. They will continue to be employed and evaluated throughout the duration of this EIS. The superintendents of the parks may take emergency actions to protect park resources and values if necessary.

This alternative is an intensively managed approach to preventing impairment of park resources and values by limiting snowmobiles and snowcoaches to two road segments in Yellowstone and snowmobiles to one road in the Parkway. Alternative 3A sets strict daily entry limits for those routes, and requires that the oversnow vehicles meet BAT requirements for air and sound emissions. Limits on the numbers of OSVs and the limitation to those road sections not frequented by wildlife will result in fewer conflicts with wildlife and fewer air and noise emissions. Limits on the numbers of snowmobiles and snowcoaches also provide park managers with more predictable winter use patterns and an assurance that use cannot increase. Requiring BAT means that emission and sound from oversnow vehicles is reduced on the roads they are allowed to travel.

Under this alternative, all entries to Yellowstone will be via commercially guided tours. This requirement will reduce conflicts with wildlife along the few open roadways because guides will be trained to deal with such situations. Guided parties tend to be larger in size, which reduces the overall number of encounters with wildlife. Commercial guides are required to be educated in safety and are knowledgeable about park rules. Commercial guides must also have reasonable control over their clientele, which greatly reduces unsafe and illegal snowmobile use. In this way, guides will ensure that park regulations are enforced and will provide a safer experience for visitors.

Winter use in most other national parks with significant snowfall is typically limited to a few areas or routes for wheeled vehicle access, often at the periphery of the park (Glacier, Lassen Volcanic, Mount Rainier, and Rocky Mountain are examples). The balance of these parks is typically open to non-motorized travel under backcountry conditions. In Yellowstone, the road from the North Entrance through Mammoth and on to Cooke City, Montana would remain open for wheeled vehicles. Similarly, in Grand Teton, U.S. Highway 191-89-26 would remain open, as would access to the Moose area.

3B: The No-Action Alternative Variation, Closing All Routes to Oversnow Vehicles

Alternative 3B is the no action variation. When fully implemented, it would not impair park resources or values or create unacceptable impacts. The actions described in this alternative do not severely affect a resource or value whose conservation is 1) necessary to fulfill specific legislative purposes; 2) key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park; or 3) identified as a goal in the parks' general management plan or other relevant NPS planning documents. The actions in this alternative also would not 1) be inconsistent with a park's purposes or values; 2) impede the attainment of a park's desired future conditions for natural and cultural resources as identified through the parks' planning processes; 3) create an unsafe or unhealthy environment for visitors or employees; 4) diminish opportunities for current or future generations to enjoy, learn about, or be inspired by park resources or values; or 5) unreasonably interfere with park programs or activities; an appropriate use of the parks; the atmosphere of peace and tranquility; or the natural soundscape maintained in wilderness and natural, historic, or commemorative locations within the parks.

The NPS believes this action would not constitute impairment to park resources or values for several reasons. Use would be restricted to plowed roads and oversnow non-motorized access. The balance of the parks would be closed to recreational oversnow vehicles, thus issues with air pollution, soundscapes, wildlife, safety, and other concerns would not exist.

4.3.5 Alternative 4

When fully implemented, alternative 4 would not impair park resources or values or create unacceptable impacts. The actions described in this alternative do not severely affect a resource or value whose conservation is 1) necessary to fulfill specific legislative purposes; 2) key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park; or 3) identified as a goal in the parks' general management plan or other relevant NPS planning documents. The use levels proposed in this alternative would not 1) be inconsistent with a park's purposes or values; 2) impede the attainment of a park's desired future conditions for natural and cultural resources as identified through the parks' planning processes; 3) create an unsafe or unhealthy environment for visitors or employees; 4) diminish opportunities for current or future generations to enjoy, learn about, or be inspired by park resources or values; or 5) unreasonably interfere with park programs or activities; an appropriate use of the parks; the atmosphere of peace and tranquility; or the natural soundscape maintained in wilderness and natural, historic, or commemorative locations within the parks.

The NPS believes this alternative would not constitute impairment to park resources or values for several reasons. This alternative will continue intensive monitoring of park resources and values, including air quality, natural soundscapes, wildlife, employee health and safety, and visitor experience. This will provide the NPS with ongoing information to assess the impacts of alternative 4 to park resources and values and to make adjustments, as appropriate, in winter use management. Appendix E contains a discussion and table on the Monitoring and Adaptive Management framework. The thresholds within the adaptive

management framework are a tool for managers to help them determine if the goals and objectives of the winter use plan are being achieved. They will continue to be employed and evaluated throughout the duration of this EIS. The superintendents of the parks may take emergency actions to protect park resources and values if necessary.

Alternative 4 sets entry limits above historical average daily snowmobile use in YNP and Grand Teton. Alternative 4 is an intensively managed approach to preventing impairment of park resources and values through requirements on snowmobiles and snowcoaches and comprehensive monitoring. Under this alternative about 75% of the daily entries to Yellowstone will be via commercially guided tours, while the remaining 25% will be unguided or non-commercially guided. This requirement will reduce conflicts with wildlife along roadways because most visitors will travel with guides trained to deal with such situations. Guided parties tend to be larger in size, which reduces the overall number of encounters with wildlife. Commercial and non-commercial guides are required to be educated in safety and are knowledgeable about park rules. Commercial and non-commercial guides must also have reasonable control over their clientele, thereby reducing unsafe and illegal snowmobile use. In this way, guides will ensure that park regulations are enforced and will provide a safer experience for visitors. All members of unguided groups would be required to participate in a park orientation to help them understand the unique circumstances of visiting the parks in the winter and to help them understand the rules and regulations of snowmobiling in the parks. As with commercially and non-commercially guided groups, unguided groups would be required to abide by all regulations in the parks.

Finally, this alternative requires that snowmobiles and snowcoaches entering Yellowstone meet BAT for noise and air emissions. This requirement will ensure that all recreational OSVs operating in Yellowstone employ state of the art emissions control equipment. Currently, BAT snowmobiles are capable of reducing HC by 90% and CO by 70%, and BAT snowcoaches are capable of reducing HC emissions by an average of 80%, CO by 93%, and NOx by 55%. Implementation of snowcoach BAT requirements by the winter of 2011-2012 may reduce coach emissions further. BAT snowmobiles and snowcoaches are capable of operating at or below 73 dBA, whereas standard two-stroke snowmobiles operate at 75 to 78 dBA.

4.3.6 Alternative 5

When fully implemented, alternative 5 would not impair park resources or values or create unacceptable impacts. The actions described in this alternative do not severely affect a resource or value whose conservation is 1) necessary to fulfill specific legislative purposes; 2) key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park; or 3) identified as a goal in the parks' general management plan or other relevant NPS planning documents. The actions in this alternative also would not 1) be inconsistent with a park's purposes or values; 2) impede the attainment of a park's desired future conditions for natural and cultural resources as identified through the parks' planning processes; 3) create an unsafe or unhealthy environment for visitors or employees; 4) diminish opportunities for current or future generations to enjoy, learn about, or be inspired by park resources or values; or 5) unreasonably interfere with park programs or activities; an appropriate use of the parks; the atmosphere of peace and tranquility; or the natural soundscape maintained in wilderness and natural, historic, or commemorative locations within the parks.

The NPS believes this alternative would not constitute impairment to park resources or values for several reasons. This EIS continues intensive monitoring of park resources and values, including air quality, natural soundscapes, wildlife, employee health and safety, and visitor experience. This will provide the NPS with ongoing information to assess the impacts

of alternative 5 to park resources and values and to make adjustments, as appropriate, in winter use management. Appendix E contains a discussion and table on the Monitoring and Adaptive Management framework. The thresholds within the adaptive management framework are a tool for managers to help them determine if the goals and objectives of the winter use plan are being achieved. They will continue to be employed and evaluated throughout the duration of this EIS. The superintendents of the parks may take emergency actions to protect park resources and values if necessary.

Alternative 5 is an intensively managed approach to preventing impairment of park resources and values through strict requirements on snowmobiles and snowcoaches and comprehensive monitoring. Alternative 5 sets daily entry limits that represent about 70% of the historical average daily snowmobile use in YNP, as well as seasonal and flexible daily limits to allow for business flexibility to better meet demand on peak days. Limits on the numbers of snowmobiles will result in fewer conflicts with wildlife, fewer air and noise emissions, and improved road conditions. Limits on the numbers of snowmobiles also provide park managers with more predictable winter use patterns and an assurance that use cannot increase.

Under this alternative about 80% of the entries will be via commercially guided tours, while the remaining 20% will be unguided. This provision will reduce conflicts with wildlife along roadways because guides will be trained to deal with such situations. Guided parties tend to be larger in size, which reduces the overall number of encounters with wildlife. Commercial guides are required to be educated in safety and are knowledgeable about park rules. Commercial guides must also have reasonable control over their clientele, which greatly reduces unsafe and illegal snowmobile use. In this way, guides will ensure that park regulations are enforced and will provide a safer experience for visitors. All members of unguided groups would be required to participate in a park orientation to help them understand the unique circumstances of visiting the parks in the winter and to help them understand the rules and regulations of snowmobiling in the parks. As with commercially guided groups, unguided groups would be required to abide by all regulations in the parks.

Finally, this alternative requires that snowmobiles entering the park meet improved BAT for noise and air emissions. This requirement will ensure that all recreational OSVs operating in the parks employ state of the art emissions control equipment. Currently, BAT snowmobiles and snowcoaches are capable of reducing HC by 90% and CO by 70%; improved BAT would further lower snowmobile emissions. Further, BAT snowmobiles are capable of operating at or below 73 dBA, whereas standard two-stroke snowmobiles operate at 75 to 78 dBA. Currently, BAT snowcoaches are capable of reducing HC emissions by an average of 80%, CO by 93%, and NOx by 55%. Implementation of snowcoach BAT requirements by the winter of 2011-2012 may reduce coach emissions further, as would implementation of improved snowmobile BAT regulations.

4.3.7 Alternative 6

When fully implemented, alternative 6 would not impair park resources or values or create unacceptable impacts. The actions described in this alternative do not severely affect a resource or value whose conservation is 1) necessary to fulfill specific legislative purposes; 2) key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park; or 3) identified as a goal in the parks' general management plan or other relevant NPS planning documents. The actions in this alternative also would not 1) be inconsistent with a park's purposes or values; 2) impede the attainment of a park's desired future conditions for natural and cultural resources as identified through the parks' planning processes; 3) create an unsafe or unhealthy environment for visitors or employees; 4) diminish opportunities for

current or future generations to enjoy, learn about, or be inspired by park resources or values; or 5) unreasonably interfere with park programs or activities; an appropriate use of the parks; the atmosphere of peace and tranquility; or the natural soundscape maintained in wilderness and natural, historic, or commemorative locations within the parks.

Although adverse impacts could occur under this alternative to wildlife, air quality, noise, and visitor experience, impacts are at acceptable levels and may be mitigated through management actions.

The NPS believes this alternative would not constitute impairment to park resources or values for several reasons. This EIS continues intensive monitoring of park resources and values, including air quality, natural soundscapes, wildlife, employee health and safety, and visitor experience. This will provide the NPS with ongoing information to assess the impacts of alternative 6 to park resources and values and to make adjustments, as appropriate, in winter use management. Appendix E contains a discussion and table on the Monitoring and Adaptive Management framework. The thresholds within the adaptive management framework are a tool for managers to help them determine if the goals and objectives of the winter use plan are being achieved. They will continue to be employed and evaluated throughout the duration of this EIS. The superintendents of the parks may take emergency actions to protect park resources and values if necessary.

Alternative 6 is an intensively managed approach to preventing impairment of park resources and values through strict requirements on snowmobiles and snowcoaches and comprehensive monitoring. Alternative 6 sets daily entry limits for wheeled vehicles, snowmobiles, and snowcoaches. Limits on the numbers of snowmobiles will result in fewer conflicts with wildlife, fewer air and noise emissions, and improved road conditions. Limits on the numbers of snowmobiles also provide park managers with more predictable winter use patterns and an assurance that use cannot increase. Alternative 6 also closes the Sylvan Pass Area to oversnow vehicle travel, thus addressing an important health and safety concern.

The west-side roads in Yellowstone would be wheeled vehicle accessible, providing a wider variety of ways for people to enjoy the interior of Yellowstone, including the Old Faithful area. Although some adverse impacts would occur as a result of the plowing regarding wildlife and dust from road sanding operations, these adverse impacts would not rise to the level of impairment or unacceptability.

This alternative also mandates that all snowmobilers enter the park accompanied by commercial guides. This requirement will reduce conflicts with wildlife along roadways because guides will be trained to deal with such situations. Guided parties tend to be larger in size, which reduces the overall number of encounters with wildlife. Commercial guides are required to be educated in safety and are knowledgeable about park rules. Commercial guides must also have reasonable control over their clientele, which greatly reduces unsafe and illegal snowmobile use. In this way, guides will ensure that park regulations are enforced and will provide a safer experience for visitors.

Finally, this alternative requires that both snowmobiles and snowcoaches entering the park will be BAT for noise and air emissions. This requirement will ensure that all recreational OSVs operating in the parks employ state of the art emissions control equipment. Currently, BAT snowmobiles are capable of reducing HC by 90% and CO by 70%. Currently, BAT snowcoaches are capable of reducing HC emissions by an average of 80%, CO by 93%, and NOx by 55%. Implementation of snowcoach BAT requirements by the winter of 2011-2012 may further reduce coach emissions. Further, BAT snowmobiles and snowcoaches are capable of operating at or below 73 dBA, whereas standard two-stroke snowmobiles operate

at 75 to 78 dBA. Additionally, buses, light buses and vans all use sophisticated emissions control technology and are relatively quiet.

4.3.8 Alternative 7

When fully implemented, alternative 7 would not impair park resources or values or create unacceptable impacts. The actions described in this alternative do not severely affect a resource or value whose conservation is 1) necessary to fulfill specific legislative purposes; 2) key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park; or 3) identified as a goal in the parks' general management plan or other relevant NPS planning documents. Similarly, the actions in this alternative also would not 1) be inconsistent with a park's purposes or values; 2) impede the attainment of a park's desired future conditions for natural and cultural resources as identified through the parks' planning processes; 3) create an unsafe or unhealthy environment for visitors or employees; 4) diminish opportunities for current or future generations to enjoy, learn about, or be inspired by park resources or values; or 5) unreasonably interfere with park programs or activities; an appropriate use of the parks; the atmosphere of peace and tranquility; or the natural soundscape maintained in wilderness and natural, historic, or commemorative locations within the parks.

Although adverse impacts could occur under this alternative to wildlife, air quality, noise, and visitor experience, impacts are at acceptable levels and may be mitigated through management actions.

The NPS believes this alternative would not constitute impairment to park resources or values for several reasons. The NPS will continue intensive monitoring of park resources and values, including air quality, natural soundscapes, wildlife, employee health and safety, and visitor experience. This will provide the NPS with ongoing information to assess the impacts of alternative 7 to park resources and values and to make adjustments, as appropriate, in winter use management. Appendix E contains a discussion and table on the Monitoring and Adaptive Management framework. The thresholds within the adaptive management framework are a tool for managers to help them determine if the goals and objectives of the winter use plan are being achieved. They will continue to be employed and evaluated throughout the duration of the regulation ensuing from this EIS. The superintendents of the parks may take emergency actions to protect park resources and values if necessary.

Alternative 7 is an intensively managed approach to prevent unacceptable impacts or impairment of park resources and values through strict requirements on snowmobiles and snowcoaches and comprehensive monitoring. Alternative 7 sets daily entry limits that represent about 70% of the historical average daily snowmobile use in YNP. These limits on the numbers of snowmobiles will result in fewer conflicts with wildlife, fewer air and noise emissions, and improved road conditions. Limits on the numbers of snowmobiles also would provide park managers with more predictable winter use patterns and an assurance that use cannot increase. Alternative 7 would also close the Sylvan Pass Area to oversnow vehicle travel, thus addressing an important health and safety concern.

The road segment from Madison Junction to Norris Junction through Gibbon Canyon could be closed for bison-groomed road research. As explained earlier, this action would be for the purpose of conducting an experiment on bison movement in the park. This action would severely inconvenience park visitors wishing to travel through that road corridor (from Mammoth to Old faithful or West Yellowstone to Canyon), and probably cause visitors to alter their travel plans. However, the well-known park features would be accessible, albeit at much greater distances and time for many visitors. Similarly park operations would be hampered because support for NPS and Xanterra operations at Old Faithful is based in

Mammoth. Restructuring of how support services are provided would be necessary if the road segment were closed. Also Yellowstone Expeditions (based in West Yellowstone) that has the yurt camp at Canyon would need to alter their operations significantly to continue to support the camp in that location.

This alternative also mandates that all snowmobilers enter the park accompanied by commercial guides. This requirement will reduce conflicts with wildlife along roadways because guides will be trained to deal with such situations. Guided parties tend to be larger in size, which reduces the overall number of encounters with wildlife. Commercial guides are required to be educated in safety and are knowledgeable about park rules. Commercial guides must also have reasonable control over their clientele, which greatly reduces unsafe and illegal snowmobile use. In this way, guides will ensure that park regulations are enforced and will provide a safer experience for visitors.

Finally, this alternative requires that both snowmobiles and snowcoaches entering the park are BAT for noise and air emissions. This requirement will ensure that all recreational OSVs operating in the parks employ state of the art emissions control equipment. Currently, BAT snowmobiles are capable of reducing HC by 90% and CO by 70%. Further, BAT snowmobiles and snowcoaches are capable of operating at or below 73 dBA, whereas standard two-stroke snowmobiles operate at 75 to 78 dBA. Currently, BAT snowcoaches are capable of reducing HC emissions by an average of 80%, CO by 93%, and NOx by 55%. Implementation of snowcoach BAT requirements by the winter of 2011-2012 may reduce coach emissions further.

4.4 Direct, Indirect and Cumulative Effects on Adjacent Lands

The potential effects on lands within the GYA other than the three national park units are discussed in this section. The potential for impacts on adjacent lands (apart from economic impacts) is primarily due to possible displacement of winter recreation use from the parks. However, the displacement of visitors onto surrounding federal, state, or county lands as a result of implementation of an alternative in this EIS is speculative. Many different scenarios can be constructed for the same basic situation (for example, allowing 540 snowmobiles into YNP daily). Additional permutations are added for multiple alternatives and even more to address gateway communities and several other access routes. A partial list of possible considerations follows.

The key piece of new information is how visitor use has changed in the parks and the region over the past few years, which includes winters before any changes occurred, during the uncertain winter of 2003-2004, and in the three winters under the Temporary Winter Use Plan. These changes are discussed in Chapter III of this EIS under the topic Visitor Use and Access and the topic of Socioeconomics.

Many non-resident visitors who currently snowmobile in the parks also snowmobile on the adjacent national forests (Taylor et a1. 1995; Littlejohn 1996; Borrie et al 1999). If they cannot snowmobile in the parks from the gateway of their choice as a result of an alternative chosen in this EIS, they could:

- Continue to visit in future years but spend their time exclusively on national forest lands. The net increase would be the one or two days per trip previously spent in the parks.

- Continue to visit in future years but spend their time on national forest lands as before and shorten their trip.
- Decline to come to the GYA and forego both national forest and park experiences.
- Continue to visit the GYA, spend as many days on the national forests as they do now and visit the parks using another gateway or a different mode of transport.

Other considerations include the possibility of attracting new visitors with different preferences and different local users. Some people who have not come to the parks in the past might choose to do so because of available mass transit opportunities, either on plowed roads or groomed oversnow routes. Such visitors could split their trips to spend a day snowmobiling on the adjacent national forests. For example, a recent winter survey indicated that 31% of West Yellowstone snowcoach riders also snowmobile as part of their trip (Nickerson et al. 2006). Local snowmobilers would likely continue to use national forest lands as they have in the past. If they can no longer use the parks as they have traditionally done from their local community, they could:

- Enter the parks from another available gateway.
- Enter the parks via a different mode of transportation.
- Leave the region and go elsewhere for one to several trips over the season.
- Curtail their activity overall.
- Spend more time on local national forest lands.
- Visit national forest lands near other gateways.

Definitive information about what people might do under a variety of scenarios cannot be obtained. (Council on Environmental Quality regulations at 40 CFR § 1502.22 address the issue of incomplete or unavailable information for use in NEPA compliance.) The best available data is from surveys of winter visitors in the parks. The results indicate what people may do under circumstances posed by various alternatives. These surveys are the basis for impacts described in the socioeconomic section of this chapter and are cited there.

Recent experience can also play a role. Since the winter of 2002-2003 (prior to any restrictions), West Entrance visits have dropped 44%, but snowmobile visits to the Hebgen Lake District on the Gallatin National Forest (adjacent to West Yellowstone) dropped 24% during the same period. This suggests that instead of displacing snowmobilers to surrounding lands, restrictions on Yellowstone visitation may curtail region-wide visitation, but that some people are choosing to continue to recreate on the forests even without visiting the parks. Such reduced visitation could relieve strain on national forest, state, and county land infrastructure and resources, some of which are currently stressed by high winter visitation (GYCC 1999).

Further confounding the discussion is that visitation to Yellowstone has fluctuated up and down over the past two decades, making predictions of use based on past (especially short-term) trends virtually impossible. Recently, visitation to Yellowstone began dropping even before any restrictions were put in place, probably reflecting confusion about continued snowmobile access to the parks. Visitation to Yellowstone in the past three winters has been below the daily limits, which suggests that displacement of visitors onto surrounding national forest lands by restrictions on Yellowstone access did not, and would not occur.

Finally, other changes in recreation opportunities near the parks also affect use on adjacent lands irrespective of what happens in the parks. For example, the Sleeping Giant Ski Area near Yellowstone's East Entrance has ceased operation. Thus, changes in the park may or may not be directly related to variations in use on adjacent lands.

The following analysis is based upon the known preferences for visitors based on previous winter surveys and what has happened since the winter of 2002-2003.

4.4.1 Alternative Displacement Scenarios

Alternative 1

Under Alternative 1, 720 snowmobiles would be allowed into Yellowstone, and 140 would be allowed to enter Grand Teton and the Parkway. All Yellowstone snowmobiles would be commercially guided and BAT. Most Grand Teton and Parkway snowmobiles would be BAT. The East Entrance Road of Yellowstone would be closed to through travel, and those snowmobiles would be reallocated to other entrances. Yellowstone would partner with the Park County Nordic Ski Association, Wyoming Department of Transportation (WYDOT), and other interested parties regarding non-motorized recreational opportunities near the East Entrance of the park.

Because this alternative would allow a number of snowmobiles into the parks near the historical average daily visitation, it would be unlikely to result in significant visitor displacement to surrounding federal, state, or county land, except during high use periods (Christmas week and Presidents Day weekend). Survey data and recent history provide an indication of what visitors to the region might do.

As analyzed in this EIS and based on survey responses of winter visitors, total visitation to the GYA by those who live outside the five-county area could have a net reduction of about 14.6% (non-resident visitors account for about 80% of park visitation).

Under this alternative, virtually all snowmobiles touring the parks (except those east-bound on the Grassy Lake Road and those using the Cave Falls Road) would have to meet BAT requirements. Although BAT snowmobiles are becoming more prevalent, few private citizens from the surrounding states own BAT compliant vehicles, so most local residents that previously toured the parks by snowmobile will either need to rent a BAT machine, buy a snowcoach ticket, or elect not to visit the parks. These visitors could be displaced to surrounding federal, state, or county lands.

Alternative 2

Alternative 2 is similar to alternative G from the Final EIS, alternatives 1a and 1b from the SEIS, and alternative 1 from the EA, all of which called for a transition to a snowcoach-only winter transportation system. This alternative could result in snowmobile visitation possibly being shifted to the national forests and state and county lands adjacent to Yellowstone and Grand Teton. Conversely, alternative 2 could result in a reduction in snowmobile visitation on surrounding lands.

Specifically, under this alternative, some visitors would visit more often under a snowcoach-only system, some would not alter their visitation patterns, and others would visit less often and/or shift their visits more to the areas adjacent to Yellowstone.

Conversely, as analyzed in this EIS and based on survey responses of winter visitors about what they would do if the parks were open for snowcoach access only, total visitation to the GYA by those who live outside the five-county area would have a net reduction of about 33.4% (non-resident visitors account for about 80% of park visitation). Nearly 60% of the visitors who snowmobiled on their trip said they would visit the GYA less frequently if a snowcoach-only system were instituted.

As with alternative 1, Yellowstone would partner with the Park County Nordic Ski Association, WYDOT, and other interested parties regarding non-motorized recreational opportunities near the East Entrance of the park.

Alternative 3A

Alternative 3A would result in snowmobile and snowcoach access to Yellowstone only through the South Entrance to Old Faithful and the Grassy Lake Road in the Parkway. All other routes would be closed to oversnow vehicles.

This alternative (and Alternative 3B, following) could result in the greatest amount of snowmobile visitation possibly being shifted to the national forests and state and county lands adjacent to Yellowstone and Grand Teton. Conversely, alternative 3A (and 3B) could result in the greatest reduction in snowmobile visitation on surrounding lands.

No previous surveys have addressed the question of what people would do if the parks were closed to motorized oversnow travel, thus it is impossible to predict how people would change their patterns of use. In general, however, it is assumed that fewer people would choose to visit the areas near the West, East, and North entrances if no access was provided in the parks.

Alternative 3B

Alternative 3B would result in no snowmobile and snowcoach access in Yellowstone, Grand Teton, and the Parkway. All routes would be closed to oversnow vehicles.

This alternative (and alternative 3A, previously) could result in the greatest amount of snowmobile visitation possibly being shifted to the national forests and state and county lands adjacent to Yellowstone and Grand Teton. Conversely, alternative 3B (and 3A) could result in the greatest reduction in snowmobile visitation on surrounding lands.

No previous surveys have addressed the question of what people would do if the parks were closed to motorized oversnow travel, thus it is impossible to predict how people would change their patterns of use. In general, however, it is assumed that most people would choose not to visit the area if no access was provided in the parks.

As with alternatives 1 and 2, Yellowstone would partner with the Park County Nordic Ski Association, WYDOT, and other interested parties regarding non-motorized recreational opportunities near the East Entrance of the park.

Alternative 4

Alternative 4 calls for a higher level of snowmobile use than the historic average, and 25% of that use could be unguided or non-commercially guided. BAT would be required for snowmobiles in Yellowstone. Because this alternative would allow a number of snowmobiles into the parks above historical average daily visitation, it would be unlikely to result in significant visitor displacement to surrounding federal, state, or county land, even during high use periods (Christmas week and Presidents Day weekend). Survey data and recent history provide an indication of what visitors to the region might do.

As analyzed in this EIS and based on survey responses of winter visitors, total visitation to the GYA by those who live outside the five-county area could have a net reduction of about 11.4% (non-resident visitors account for about 80% of park visitation).

Under this alternative, virtually all snowmobiles touring Yellowstone (except those using the Cave Falls Road) would have to meet BAT requirements. Although BAT snowmobiles are becoming more prevalent, few private citizens in the three surrounding states own BAT

compliant vehicles, so most local residents who previously toured the parks by snowmobile will either need to rent a BAT machine, buy a snowcoach ticket, or elect not to visit the parks. These visitors could be displaced to surrounding federal, state, or county lands.

In Grand Teton, BAT snowmobiles would be required on Jackson Lake, but not required on the Grassy Lake Road. On the CDST, 2/3 of the snowmobiles would be BAT, with the remainder 2006 or newer model year sleds. These varied BAT restrictions would allow easier access across the Grassy Lake Road for visitors without BAT machines and probably create more use on lands west of the Parkway. Similarly the unguided and non-BAT requirements on the CDST may encourage more through travel and use on lands outside the parks.

Alternative 5

As with alternative 1, this alternative could result in somewhat lower visitation to surrounding federal, state, and county lands. Because daily entrance limits to the parks would be lower under this alternative (540 per day for Yellowstone) than alternative 1, the number of displaced visitors would probably be less. Again, though, recent winters' experience of decreased snowmobile numbers on the adjacent national forests contradicts this possibility, suggesting instead that visitation to those lands could decrease under this alternative. Improved BAT requirements under this alternative could have effects more pronounced than those under alternative 1, because it would be expected that only a handful of snowmobile models would initially meet the stricter BAT requirements.

Alternative 6

Under Alternative 6, the west-side roads in Yellowstone would be plowed, allowing wheeled vehicle access from West Yellowstone and Mammoth to Old Faithful. Commercially guided snowmobiles and snowcoaches would be allowed through Yellowstone's South Entrance; the East Entrance Road would be closed.

As analyzed in this EIS and based on survey responses of winter visitors, total visitation to the GYA by those who live outside the five-county area could have a net reduction of about 18.4% (non-resident visitors account for about 80% of park visitation).

With the proposed wheeled vehicle access through the West Entrance to Old Faithful (and to Mammoth Hot Springs) (and probable lower cost of visiting the park in the winter), this alternative may attract even more visitors to the region interested in a varied recreation experience (seeing Yellowstone via wheeled vehicle, snowmobiling on forest lands, and cross-country or downhill skiing in the area).

Under this alternative, virtually all snowmobiles touring the parks (except those east-bound on the Grassy Lake Road and those using the Cave Falls Road) would have to meet BAT requirements. Although BAT snowmobiles are becoming more prevalent, few private citizens from the three surrounding states own BAT compliant vehicles, so most local residents who previously toured the parks by snowmobile will either need to rent a BAT machine, buy a snowcoach or bus ticket, or elect not to visit the parks. These visitors could be displaced to surrounding federal, state, or county lands.

As with alternatives 1, 2, and 3, Yellowstone would partner with the Park County Nordic Ski Association, WYDOT, and other interested parties regarding non-motorized recreational opportunities near the East Entrance of the park.

Alternative 7

Under Alternative 7, 540 snowmobiles would be allowed into Yellowstone, and 65 would be allowed to enter Grand Teton and the Parkway. All Yellowstone snowmobiles would be

commercially guided and BAT. Some Grand Teton and Parkway snowmobiles would be BAT. The East Entrance Road of Yellowstone would be closed to through travel, and those snowmobiles would be reallocated to other entrances. Yellowstone would partner with the Park County Nordic Ski Association, Wyoming Department of Transportation (WYDOT), and other interested parties regarding non-motorized recreational opportunities near the East Entrance of the park.

Because daily entrance limits to the parks would be lower under this alternative (540 per day for Yellowstone) than alternative 1, the number of displaced visitors would probably be higher. Again, though, recent winters' experience of decreased snowmobile numbers on the adjacent national forests contradicts this possibility, suggesting instead that visitation to those lands could decrease under this alternative.

Under this alternative, virtually all snowmobiles touring the parks (except those on the Grassy Lake Road and those using the Cave Falls Road) would have to meet BAT requirements. Although BAT snowmobiles are becoming more prevalent, few private citizens from the surrounding states own BAT compliant vehicles, so most local residents that previously toured the parks by snowmobile will either need to rent a BAT machine, buy a snowcoach ticket, or elect not to visit the parks. These visitors could be displaced to surrounding federal, state, or county lands.

4.5 Adverse Effects that Cannot be Avoided

Adverse impacts are discussed for human health and safety, the economic and social environment, physical and biological resources, and the experiential environment of the three parks. These elements are interrelated and interdependent, as is the nature of any ecosystem process and the human role in it. Therefore, the alternatives taken together display consequences, tradeoffs, benefits, impacts, and opportunity costs in a way that reveals the interdependent working of human and natural park systems. This means that, considering the human use and enjoyment of national parks, an adverse impact from one perspective is often a benefit from another. For example, a change from historical conditions to management under alternative 2 results in the loss of experiential quality for snowmobilers in the parks although these visitors may still avail themselves of motorized access using snowcoaches. At the same time, visitors who have avoided the parks because of the presence of snowmobiles, or who have been unable to enjoy a quality experience because of their presence, will benefit from this change. Any alternative that has been evaluated can be viewed in the same light.

Similarly, alternatives 3A and 3B, with their restrictions on visitor access across the parks, would result in the most pristine resource conditions at the expense of very limited to virtually no use and enjoyment of the parks.

Potential unavoidable adverse economic impacts on the regional economy are disclosed for all alternatives that depart from the historical conditions described in the 2000 Final EIS (NPS 2000b), the 2003 Final SEIS (NPS 2003a), and the 2004 Temporary EA (NPS 2004b). The decrease or loss of snowmobiling opportunities in the parks readily equates to an adverse economic impact. These impacts are not considered irreversible or long-term in the context of the total economy. For some individual businesses, the effects may be more drastic, as they have been during the past few winters (beginning prior to any change in winter use management). It is, however, in the nature of business to start or change course based on economic self-interest and survival. Long-term economic impacts are not easy to determine because of this dynamic, and because the business world is adaptable and creative.

So, as indicated in the analysis, it is possible that the adverse regional impacts of some alternatives could be offset by a change in the type and mix of visitors coming to the parks.

Potential unavoidable adverse impacts on physical and biological resources are disclosed through the range of EIS alternatives. These include impacts on air quality, wildlife displacement and habituation, and natural quiet. For the most part, any such impacts are short-term (for the duration of this plan) and minor or moderate for alternatives that reduce average snowmobile levels. Other possible minor to moderate impacts would be mitigated or avoided by the features of the alternatives or the recommended mitigation measures expressed in specific analyses.

Historical adverse impacts on human health and safety decline under most alternatives that reduce average snowmobile levels. The focal points regarding health and safety herein are air quality and emissions from OSVs. The desired impact is beneficial in reducing these factors. Allowing the range of winter recreational use and access, which is implicit in the purpose and need, carries with it the unavoidable potential for accidents. Unavoidable impacts are referred to in the beginning of this chapter, "Effects Common to all Alternatives." These result from winter use of the parks at any level, and they include impacts on natural soundscape, wildlife (collisions, displacement), safety, and visitor experience.

4.6 Irreversible and Irretrievable Commitment of Resources

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, though lost in the interim, would be available again.

From an economic or social perspective, there would be no irreversible commitment of resources from any of the alternatives. However, alternatives to the current management situation that change recreational opportunities or affect visitors by displacing them from accustomed usage would involve irretrievable losses. By the nature of alternative actions, those losses would be balanced by a gain in some other opportunity or resource benefit. Any perceived losses or tradeoffs in recreational opportunities would have both social and economic consequences that would be irretrievable, but not irreversible.

The seven alternatives prescribe differing mixes of winter visitor experience. The changes are intended to address the purpose and need for action described in Chapter I, while sharply defining the public's issues about the proposal. In alternative 2, the consequences of those changes improve the quality or condition of the parks' experiential values and resources. This includes improving values like air quality, natural quiet, wildlife species and habitat, and recreation experiences (motorized and non-motorized) whose quality is dependent on those values. The achievement of such improvements is accompanied by some tradeoff in another aspect of winter recreation such as loss of snowmobiling opportunities, available modes of transport, redistribution of use, or regulating types of equipment allowed. All these changes or tradeoffs would be associated with an irretrievable loss of the kind indicated. Conversely,

for alternatives 1, 4, 5, 6, and 7, which provide a full range of winter recreation opportunities, including snowmobiling, there would be tradeoffs representing irretrievable losses in types and qualities of other visitor experiences. For the range of alternatives, a variety of irretrievable resource commitments would be made, but none would be irreversible. For alternatives 3A and 3B, oversnow vehicle visitor use would be limited to small portions of the parks or be prohibited entirely. Thus, there would be an irretrievable reduction of loss of any type of use and visitor experience for those areas that area closed.

4.7 The Relationship Between Short-Term Uses of the Environment and Maintenance and Enhancement of Long-Term Productivity

All the activities implied in the EIS alternatives could be considered local and short-term, in that they are specific to the three park units and are reversible actions. Long-term productivity is construed as the continued existence of the natural resources of the parks, 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 EIS 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 no such impacts result from implementation. Adaptive management is a component of most alternatives (except 3B). Adaptive management addresses this relationship (monitoring and management) directly and programmatically. Otherwise every alternative would induce short-term effects on a variety of experiential values or resources that would persist for as long as the impacting activity is undertaken. Programmatic changes in opportunities affecting visitor experience and use would continue for the duration of plan implementation.

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CHAPTER V: CONSULTATION AND COORDINATION

5.1 Introduction

This section describes the consultation and coordination that has occurred leading up to the Notice of Availability for this FEIS.

This chapter, as well as Appendix I (Comment Analysis) and information on the winter use website (See 5.2.3 below) and provided to the Cooperating Agencies and others demonstrates how public and agency participation shaped this process. In summary, the substantive, procedural, and relational effects of agency and public participation are visible:

- in the particular mix of *elements and expectations* contained in the analysis;
- in the sometimes fragile but consistent efforts by all parties to *keep talking and working with one another* even while the litigation and legislative context has a tendency to mirror or reproduce adversarial modes of communication;
- in the commitment of NPS to *adaptive management*, and the agency's willingness to keep explaining what that commitment is as they move ahead with winter use management in the parks.

Winter use in Yellowstone and Grand Teton National Parks and the John D. Rockefeller, Jr. Memorial Parkway has the interest and involvement of all three branches of government (executive, legislative and judicial), the media, citizens, and interest groups.

To be meaningful, effective consultation needs to show how participation affected the NPS proposed decision.

The passage of time will be the surest way to show how participation has affected the decision – seeing what happens on the ground. In the meantime, written and verbal feedback from participants on the participation process itself – gathered during larger meetings and in each periodic participation assessment -- have indicated that the NPS accuracy and honesty regarding the various roles of governmental and non-governmental participants (i.e., not shared decision making) is part of what has, perhaps ironically, made the participation process more meaningful. Whether that appreciation holds even when elements of the decision are not satisfying to participants with a stake in the outcomes remains to be seen.

Table 5-1 indicates some key steps of the planning process. A Public and Agency Participation Plan[1] and the Cooperating Agency Memorandum of Understanding were developed and implemented with involvement from governmental and non-governmental stakeholders.

The NPS sustained its commitment to open information sharing throughout the process toward a winter use management decision that can be publicly understood and supported to the maximum extent possible.

[1] Available at http://www.nps.gov/yell/planyourvisit/upload/participationplan10-13-05.pdf.

Table 5-1: Overall Planning Process

Planning Step	Methods	Timeframe
Pre-scoping assessment	Assistance from the U.S. Institute for Environmental Conflict Resolution to help discern possibilities for agreement-seeking process such as negotiated rulemaking, or a focus on public participation programs geared to informing, consulting or involving.	January-March 2005
Pre-scoping and beginning of scoping	Interviews with 60+ governmental and non-governmental interested parties	May-July 2005
Scoping—gather ideas and concerns, confirm purpose, need, and significance	*Federal Register* notice, PEPC*, newsletter, web site, stakeholder assessments.	June-September, 2005
Finalize Public Participation Plan	Plan conforms to the emphases stakeholders suggested: maximize information sharing, minimize expectations for large group meetings, recognize that other possibilities for engagement could emerge later.	October 2005
Analyze scoping comments, review history and legal proceedings	Planning team research, scoping report.	Fall 2005
Cooperating Agency MOU text concluded and signed	The Memorandum of Understanding (MOU) describes how agencies share information, with tailored roles for each agency.	January 2006 (began in June 2005)
Modeling scenarios	Discuss issues with and present scenarios to cooperating agencies and other stakeholders	Fall 2005
Confirm issues, goals and opportunities; develop general alternative concepts	PEPC, newsletter, web site, stakeholder dialog, roving team meetings. Two large open house meetings in Montana and Wyoming.	Winter 2005/2006
Analyze resources, identify impacts	Planning team research, stakeholder dialog.	Spring/Summer 2006
Refine alternatives	Cooperating Agency meeting in Idaho to discuss preliminary alternatives.	April 2006
Cooperating Agency review of preliminary and Draft EIS	Cooperating agency meetings in Wyoming and Idaho. Meetings open to other stakeholders as well.	December 2006 and May 2007
Public review of Draft EIS; Publish Proposed Rule	*Federal Register* notice, PEPC, newsletter, web site, stakeholder dialog, information fair in Wyoming; public comment meetings	November 2006 through June 2007
Analyze comments, make changes as appropriate, prepare Final EIS	Planning team refined elements of the document with attention to results of agency and public participation – verbal and written comments and ongoing work regarding discrete elements of the analyses.	June 2007 through September 2007
Availability of Final EIS (30-day waiting period)	*Federal Register* notice, PEPC, newsletter, and web site	September-October 2007
Prepare and publish Record of Decision	Planning team, with recommendation by park superintendents and approved by NPS regional director; *Federal Register* notice	October-November 2007
Publish Final Rule	*Federal Register* notice	November 2007

* PEPC is the National Park Service's "Planning, Environment, and Public Comment" website, the Internet site at which members of the public offer comments on NPS planning projects.

5.2 Public and Agency Participation

5.2.1 Participation Plan and Assistance

The winter use team turned to the U.S. Institute for Environmental Conflict Resolution's roster of facilitators and mediators for assistance in late April 2005. The NPS then utilized the Rocky Mountain Cooperative Ecosystems Study Unit (RM-CESU) to implement an agreement between itself, the Montana State University Department of Political Science, and Cadence, Inc. This agreement allows for impartial assessment services, meeting facilitation with cooperating agencies and other stakeholders, and continual assistance on the public and agency involvement elements of the EIS and rulemaking processes.

5.2.2 NEPA, Rulemaking, and Assessment[2] Context

Over the past few decades, litigation steered many NEPA decisions through long, confrontational, narrowly-defined debates. This has proven to be true at times for winter use in the two parks over the past decade. In some other national and regional cases, litigation sometimes seems to be the only available tool to secure adequate environmental protection and appropriate agency action. Despite its utility, the use of this power has also, at times, led to an unintended consequence of stalled (or slowed) decision outcomes and polarized political climates (Chandler et al. 2000).

This is the sixth NEPA process on winter use in the three parks. The rulemaking process has also been necessary to get a regulation in place to implement prior NEPA decisions.

In light of the long NEPA and litigation history of this issue and the procedural fatigue many of the most involved participants expressed, public and agency involvement was tailored to be responsive and flexible.

What this meant in practice is that continual assessment[3] was needed to keep checking on the fit and effectiveness of winter use participation work. That turned out to be key: to have a flexible participation plan that was responsive to how stakeholders told NPS they wanted to be engaged, but to also stay open to adjusting the participation strategies as indicated by stakeholders as the project progressed.

There were five main participation assessments between winter of 2004-2005 and spring of 2007, ranging from very informal and brief, to more intense and deliberate, as described below. From July 2005 forward, these assessments and brief thematic summaries were prepared by Cadence, broadly shared with the full stakeholder contact list, and then used by NPS to guide next steps for public and agency participation.

Assessment 1: Winter 2004-2005

The pre-planning process began in winter of 2004-2005 when NPS asked for assistance from the U.S. Institute for Environmental Conflict Resolution, a federal agency created by Congress to assist parties in resolving environmental, natural resource, and public lands conflicts. Yellowstone management and staff asked for assistance to help them make an

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[2] "Assessment" as currently practiced is not formulaic or standardized, nor should it be. A comprehensive but flexible conceptual framework for assessment work is preferable, one that *asks participants to examine and probe the appropriateness of various tools, techniques, and desired outcomes* (Bean et al. 2007, emphasis added).

[3] Assessment is defined as an impartial analysis that helps prepare the path for a conflict-resolution or agreement-seeking process. This analysis can include a determination that such a process is not timely or appropriate (Bean et al. 2007).

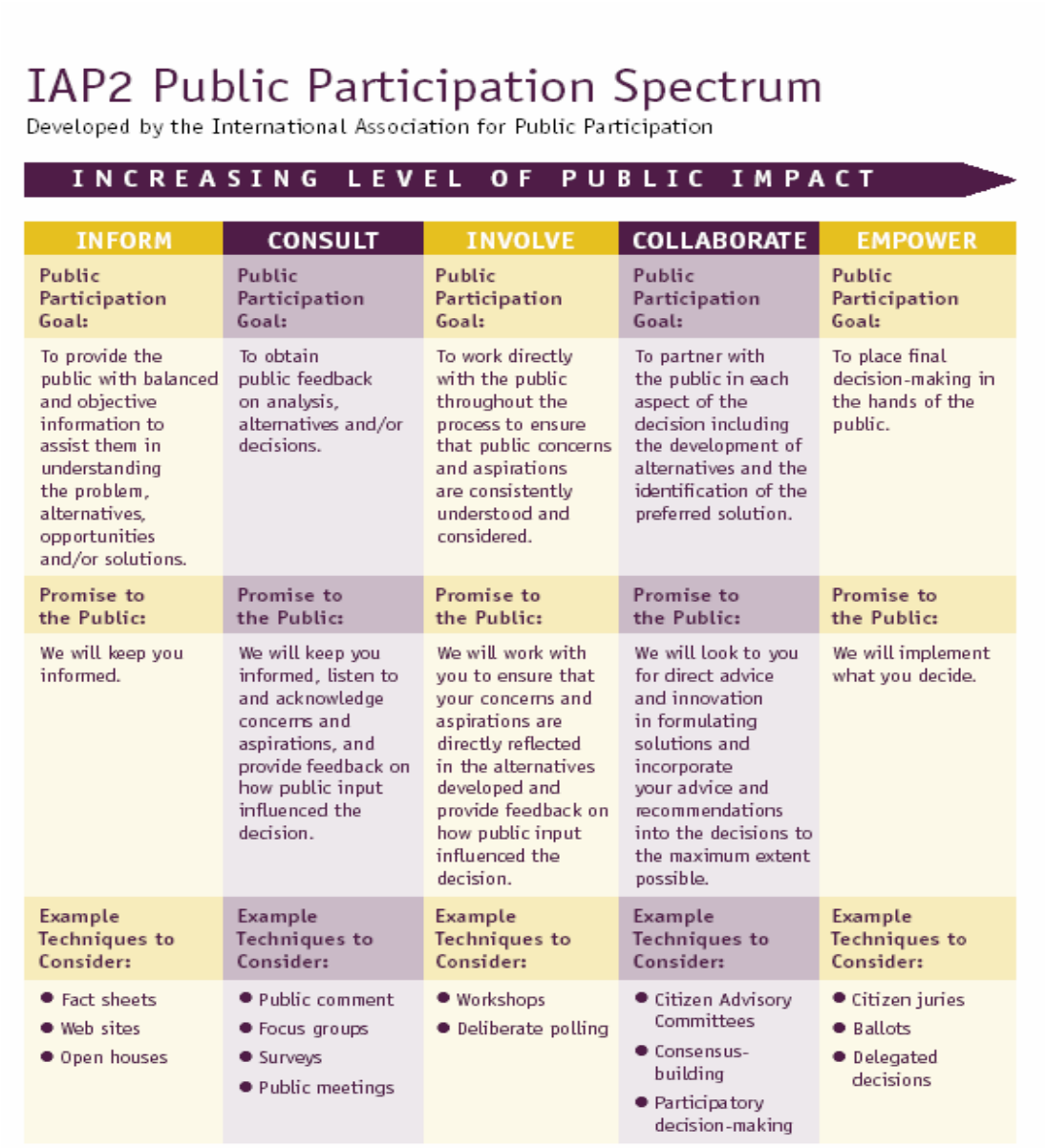
informed decision about how to proceed toward meaningful public and agency involvement in the forthcoming (this) NEPA process.

The consultation between the U.S. Institute and NPS was a verbal exploration to discern the level of interest in and support for mediation. How might a negotiated rulemaking or mediation be structured? What topics could reasonably be addressed? Are key parties interested, and if so, under what conditions? Under what circumstances would a mediated process and potential result be the best option for stakeholders? What technical resources should be brought to the table and in what manner?

The conclusion at the time was that conditions were not ripe for an agreement-seeking process.

Assessment 2: Spring/Summer 2005

In May 2005, approximately one month before the Park Service published the Notice of Intent that launched scoping, the winter use team invited cooperating agencies to work with the facilitation team to jointly negotiate the terms of the Memorandum of Understanding that would guide their involvement during this EIS. The NPS also asked the Cadence team to conduct an informal situation assessment for public and agency participation, this time with both the opportunities and the limits of the NPS participation "promise" firmly in view (promise is a term of art coined by the International Association for Public Participation). For this process, "the NPS promise to governmental and non-governmental stakeholders is to open information sharing. We will actively listen to and acknowledge concerns. We will let you know where timely agency and public input was incorporated in the EIS, and how it did/did not influence NPS decisions." This promise is located between the "consult" and "involve" vectors of the International Association for Public Participation spectrum.



IAP2 Public Participation Spectrum

Developed by the International Association for Public Participation

INCREASING LEVEL OF PUBLIC IMPACT

INFORM	CONSULT	INVOLVE	COLLABORATE	EMPOWER
Public Participation Goal:	**Public Participation Goal:**	**Public Participation Goal:**	**Public Participation Goal:**	**Public Participation Goal:**
To provide the public with balanced and objective information to assist them in understanding the problem, alternatives, opportunities and/or solutions.	To obtain public feedback on analysis, alternatives and/or decisions.	To work directly with the public throughout the process to ensure that public concerns and aspirations are consistently understood and considered.	To partner with the public in each aspect of the decision including the development of alternatives and the identification of the preferred solution.	To place final decision-making in the hands of the public.
Promise to the Public:	**Promise to the Public:**	**Promise to the Public:**	**Promise to the Public:**	**Promise to the Public:**
We will keep you informed.	We will keep you informed, listen to and acknowledge concerns and aspirations, and provide feedback on how public input influenced the decision.	We will work with you to ensure that your concerns and aspirations are directly reflected in the alternatives developed and provide feedback on how public input influenced the decision.	We will look to you for direct advice and innovation in formulating solutions and incorporate your advice and recommendations into the decisions to the maximum extent possible.	We will implement what you decide.
Example Techniques to Consider:	**Example Techniques to Consider:**	**Example Techniques to Consider:**	**Example Techniques to Consider:**	**Example Techniques to Consider:**
• Fact sheets • Web sites • Open houses	• Public comment • Focus groups • Surveys • Public meetings	• Workshops • Deliberate polling	• Citizen Advisory Committees • Consensus-building • Participatory decision-making	• Citizen juries • Ballots • Delegated decisions

Figure 5-1: International Association for Public Participation spectrum **(IAPP 2007).**

In June, the Cadence team made a series of approximately 60 individual and small group phone calls and visits to ask governmental and non-governmental interested parties their view of the situation and how they wanted to be engaged in the new NEPA process. The Cadence team wrote a draft assessment document of the situation's possibilities for participation and how those fit with the promise (which communicates both the limits and opportunities the agency and stakeholders had identified for the process).

The July 2005 assessment document, with a series of unattributed thematic notes about participation, was delivered simultaneously to NPS and all stakeholders (no party pre-reviewed or edited the themes) and then received an accuracy check by the 60 interviewees via electronic mail.

The six main participation themes affirmed from that independent assessment included:

- a low level of trust about the process;
- fatigue in the process;
- confusion about how past winter use analyses are connected to current winter use analyses and the current EIS work;
- concern about ongoing or expected litigation that could confound participation efforts;
- uncertainty regarding some of the science and ecology aspects, monitoring results, and their use or disuse by the agency and others; and
- tension over how NPS was hearing and using local/regional/national interests in winter use planning for these parks.

Many of the interested parties themselves acknowledged what the NPS had concluded in the previous winter with assistance from the U.S. Institute for Environmental Conflict Resolution: conditions were not ripe for mediation or shared decision making. That is, the necessary preliminary agreements and organizational structures simply were not present under the circumstances at that time.

NPS embarked on a public and agency outreach and participation effort with the explicit goal of investing in disclosure and exchange of information and rebuilding trust in working relationships for the long term, and to lay possible groundwork so that collaboration, mediation and/or a negotiated settlement might be possible in the future. The related goal was to improve the overall potential for a durable winter use management scheme in the two parks. NPS made this commitment in spite of the continuing litigation context and the confining aspects of that situation that tend to mirror/reproduce, the adversarial relationships onto every aspect of the EIS, and onto the working relationships between and among those with a stake in the outcomes.

Assessment 3: Winter/Spring 2006

Cadence used email and telephone communication to conduct the least structured of all five assessments immediately following a complaint by interested parties in Wyoming that the open meeting to describe the preliminary scenarios for the EIS was scheduled only for Bozeman, Mont. After checking with a sampling of interested groups and individuals most likely to attend and engage, the NPS scheduled a second and identical open meeting in Jackson, Wyoming for the same week as the Bozeman meeting (March 2006). The Cadence team asked stakeholders their preferences for how to structure the meetings, especially since one of the key themes from the previous summer had been to avoid large group meetings as general principal (primarily because of difficult memories of past large group meetings associated with previous winter use planning). Process evaluations by participants were positive about the chance to talk with NPS staff and each other and learn of the scenarios.

Assessment 4: Fall 2006

The Cadence team posed the following three questions via email to about 100 governmental and non-governmental interested parties and received responses back from a mix of people (nine governmental cooperators/agencies, seven nongovernmental groups, and two unaffiliated individuals). The questions were intended to help identify the salient themes of opinions about the public participation process held by participants, not to provide a statistical analysis of the predominance of any particular opinions:

- How well did the public and agency engagement methods used in the last year suit your needs?

- Do last year's themes from participants (such as process fatigue and steering away from large meetings) still ring true? Are there new themes that ought to be acknowledged and responded to in the participation methods?
- What changes do you believe would improve the public and agency engagement process in the next year when the NPS expects to publish the Draft EIS and conduct the corresponding public comment period?

The resultant themes about winter use participation were:

NPS Management Policies of great interest – the Secretary of the Interior's clarification in summer 2006 of the NPS's approach to its dual goals by was perceived by many as directly applicable to the winter use plan. Specifically, the outcome of this Winter Use Planning process was anticipated as a "first example" of the NPS's implementation of this clarified policy.

Trust and distrust of the NPS – although some parties expressed a high opinion of the integrity of the NPS, chronic distrust of the agency continued to be a strong theme. There was, however, some acknowledgement that the NPS has handled the process in this past year better than in earlier Winter Use processes. Rebuilding trust was recognized as slow work especially in the midst of a process and expected litigation that could be expected to strain some parties' confidence in the integrity of others.

Format for public meetings – whereas most public participation processes are intended to introduce to the public a topic that may be relatively unfamiliar to them, the question of winter use is now generally well understood. The type of information sought by participating stakeholders is, therefore, quite advanced, so that, for example, open house meetings may require more technical personnel to enable participants to get the information that they seek. Much of the interested public has formed well-developed opinions on the outcome that they desire from this process. So there was limited benefit to providing public meetings as a forum for the public airing of perspectives or for debate. Also, there was concern that large meetings can be intimidating for participants who fear being shamed, discredited, or shouted at. There was even a fear of violence expressed. Despite this concern, others accept "venting" at meetings as an unavoidable, necessary part of the process.

Winter use management by administration or by litigation – the theme of "Process Fatigue" that was so strong in the summer of 2005 was now more clearly expressed as a perception that the administrative process will probably be followed by a litigated process. Emphasis on public and agency participation within the administrative process provides opportunities for NPS to sustain the relationships that it needs for the adaptive management of the Park. These relationships will inevitably be strained by litigation.

Format for meetings of cooperating agencies – some respondents preferred meetings at which all Cooperating Agencies (CAs) meet together with the opportunity to understand each others' interests. Others prefer that one agency at a time meet with NPS. Still others are confined by travel restrictions (small or no travel budgets).

Availability of data – there was interest in knowing what the NPS is learning from its studies as soon as it has the information and in hearing how the NPS is interpreting the information. The provision of this information as it becomes available is reassuring, because it indicates the NPS's interest in staying engaged with stakeholder groups. It was noted that the frequent delivery of information as it becomes available has reduced opportunities for newsworthy issues to develop.

General communication – there was great interest in knowing about alternatives and what the preferred alternative would be. Several stakeholders noted Congressional delegations need

to be encouraged to participate within the agency and public participation process rather than on its periphery or outside of it. Related to this is the realization that as all three branches of government are involved in decision making in three separate, but connected, arenas (administrative, political, and judicial), this often makes it all the more confounding to an individual or group seeking to shape the outcomes of winter use in the parks.

Assessment 5: Spring 2007

Coinciding with the release of the Draft EIS for formal public comment, the Cadence team made another round of phone calls to about a dozen governmental and non-governmental people, local to national, with a stake in the outcomes of the winter use decision making. They asked for additional thoughts/perspectives on what meeting format(s) could be most useful and helpful, in their view, during the formal public comment period.

The Cadence team distilled three main messages from that set of informal calls and distributed them via email to continue the principal of conducting all work with full transparency:

- During this formal public comment period, go national – (e.g., it is important to be congruent with local and national interest in these National Parks and public meetings should occur locally and in out-of-area places).
- Communicate what is likely to happen next winter season. (e.g., there is much uncertainty, especially in gateway communities, about what is going to happen next winter season, and it is critically important to help people see what is most likely to occur).
- Explain (especially to Cody and Wyoming-based interests) what it would take for NPS to keep Sylvan Pass open to motorized oversnow traffic. (e.g., there was/is much grassroots involvement about the current NPS preferred alternative to close Sylvan Pass to motorized oversnow traffic in the winter. Even those outside the Cody area mentioned how important it will be to help people know how and/or where they can or cannot work with NPS to shape that aspect of the current NPS preferred alternative).

5.2.3 Participation Plan Elements

The full text of the Public and Agency Information/Participation Plan, which NPS adopted in late 2005 pursuant to the first assessment, may be found at http://www.nps.gov/yell/planyourvisit/upload/participationplan10-13-05.pdf . The document provides more background, explanation of participation themes, descriptions of these elements, excerpts from the NPS Director's Order #75A on Civic Engagement and Public Involvement, CEQ guidance regarding cooperating agency involvement, and other references.

The main participation strategies of this plan were:

- Documents and noticing in the Federal Register (EIS, Rule, ROD)
- Customized cooperating agency work (one-on-one calls, written communication, meetings, and three full group meetings)
- Roving team meetings (see Table 5-2). These were a valuable tool for sharing information and receiving input to the planning process. Early meetings were held to discuss the history and background of winter use planning and the need for a new planning effort; beginning in November 2005 a range of modeling scenarios were introduced. In April 2006, draft alternatives were presented. In December 2006, a Cooperating Agency Review Draft EIS was presented. Many meeting summaries are available on the winter use planning web site.
- Media communication (news releases, news advisories and interviews)

- Outreach to Congressional delegation staff
- Project newsletters sent to full stakeholder contact list via surface mail
- Rounds of phone calls and/or emails to various stakeholders (from NPS and also via the Cadence team as part of their periodic assessments of the participation work)
- Translation task (NPS did ongoing tracking of how the agency used/did not use what stakeholders said)
- Web archive and PEPC updates. The winter use website http://www.nps.gov/yell/planyourvisit/winteruse.htm, has been a project library/archive and a useful tool for disseminating information about the status of the plan to the public throughout the process. The NPS Planning, Environment and Public Comment website at http://parkplanning.nps.gov was used throughout the process to notify stakeholders of meetings and to receive written comments.
- Public meetings. In addition to the three full cooperating agency meetings (which were always open public meetings), NPS convened two large open meetings in the spring of 2006, a December 2006 technical information fair coinciding with the release of the preliminary DEIS for cooperating agency review (November 2006), and four public comment meetings during the formal public comment period in the spring of 2007 in Montana, Wyoming, Minnesota, and Colorado (See Table 5-2).
- Project contact lists. Participants were continually asked whether they would like to be added to the NPS contact list at face to face meetings and the Cadence team built and used an email contact list as the project developed through the initial interviews in the summer of 2005 and by asking, "who else do you think would appreciate being contacted?"
- Invitations to review and comment (technical review by cooperating agencies and stakeholders with relevant expertise) on the following documents:
    - Soundscapes Modeling Plan and Draft Report
    - Soundscapes Monitoring Reports
    - Air Quality Modeling Plan and Draft Report
    - Air Quality Monitoring Reports
    - Wildlife Monitoring Reports
    - Economics Modeling Plan
    - Economic Analysis Memorandum and Draft Modeling Report
    - The research proposal "Evaluating key uncertainties regarding road grooming and bison movements"
    - Operational Risk Management Assessment for Avalanche Hazard Mitigation at Sylvan Pass and Talus Slope

Table 5-2: Meetings held during winter planning process

Stakeholder	Meeting location	Date
State of Wyoming	Cheyenne, WY	July 2005
Park County, WY	Cody, WY	September 2005
State of Montana	Helena, MT	September 2005
Park County, MT	Livingston, MT	October 2005
Fremont County, ID	West Yellowstone, MT	November 2005
State of Idaho	Boise, ID	November 2005
EPA	Denver, CO	November 2005
State of Wyoming	Cheyenne, WY	November 2005
Greater Yellowstone Coordinating Committee	Cody, WY	November 2005
Gallatin County, MT	Bozeman, MT	November 2005
Park County, WY; Park County, MT	Telephone	November 2005
State of Wyoming	Telephone	November 2005
NPS and Xanterra Staff	Mammoth, WY	December 2005
Winter Guides & Outfitters	Old Faithful, WY	December 2005
State of Montana; Conservation Interests	Bozeman, MT	December 2005
ISMA, BRP, Yamaha, Polaris, Arctic Cat	Houghton, MI	January 2006
USFS; OMB staff	Telephone	January 2006
BRC and local businesses	West Yellowstone, MT	January 2006
BRC, ACSA and local businesses	Jackson, WY	January 2006
Conservation Interests; Teton County, WY	Jackson, WY	February 2006
Local congressional staff	Telephone	March 2006
Open house	Bozeman, MT	March 2006
Open house	Jackson, WY	March 2006
Cooperating Agencies, GYC, BRC	Idaho Falls, ID	April 2006
New NPS Employees	Gardiner, MT	June 2006
Island Park Area Chamber of Commerce	Island Park, ID	August 2006
Yellowstone Concessioners	Bozeman, MT	October 2006
Eastern Idaho's Yellowstone Teton Territory group	Rexburg, ID	October 2006
Montana State Snowmobile Association	Bozeman, MT	October 2006
Local congressional staff	Telephone	November 2006
NPS Employees, at multiple duty locations	Yellowstone NP	November 2006
Cooperating Agencies, other stakeholders	Cody, WY	December 2006
State of Montana	Helena, MT	December 2006
Winter Guides & Outfitters	Old Faithful, WY	December 2006
Winter Operators	Jackson, WY	December 2006
Winter Operators	West Yellowstone, MT	December 2006
Parks subcommittee, Cody Chamber	Cody, WY	January 2007
State of WY staff, Senators and Representatives, Park County Commissioners	Billings, MT	January 2007
Wyoming Governor Freudenthal and staff	Old Faithful, WY	February 2007
Wyoming Senators and Representatives	Cheyenne, WY	February 2007
State of Wyoming, Governor's staff	Cheyenne, WY	March 2007
Park County, WY Commissioners	Cody, WY	March 2007
"Shut Out of Yellowstone" Forum	Cody, WY	March 2007
Delegation and Local Congressional Staff	Telephone	March 2007
Cooperating Agencies, other stakeholders	Idaho Falls, ID	May 2007
Public Meetings and Guide and Outfitter meetings (6 total)	Jackson; Cody; West Yellowstone (2); St. Paul; Lakewood	May – June 2007
NPS Employees, at multiple duty locations	Yellowstone NP	June 2007

5.2.4 Cooperating Agencies

Table 5-3: List of Cooperating Agency Representatives

Name	Agency
Tamra Cikaitoga	Fremont County, Idaho
Pat Flowers	State of Montana, Department of Fish, Wildlife and Parks
Tim French	Park County, Wyoming
Becki Heath	Gallatin National Forest
Larry Lahren	Park County, Montana
Bill Murdock	Gallatin County, Montana
Bill Paddleford	Teton County, Wyoming
Tom Puchlerz	Gallatin County, Montana
Temple Stevenson	State of Wyoming, Office of the Governor
Phil Strobel	U.S. EPA Region 8
Mark Toft	State of Wyoming, Office of the Governor
Carl Wilgus	State of Idaho, Department of Commerce and Labor

5.2.5 Public Scoping Comments and Public Input on DEIS

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

Although the public scoping period was intended to garner comments about the scope of this EIS, many people simply expressed their opinions regarding winter use management in the parks. A detailed report of the public scoping comments is available for public review on the NPS website: http://www.nps.gov/yell/parkmgmt/winterusetechnicaldocuments.htm. Chapter V of the FEIS contains a summary of public involvement during this process.

The Draft EIS was on public review from March 27 – June 5, 2007. The NPS received approximately 120,000 documents commenting on the DEIS. A summary of comments and responses is found in Appendix I of the FEIS. Four public meetings were held during the EIS comments period: Cody, Wyoming; West Yellowstone, Montana; St. Paul, Minnesota; and Lakewood, Colorado. A detailed report is available at the above web site.

5.3 List of Preparers and Contributors

Table 5-4: List of preparers

Name	Title or Role	Agency or Affiliation
Project management and coordination		
Gary Pollock	Management Assistant	Grand Teton National Park
John Sacklin	Management Assistant	Yellowstone National Park
Denice Swanke	Outdoor Recreation Planner	Yellowstone National Park
Mike Yochim	Outdoor Recreation Planner	Yellowstone National Park
Technical expertise		
Shan Burson	Ecologist	Grand Teton National Park
Troy Davis	Wildlife Biologist	Yellowstone National Park

Laurie Domler	NEPA Specialist	National Park Service
Kevin Franken	Planning Assistant	Administrative Record and Support
Bruce Peacock	Economist	National Park Service
John D. Ray	Atmospheric Chemist	National Park Service
Robert Rossman	DEIS Contractor	Rossman Services
Barry Roth	Deputy Associate Solicitor	U.S. Department of the Interior
Christine Turk	Environmental Quality Coordinator	National Park Service
Deborah Van De Polder	Planning Assistant	Administrative Record and Support
Jason Waanders	Attorney-Advisor	U.S. Department of the Interior
Aaron Worstell	Air Resource Specialist	National Park Service
Consultants		
Martha Bean	Public Engagement and Facilitation	Cadence, Inc.
Nedra Chandler	Public Engagement and Facilitation	Cadence, Inc.
Carol Cole	Public Comment Analysis	Northwind Environmental
Nicolas Dewar	Public Engagement and Facilitation	Cadence, Inc.
John Duffield	Economic Analysis	University of Montana
Aaron Hastings	Soundscapes Analysis	DOT, Volpe Center
Chris Neher	Economic Analysis	University of Montana
James Wu	Air Quality Analysis	Air Resource Specialists
Management Support		
Jim Bellamy	Deputy Superintendent (retired)	Grand Teton National Park
Colin Campbell	Deputy Superintendent	Yellowstone National Park
Chris Lehnertz	Deputy Superintendent	Yellowstone National Park
Suzanne Lewis	Superintendent	Yellowstone National Park
Al Nash	Chief of Public Affairs	Yellowstone National Park
Mary Gibson Scott	Superintendent	Grand Teton National Park
Michael Snyder	Intermountain Regional Director	National Park Service
Bob Vogel	Deputy Superintendent	Grand Teton National Park
Franklin Walker	Deputy Superintendent (retired)	Yellowstone National Park

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