CHAPTER V: CONSULTATION AND COORDINATION

5.1 Introduction

This section describes the consultation and coordination that has occurred during the preparation of this document. The planning process began in spring 2005. Table 111 indicates some key steps of the planning process. Table 112 lists those persons most involved in the preparation of this document. A Public and Agency Participation Plan[1] was developed and implemented with involvement from stakeholders. The NPS is committed to open information sharing throughout the process.

Table 107: Overall Planning Process

Planning Step	Methods	Timeframe
Scoping—gather ideas and concerns, confirm purpose, need, and significance	Federal Register notice, PEPC, newsletter, web site, stakeholder dialog	June – September, 2005
Analyze comments, review history and legal proceedings	Planning team research, scoping report	Fall 2005
Confirm issues, goals and opportunities; develop general alternative concepts	PEPC, newsletter, web site, stakeholder dialog, meetings	Winter 2005/2006
Analyze resources, refine alternatives, identify impacts	Planning team research, stakeholder dialog	Spring/Summer 2006
Select a preferred alternative and begin internal review	Concurrence of NPS regional director and NPS Washington Office	Fall 2006
Internal, cooperating agency and public review of Draft EIS; Publish Proposed Rule	Federal Register notice, PEPC, newsletter, web site, stakeholder dialog, cooperating agency meeting	November 2006 through May 2007
Analyze comments, make changes as appropriate, prepare Final EIS	Planning team research	May 2007 through August 2007
Review of Final EIS (internal followed by cooperating agency and stakeholders)	Federal Register notice, PEPC, newsletter, web site, stakeholder dialog, meetings	August – September 2007
Prepare and publish Record of Decision	Planning team, with approval of NPS regional director and NPS Washington Office; Federal Register Notice	October – November 2007
Publish Final Rule	Federal Register Notice	November 2007

[1] Available at http://www.nps.gov/yell/planyourvisit/upload/participationplan10-13-05.pdf.

5.2 Public Input to the Planning Process

5.2.1 Plan Webpage

The plan website <http://www.nps.gov/yell/planyourvisit/winteruse.htm> has been a useful tool for disseminating information about the status of the plan to the public.

5.2.2 Outreach

To date, the NPS has:

- Employed a variety of outreach methods to keep cooperating agencies and other interested parties informed. These methods attempt to meaningfully involve the public through: roving team and selected larger meetings, newsletters, telephone calls and web site postings (Yellowstone site and NPS Planning, Environment, and Public Comment (PEPC) system).
- Finalized a Memorandum of Understanding with each Cooperating Agency. Three states, five counties, the USFS and EPA are cooperating agencies, as they were in the EIS and SEIS process.
- Met with cooperating agencies and other stakeholders multiple times since finalizing the Public and Agency Participation Plan. These 'Roving Team' meetings, approximately thirty to date, have been a valuable tool for sharing information and receiving input to the planning process.
- Submitted draft reports of monitoring and scientific work, as well as draft modeling and study plans, for technical review by cooperating agencies and stakeholders with relevant expertise.

5.2.3 Cooperating Agencies

Table108: 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 Jorgenson	Teton County, Wyoming
Larry Lahren	Park County, Montana
Temple Stevenson	State of Wyoming, Office of the Governor
Phil Strobel	U.S. EPA Region 8
Bill Murdock	Gallatin County, Montana
Carl Wilgus	State of Idaho, Department of Commerce & Labor

5.2.4 Public Scoping Comments and Other Public Input

The summary and analysis of scoping comments and synopsis of cooperating agency, stakeholder, and public meetings is available on the plan website.

5.3 List of Preparers and Contributors

Table 109: 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
Bruce Peacock	Economist	National Park Service
Robert Rossman	EIS Contractor	Rossman Services
Barry Roth	Deputy Associate Solicitor	U.S. Department of the Interior
Christine Turk	Environmental Quality Coordinator	National Park Service
Deborah VanDePolder	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.
Aaron Hastings	Soundscapes Analysis	Volpe National Transportation Systems Center
James Wu	Air Quality Analysis	Air Resource Specialists
Management Support		
Jim Bellamy	Deputy Superintendent (retired)	Grand Teton 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
Franklin Walker	Deputy Superintendent (retired)	Yellowstone National Park

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APPENDIX A. POLICIES AND MANDATES

1.8.1 The Organic Act

The NPS gets its basic mandate from the NPS Organic Act (16 USC 1, 2–4) and the General Authorities Act (16 USC 1a–1 through 1a–8). The NPS Organic Act provides:

> "The Service thus established shall promote and regulate the use of the Federal areas known as National Parks. . .by such means and measures as to conform to the fundamental purposes of the said Parks. . .which purpose is to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations."

The direction provided by the Organic Act was the subject of many comments on the 1999 Draft Environmental Impact Statement (Draft EIS) and these are discussed in the 2000 Final EIS (page 3).

1.8.2 The General Authorities Act

The General Authorities Act, as amended by the Redwood Act (March 27, 1978, P.L. 95–250, 92 Stat. 163, 16 USC 1a–1) affirms the basic tenets of the Organic Act and provides additional guidance on National Park System management:

> "The authorization of activities shall be construed, and the protection, management and administration of these areas shall be conducted in light of the high public value and integrity of the National Park System and shall not be exercised in derogation of the values and purposes for which these various areas have been established. . .."

The restatement of these principles of park management in the Redwood Act is intended to serve as the basis for any judicial resolution of competing private and public values and interests in the National Park System (Senate Report No. 95–528 on S. 1976 pg. 7). The Senate committee report stated that under the Redwood amendment:

> "The Secretary of the Interior has an absolute duty, which is not to be compromised, to fulfill the mandate of the 1916 Act to take whatever actions and seek whatever relief as will safeguard the units of the National Park System."

Consideration of these principles gives rise to the concept of "impairment" discussed on page 3 of the Final EIS, and below under Management Policies 2006.

1.8.3 Park-Specific Legislation

The Yellowstone National Park Act (16 USC 21, et seq.), the Grand Teton National Park Act (16 USC 406d–1 et seq.), and the John D. Rockefeller, Jr., Memorial Parkway Act (P.L. 92-404) provide authority and direction for management of each park. The establishment legislation is included in Appendix C of the 2000 EIS.

1.8.4 Other Laws

Because one of the primary issues about snowmobile use is that of air quality, the Clean Air Act (as amended, P.L. Chapter 360, 69 Stat. 322, 42 U.S.C. 7401 et seq.) is a primary focus in both the 2000 Final EIS and in the 2003 Final SEIS. Other laws that are generally pertinent to national park management are listed on page 3 of the 2000 Final EIS.

The Clean Air Act

The Clean Air Act provides both for the prevention of significant deterioration of areas where air is cleaner than National Ambient Air Quality Standards (NAAQS), and for an affirmative responsibility by the federal land manager to protect air quality-related values, including visibility. The federal land manager, in this case the NPS, has an affirmative responsibility to protect these resources, which is a separate issue from air quality vis-à-vis the NAAQS.

The Prevention of Significant Deterioration (PSD) provisions of the Clean Air Act are intended, in part, to preserve, protect, and enhance the air quality in national parks. The legislative history of the PSD provisions (S. Rep 95–127, 95th Cong., 1st Sess., 1977) indicates that federal land managers are to "assume an aggressive role in protecting the air quality values of land areas under his jurisdiction" and to "err on the side of protecting the air quality-related values for future generations." The Act also requires the prevention of any future impairment and the remedying of any existing impairment in Class I federal areas, which includes Yellowstone and Grand Teton National Parks. Additionally, the John D. Rockefeller, Jr., Memorial Parkway (a Class II area) abuts Class I federal areas, including the two national parks and the Jedediah Smith and Teton Wilderness Areas.

1.8.5 Executive Orders

EO 11644, Use of Off-Road Vehicles on the Public Lands, issued by President Nixon in 1972, states, "The widespread use of such vehicles on the public lands—often for legitimate purposes but also in frequent conflict with wise land and resource management practices, environmental values, and other types of recreational activity—has demonstrated the need for a unified federal policy…that will ensure that the use of off-road vehicles on public lands will be controlled and directed so as to protect the resources of these lands, to promote the safety of all users of those lands, and to minimize conflicts among the various users of those lands." Further, the order directs federal land managers that "[a]reas and trails shall be located to minimize harassment of wildlife or significant disruption of wildlife habitats" and "areas and trails shall be located to minimize conflicts between off-road vehicle use and other existing or proposed recreational uses of the same or neighboring public lands…." Additionally, "Areas and trails shall be located in areas of the National Park System…only if the respective agency head determines that off-road vehicle use in such locations will not adversely affect their natural, aesthetic, or scenic values." Finally, "The respective agency head shall monitor the effects of the use of off-road vehicles on lands under their jurisdictions. On the basis of the information gathered, they shall from time to time amend or rescind designation of areas or other actions taken pursuant to this order as necessary to further the policy of this order."

Under the Executive Orders, the term "off-road vehicle" specifically excludes "any vehicle whose use is expressly authorized by the respective agency head under a permit, lease, license, or

contract." Executive Order No. 11644 § 2(3(C).

This order is amended by EO 11989, issued by President Carter in 1978, which adds:

> "…the respective agency head shall, whenever he determines that the use of off-road vehicles will cause or is causing considerable adverse effects on the soil, vegetation, wildlife, wildlife habitat or cultural or historic resources of particular areas or trails of the public lands, immediately close such areas or trails to the type of off-road vehicle causing such effects, until such time as he determines that such adverse effects have been eliminated and that measures have been implemented to prevent future recurrence."

1.8.6 Regulations

36 CFR 2.18 Snowmobiles

General provisions in NPS regulations address snowmobile use (36 CFR 2.18). Snowmobiling is generally prohibited except on designated routes and water surfaces available for motorized use at other times. In addition, snowmobiles are prohibited except where designated and "only when their use is consistent with the park's natural, cultural, scenic and aesthetic values, safety considerations, park management objectives, and will not disturb wildlife or damage park resources" (36 CFR 2.18c). Section (d) of this regulation lists additional limitations and prohibitions that apply where snowmobiles are allowed, including noise limits, speed limits, operator requirements, and machine appurtenances.

36 CFR 1.5 Closures and public use limits.

"(a) Consistent with applicable legislation and Federal administrative policies, and based upon a determination that such action is necessary for the maintenance of public health and safety, protection of environmental or scenic values, protection of natural or cultural resources, aid to scientific research, implementation of management responsibilities, equitable allocation and use of facilities, or the avoidance of conflict among visitor use activities, the superintendent may:

(1) Establish, for all or a portion of a park area, a reasonable schedule of visiting hours, impose public use limits, or close all or a portion of a park area to all public use or to a specific use or activity.

(2) Designate areas for a specific use or activity, or impose conditions or restrictions on a use or activity.

(3) Terminate a restriction, limit, closure, designation, condition, or visiting hour restriction imposed under paragraph (a)(1) or (2) of this section."

36 CFR 1.7 Public Notice

"(a) Whenever the authority of §1.5(a) is invoked to restrict or control a public use or activity, to relax or revoke an existing restriction or control, to designate all or a portion of a park area as open or closed, or to require a permit to implement a public use limit, the public shall be notified by one or more …methods…"

1.8.7 NPS Management Policies

Current policy guidance for the NPS is published in Management Policies 2006 (August 31, 2006; available on the Internet at www.nps.gov/policy/mp/policies.html). The policies interpret the laws, regulations, and Executive Orders governing management of National Park System units. The policies most applicable to this EIS are summarized or abstracted here. The parenthetical numbers below refer to the portions of the Management Policies 2006 that are the sources for the text.

The NPS Obligation to Conserve and Provide for Enjoyment of Park Resources and Values (1.4.3)

"The fundamental purpose of the national park system, established by the Organic Act and reaffirmed by the General Authorities Act, as amended, begins with a mandate to conserve park resources and values. This mandate is independent of the separate prohibition on impairment and applies all the time with respect to all park resources and values, even when there is no risk that any park resources or values may be impaired. NPS managers must always seek ways to avoid, or to minimize to the greatest extent practicable, adverse impacts on park resources and values. However, the laws do give the Service the management discretion to allow impacts to park resources and values when necessary and appropriate to fulfill the purposes of a park, so long as the impact does not constitute impairment of the affected resources and values.

"The fundamental purpose of all parks also includes providing for the enjoyment of park resources and values by the people of the United States. The enjoyment that is contemplated by the statute is broad; it is the enjoyment of all the people of the United States and includes enjoyment both by people who visit parks and by those who appreciate them from afar. It also includes deriving benefit (including scientific knowledge) and inspiration from parks, as well as other forms of enjoyment and inspiration. Congress, recognizing that the enjoyment by future generations of the national parks can be ensured only if the superb quality of park resources and values is left unimpaired, has provided that when there is a conflict between conserving resources and values and providing for enjoyment of them, conservation is to be predominant. This is how courts have consistently interpreted the Organic Act."

The Prohibition on Impairment of Park Resources and Values (1.4.4)

"While Congress has given the Service the management discretion to allow impacts within parks, that discretion is limited by the statutory requirement (generally enforceable by the federal courts) that the Park Service must leave park resources and values unimpaired unless a particular law directly and specifically provides otherwise. This, the cornerstone of the Organic Act, establishes the primary responsibility of the National Park Service. It ensures that park resources and values will continue to exist in a condition that will allow the American people to have present and future opportunities for enjoyment of them.

"The impairment of park resources and values may not be allowed by the Service unless directly and specifically provided for by legislation or by the proclamation establishing the park. The relevant legislation or proclamation must provide explicitly (not by implication or inference) for the activity, in terms that keep the Service from having the authority to manage the activity so as to avoid the impairment."

What Constitutes Impairment of Park Resources and Values (1.4.5)

"The impairment that is prohibited by the Organic Act and the General Authorities Act is an impact that, in the professional judgment of the responsible NPS manager, would harm the integrity of park resources or values, including the opportunities that otherwise would be present for the enjoyment of those resources or values. Whether an impact meets this definition depends on the particular resources and values that would be affected; the severity, duration, and timing of the impact; the direct and indirect effects of the impact; and the cumulative effects of the impact in question and other impacts.

"An impact to any park resource or value may, but does not necessarily, constitute an impairment. An impact would be more likely to constitute impairment to the extent that it affects a resource or value whose conservation is:

- necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the park, or
- key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park, or
- identified in the park's general management plan or other relevant NPS planning documents as being of significance.

"An impact would be less likely to constitute an impairment if it is an unavoidable result of an action necessary to preserve or restore the integrity of park resources or values and it cannot be further mitigated.
"An impact that may, but would not necessarily, lead to impairment may result from visitor activities; NPS administrative activities; or activities undertaken by concessioners, contractors, and others operating in the park. Impairment may also result from sources or activities outside the park."

What Constitutes Park Resources and Values (1.4.6)

"The 'park resources and values' that are subject to the no-impairment standard include:

- the park's scenery, natural and historic objects, and wildlife, and the processes and conditions that sustain them, including, to the extent present in the park: the ecological, biological, and physical processes that created the park and continue to act upon it; scenic features; natural visibility, both in daytime and at night; natural landscapes; natural soundscapes and smells; water and air resources; soils; geological resources; paleontological resources; archeological resources; cultural landscapes; ethnographic resources; historic and prehistoric sites, structures, and objects; museum collections; and native plants and animals;
- appropriate opportunities to experience enjoyment of the above resources, to the extent that can be done without impairing them;
- the park's role in contributing to the national dignity, the high public value and integrity, and the superlative environmental quality of the national park system, and the benefit and inspiration provided to the American people by the national park system; and
- any additional attributes encompassed by the specific values and purposes for which the park was established."

Decision-making Requirements to Avoid Impairments (1.4.7)

"Before approving a proposed action that could lead to an impairment of park resources and values, an NPS decision-maker must consider the impacts of the proposed action and determine, in writing, that the activity will not lead to an impairment of park resources and values. If there would be an impairment, the action must not be approved.

"In making a determination of whether there would be an impairment, an NPS decision-maker must use his or her professional judgment. This means that the decision-maker must consider any environmental assessments or environmental impact statements required by the National Environmental Policy Act of 1969 (NEPA); consultations required under section 106 of the National Historic Preservation Act (NHPA), relevant scientific and scholarly studies; advice or insights offered by subject matter experts and others who have relevant knowledge or experience; and the results of civic engagement and public involvement activities relating to the decision. The same application of professional judgment applies when reaching conclusions about "unacceptable impacts."

"When an NPS decision-maker becomes aware that an ongoing activity might have led or might be leading to an impairment of park resources or values, he or she must investigate and determine if there is or will be an impairment. This investigation and determination may be made independent of, or as part of, a park planning process undertaken for other purposes. If it is determined that there is, or will be, an impairment, the decision-maker must take appropriate action, to the extent possible within the Service's authorities and available resources, to eliminate the impairment. The action must eliminate the impairment as soon as reasonably possible, taking into consideration the nature, duration, magnitude, and other characteristics of the impacts on park resources and values, as well as the requirements of the National Environmental Policy Act, National Historic Preservation Act, the Administrative Procedure Act, and other applicable laws."

1.4.7.1 Unacceptable Impacts

"The impact threshold at which impairment occurs is not always readily apparent. Therefore, the Service will apply a standard that offers greater assurance that impairment will not occur. The Service will do this by avoiding impacts that it determines to be unacceptable. These are impacts that fall short of impairment, but are still not acceptable within a particular park's environment. Park managers must not allow uses that would cause unacceptable impacts; they must evaluate existing or proposed uses and determine whether the associated impacts on park resources and values are acceptable.

"Virtually every form of human activity that takes place within a park has some degree of effect on park resources or values, but that does not mean the impact is unacceptable or that a particular use must be disallowed. Therefore, for the purposes of these policies, unacceptable impacts are impacts that, individually or cumulatively, would:

- be inconsistent with a park's purposes or values, or
- impede the attainment of a park's desired future conditions for natural and cultural resources as identified through the park's planning process, or
- create an unsafe or unhealthful environment for visitors or employees, or

- diminish opportunities for current or future generations to enjoy, learn about, or be inspired by park resources or values, or
- unreasonably interfere with
    - park programs or activities, or
    - an appropriate use, or
    - the atmosphere of peace and tranquility, or the natural soundscape maintained in wilderness and natural, historic, or commemorative locations within the park.
    - NPS concessioner or contractor operations or services."

Air Quality (4.7.1)

"The National Park Service has a responsibility to protect air quality under both the 1916 Organic Act and the Clean Air Act (CAA). Accordingly, the Service will seek to perpetuate the best possible air quality in parks to (1) preserve natural resources and systems; (2) preserve cultural resources; and (3) sustain visitor enjoyment, human health, and scenic vistas. Vegetation, visibility, water quality, wildlife, historic and prehistoric structures and objects, cultural landscapes, and most other elements of a park environment are sensitive to air pollution and are referred to as "air quality-related values." The Service will actively promote and pursue measures to protect these values from the adverse impacts of air pollution. In cases of doubt as to the impacts of existing or potential air pollution on park resources, the Service will err on the side of protecting air quality and related values for future generations.

"Superintendents will take actions consistent with their affirmative responsibilities under the Clean Air Act to protect air quality-related values in Class I areas. Class I areas are national parks over 6, 000 acres and national wilderness areas over 5,000 acres that were in existence on August 7, 1977. The act establishes a national goal of preventing any future and remedying any existing human-made visibility impairment in Class I areas. The Service supports that goal and will take advantage of opportunities created by the act to help achieve it. The federal land manager shares the responsibility to protect air quality-related values in Class I areas. As the federal land manager for the department, the Secretary of the Interior has delegated this responsibility to the Assistant Secretary for Fish and Wildlife and Parks.

"The Clean Air Act also recognizes the importance of integral vistas, which are those views perceived from within Class I areas of a specific landmark or panorama located outside the boundary of the Class I area. Integral vistas have been identified by the Service and are listed in *Natural Resources Reference Manual 77*. There are no regulations requiring special protection of these integral vistas, but the Service will strive to protect these park-related resources through cooperative means.

"Although the Clean Air Act gives the highest level of air quality protection to Class I areas, it provides many opportunities for the Service to participate in the development of pollution control programs to preserve, protect, and enhance the air quality of all units of the national park system. Regardless of Class I designation, the Service will take advantage of these opportunities.

"Air resource management requirements will be integrated into NPS operations and planning,

and all air pollution sources within parks—including prescribed fire management and visitor use activities—will comply with all federal, state, and local air quality regulations and permitting requirements. Superintendents will make reasonable efforts to notify visitors and employees when air pollution concentrations within an area exceed the national or state air quality standards established to protect public health. Furthermore, because the current and future quality of park air resources depends heavily on the actions of others, the Service will acquire the information needed to effectively participate in decision-making that affects park air quality. The Service will:

- inventory the air quality-related values associated with each park;
- monitor and document the condition of air quality and related values;
- evaluate air pollution impacts and identify causes;
- minimize air quality pollution emissions associated with park operations, including the use of prescribed fire and visitor use activities; and
- ensure healthful indoor air quality in NPS facilities.

"External programs needed to remedy existing and prevent future impacts on park resources and values from human-caused air pollution will be aggressively pursued by NPS participation in the development of federal, state, and local air pollution control plans and regulations. Permit applications for major new air pollution sources will be reviewed, and potential impacts will be assessed. If it is determined that any such new source might cause or contribute to an adverse impact on air quality-related values, the Park Service will recommend to the permitting authority that the construction permit be denied or modified to eliminate adverse impacts.

The public's understanding of park air quality issues and the positive role and efforts of the Service toward improving the air quality in parks will be promoted through educational and interpretive programs."

Soundscape Management (4.9)

"Park natural soundscape resources encompass all the natural sounds that occur in parks, including the physical capacity for transmitting those natural sounds and the interrelationships among park natural sounds of different frequencies and volumes. Natural sounds occur within and beyond the range of sounds that humans can perceive, and they can be transmitted through air, water, or solid materials. The National Park Service will preserve, to the greatest extent possible, the natural soundscapes of parks.

"Some natural sounds in the natural soundscape are also part of the biological or other physical resource components of the park. Examples of such natural sounds include:

- sounds produced by birds, frogs, or katydids to define territories or aid in attracting mates
- sounds produced by bats or porpoises to locate prey or navigate
- sounds received by mice or deer to detect and avoid predators or other danger
- sounds produced by physical processes, such as wind in the trees, claps of thunder, or falling water.

"The Service will restore to the natural condition wherever possible those park soundscapes that

have become degraded by unnatural sounds (noise), and will protect natural soundscapes from unacceptable impacts.

"Using appropriate management planning, superintendents will identify what levels and types of unnatural sound constitute acceptable impacts on park natural soundscapes. The frequencies, magnitudes, and durations of acceptable levels of unnatural sound will vary throughout a park, being generally greater in developed areas. In and adjacent to parks, the Service will monitor human activities that generate noise that adversely affects park soundscapes, including noise caused by mechanical or electronic devices. The Service will take action to prevent or minimize all noise that through frequency, magnitude, or duration adversely affects the natural soundscape or other park resources or values, or that exceeds levels that have been identified through monitoring as being acceptable to or appropriate for visitor uses at the sites being monitored."

Visitor Use (8.2)

"Enjoyment of park resources and values by the people of the United States is part of the fundamental purpose of all parks. The Service is committed to providing appropriate, high quality opportunities for visitors to enjoy the parks, and the Service will maintain within the parks an atmosphere that is open, inviting, and accessible to every segment of American society. However, many forms of recreation enjoyed by the public do not require a national park setting and are more appropriate to other venues. The Service will therefore:

- provide opportunities for forms of enjoyment that are uniquely suited and appropriate to the superlative natural and cultural resources found in the parks;
- defer to local, state, tribal, and other federal agencies; private industry; and non-governmental organizations to meet the broader spectrum of recreational needs and demands.

"To provide for enjoyment of the parks, the National Park Service will encourage visitor activities that:

- are appropriate to the purpose for which the park was established; and
- are inspirational, educational, or healthful, and otherwise appropriate to the park
- environment; and
- will foster an understanding of and appreciation for park resources and values, or will
- promote enjoyment through a direct association with, interaction with, or relation to park resources; and
- can be sustained without causing unacceptable impacts to park resources or values.

"The primary means by which the Service will actively foster and provide activities that meet these criteria will be through its interpretive and educational programs, which are described in detail in chapter 7. The Service will also welcome the efforts of nongovernmental organizations, tour companies, guides, outfitters, and other private sector entities to provide structured activities that meet these criteria. In addition to structured activities, the Service will, to the extent practicable, afford visitors ample opportunity for inspiration, appreciation, and enjoyment through their own personalized experiences—without the formality of program or structure.

"The Service may allow other visitor uses that do not meet all the above criteria if they are

appropriate to the purpose for which the park was established and they can be sustained without causing unacceptable impacts to park resources or values. For the purposes of these policies, unacceptable impacts are impacts that, individually or cumulatively, would:

- be inconsistent with a park's purposes or values, or
- impede the attainment of a park's desired conditions for natural and cultural resources as identified through the park's planning process, or
- create an unsafe or unhealthy environment for visitors or employees, or
- diminish opportunities for current or future generations to enjoy, learn about, or be inspired by park resources or values, or
- unreasonably interfere with:
    - park programs or activities, or
    - an appropriate use, or
    - the atmosphere of peace and tranquility, or the natural soundscape maintained in wilderness and natural, historic, or commemorative locations within the park, or
    - NPS concessioner or contractor operations or services.

"Management controls and conditions must be established for all park uses to ensure that park resources and values are preserved and protected for the future. If and when a superintendent has a reasonable basis for believing that an ongoing or proposed public use would cause unacceptable impacts to park resources or values, the superintendent must make adjustments to the way the activity is conducted to eliminate the unacceptable impacts. If the adjustments do not succeed in eliminating the unacceptable impacts, the superintendent may (1) temporarily or permanently close a specific area, or (2) place limitations on the use, or (3) prohibit the use. Restrictions placed on recreational uses that have otherwise been found to be appropriate will be limited to the minimum necessary to protect park resources and values and promote visitor safety and enjoyment. Any closures or restrictions—other than those imposed by law—must be consistent with applicable laws, regulations, and policies, and (except in emergency situations) require a written determination by the superintendent that such measures are needed to:

- protect public health and safety;
- prevent unacceptable impacts to park resources or values;
- carry out scientific research;
- minimize visitor use conflicts; or
- otherwise implement management responsibilities.

"When practicable, restrictions will be based on the results of study or research, including (when appropriate) research in the social sciences. Any restrictions imposed will be fully explained to visitors and the public. Visitors will be given appropriate information on how to keep adverse impacts to a minimum, and how to enjoy the safe and lawful use of the parks."

Use of Motorized Equipment (8.2.3)

"The variety of motorized equipment—including visitor vehicles, concessioner equipment, and NPS administrative or staff vehicles and equipment—that operates in national parks could adversely impact park resources, including the park's natural soundscape and the flow of natural chemical information and odors that are important to many living organisms. In addition to their

natural values, natural sounds (such as waves breaking on the shore, the roar of a river, and the call of a loon), form a valued part of the visitor experience. Conversely, the sounds of motor vehicle traffic, an electric generator, or loud music can greatly diminish the solemnity of a visit to a national memorial, the effectiveness of a park interpretive program, or the ability of a visitor to hear a bird singing its territorial song. Many parks that appear as they did in historical context no longer sound the way they once did.

"The Service will strive to preserve or restore the natural quiet and natural sounds associated with the physical and biological resources of parks. To do this, superintendents will carefully evaluate and manage how, when, and where motorized equipment is used by all who operate equipment in the parks, including park staff. Uses and impacts associated with the use of motorized equipment will be addressed in park planning processes. Where such use is necessary and appropriate, the least impacting equipment, vehicles, and transportation systems should be used, consistent with public and employee safety. The natural ambient sound level—that is, the environment of sound that exists in the absence of human-caused noise—is the baseline condition, and the standard against which current conditions in a soundscape will be measured and evaluated.

"To meet its responsibilities under Executive Order 13149 (Greening the Government through Federal Fleet and Transportation Efficiency), the Service will develop and implement a strategy to reduce its vehicle fleet's annual petroleum consumption."

Motorized Off-road Vehicle Use (8.2.3.1)

"Off-road motor vehicle use in national park units is governed by Executive Order 11644 (Use of Off-road Vehicles on Public Lands, as amended by Executive Order 11989), which defines offroad vehicles as "any motorized vehicle designed for or capable of cross-country travel on or immediately over land, water, sand, snow, ice, marsh, swampland, or other natural terrain" (except any registered motorboat or any vehicle used for emergency purposes). Unless otherwise provided by statute, any time there is a proposal to allow a motor vehicle meeting this description to be used in a park, the provisions of the executive order must be applied.

"In accordance with 36 CFR 4.10(b), routes and areas may be designated only in national recreation areas, national seashores, national lakeshores, and national preserves, and only by special regulation. In accordance with the executive order, they may be allowed only in locations where there will be no adverse impacts on the area's natural, cultural, scenic, and esthetic values, and in consideration of other existing or proposed recreational uses. The criteria for new uses, appropriate uses, and unacceptable impacts listed in sections 8.1 and 8.2 must also be applied to determine whether off-road vehicle use may be allowed. As required by the executive order and the Organic Act, superintendents must immediately close a designated off-road vehicle route whenever the use is causing or will cause unacceptable impacts on the soil, vegetation, wildlife, wildlife habitat, or cultural and historic resources.

"NPS administrative off-road motor vehicle use will be limited to what is necessary to manage the public use of designated off-road vehicle routes and areas; to conduct emergency operations; and to accomplish essential maintenance, construction, and resource protection activities that cannot be accomplished reasonably by other means."

Snowmobiles (8.2.3.2)

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

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

1.8.8 U.S. Department of the Interior Memorandum

February 17, 2004, memorandum from Assistant Secretary, Fish and Wildlife and Parks, to Director, National Park Service, addressing snowmobile use in national parks service wide:

> "…it has become clear that a service-wide directive to prohibit all forms of recreational snowmobile use in the National Park System is no longer warranted and that, with requirements for monitoring and increased use of newer technology snowmobiles, recreational uses can continue to be a part of the NPS winter experience. This will also allow decisions to be made on a park-by-park basis, relying on the professional judgment of each parks' staff. They will be able to consider the lessons from Yellowstone, such as the use of Best Available Technology requirements, guiding requirements, and adaptive management, as well as overall technological improvements and any other new information, and will then be able to determine whether any review or revision of their special regulations is needed."
>
> "Existing road grooming serves an important and sometimes essential role in guaranteeing winter access for both visitors and park staff. It is necessary not only for the operation of recreational snowmobiles, but also for snowcoaches and for snowmobile use by park staff. In some parks, eliminating road grooming would eliminate motorized access to many popular and developed areas. It would not necessarily serve the needs of most visitors or park staff, if it becomes necessary to walk, snowshoe, or cross-country ski over dozens of miles of ungroomed snow-covered roads or trails to reach such areas. Park staff need to retain the flexibility to address these issues in their parks and make decisions regarding park resources, visitor needs, and administrative access needs."
>
> "NPS also needs to lead by example when purchasing and operating snowmobiles for administrative purposes. Only snowmobiles that meet the BAT standards as outlined in the Winter Use SEIS should be used by the NPS for administrative purposes. All purchases of

snowmobiles by NPS units must be limited to BAT-compliant models unless a justification for an exception based on operational needs is approved by the respective Regional Director. No approval of a non-BAT machine may be made on the grounds of cost. Parks with employees who reside in the park during the winter months and use snowmobiles as a means of travel on and off duty should also develop a policy that promotes the use of BAT-compliant snowmobiles for these types of uses. Superintendents should encourage their employees, especially new hires, to use BAT-compliant personal snowmobiles as well. Through a deliberate process of converting to cleaner and quieter snowmobiles, the NPS can be the leader in reducing impacts to our national parks.""Park superintendents with continued snowmobile use need to do some form of monitoring as outlined in Executive Orders 11644 and 11989. This kind of use must continue to be a part of an active monitoring program and impacts of the use must be assessed from time to time. The appropriate level of monitoring must be tailored to the actual level of use in a park, as determined by the superintendent and park staff. Park officials should use their best professional judgment in determining the level of monitoring that is required."

APPENDIX B. HISTORY AND TIMELINE

Process Timeline for Winter Use Planning Yellowstone and Grand Teton National Parks and the John D. Rockefeller, Jr., Memorial Parkway

1932 Interests in Cody requested that the NPS plow roads into Yellowstone to allow year-round access. Park authorities turn down the request due to poor roads, severe winter conditions, unwinterized buildings, and lack of rotary plows.

1938 NPS began plowing Mammoth to Cooke City road year-round.

Cody interests again request park authorities to examine feasibility of plowing Yellowstone roads year-round. Park authorities again declined, citing the same reasons.

1939 Two residents of Anaconda, Montana demonstrate snowplane use to Yellowstone authorities.

1946 From now through **1949**, local communities again requested that the NPS plow roads into Yellowstone to allow year-round access. NPS declined citing poor roads, non-winterized facilities, and opinion of Public Roads Administration (predecessor to Federal Highways).

1948 First motorized oversnow travel by visitors into Yellowstone occurs via snowplanes. 35 visitors toured Yellowstone that January (more in February). Snowplane use had occurred in Jackson Hole for several years by this time. Up to 150 snowplane visitors toured Yellowstone each of next several winters.

1955 Harold Young and Bill Nicholls of West Yellowstone began offering Bombardier snowcoach tours of Yellowstone. Several hundred people took such tours in each of the next several winters.

1956 Local communities again requested that NPS plow its roads year-round. NPS formed “Snow Survey Committee” to investigate feasibility of plowing; committee concluded that it was “feasible but not practical” due to poor roads, severe weather, estimates of low traffic volumes, and cost of necessary developments and road improvements.

NPS began opening East and South Entrances earlier in spring time for summer season.

1963 First machines—three, total for the winter—identifiable as snowmobiles enter Yellowstone (that January).

1966 Winter visitor use grew to 5,000 people annually. Snowmobile use was especially rapidly growing, numbering 1,500 in 1966-67 and 26,800 by 1972-73.

1967 Requests to plow park roads arose again, so NPS initiated the tri-state commission to discuss them. The debate culminated in a congressional hearing in Jackson, WY, in August 1967 on the issue. NPS position was that the mode of transportation in winter should be that which is most appropriate in the park, and that oversnow transport seemed to best meet that need.

1968 From now through **1972**, Yellowstone authorities formalized their winter use policy. The policy encouraged oversnow travel instead of plowing roads year-round.

1971 Grand Teton authorities began plowing the road from Colter Bay to Flagg Ranch year-round.

1972 NPS began grooming roads for oversnow vehicle travel, and the Old Faithful Snow Lodge opened.

1973 President Nixon issued Executive Order 11644 establishing a federal policy on off-road vehicle use in relation to resource issues. Yellowstone's Superintendent Anderson designated all the park's interior roads for snowmobile use.

1981 Winter use increased to 105,000 visitors annually.

1982 NPS reopened the Mammoth Hotel for winter use (it had been open continuously 1966-1970).

1989 Superintendent Bob Barbee commissioned the first winter use management guidelines: *Existing Winter Use Management, Guidelines, Inventory, and Needs*.

1990 NPS released *Winter Use Plan and Environmental Assessment* for all three park units.

1993 Winter visitation exceeded 143,000, which the *Winter Use Plan* had not projected until the year 2000. Also this year, the Continental Divide Snowmobile Trail opened through Grand Teton and the Parkway on an experimental basis. Consequently, NPS and USFS staff began work on a coordinated interagency report on Winter Visitor Use Management.

1997 The *Draft Winter Visitor Use Management: A Multi-Agency Assessment* was released for public review. Over 2,000 comment letters were received.

From January through March, near-record snowfall and ice caused many bison to leave Yellowstone. The State of Montana and NPS sent over 1,000 to slaughter amid concerns about brucellosis transmission. Concerned about this action, in May 1997 the Fund for Animals and other organizations and individuals filed suit against the NPS, with three primary complaints. The plaintiffs alleged 1) that the NPS had failed to prepare an environmental impact statement concerning winter use in Yellowstone and Grand Teton national parks and the John D. Rockefeller Parkway; 2) that the NPS had failed to consult with the U.S. Fish and Wildlife Service on the impacts of winter recreation on threatened and endangered species; and 3) that NPS had failed to evaluate the effects of road grooming on wildlife and other park resources.

On October 27, 1997, the NPS agreed to a settlement in which it would prepare a new winter use plan and corresponding environmental impact statement, and to consult with the U.S. Fish and Wildlife Service on the effects of winter use on threatened and endangered species. The NPS also agreed to prepare an environmental assessment evaluating the effects of temporarily closing a segment of road in order to study wildlife movements on groomed roads within the park. The *Environmental Assessment-Temporary Closure of a Winter Road, Yellowstone National Park,* was completed in November 1997 and made available for public review for 45 days. On January 16, 1998, the NPS decided to defer a road closure because further research was necessary before a decision could be made.

1998 Between April and July, the NPS accepted scoping comments on the EIS, receiving approximately 2,500 comment letters.

In fall 1998, the NPS signed memorandums of agreement with Montana, Wyoming, Idaho; Teton and Park counties, WY; Gallatin and Park counties, MT; Fremont County, ID, and the U.S. Forest Service to act as cooperating agencies in the development of the EIS.

1999 The *Final Winter Visitor Use Management: A Multi-Agency Assessment* was released in June. This document identified the desired and actual conditions for winter use throughout the Greater Yellowstone area, as well as management actions to address discrepancies. However, it was not a decision document.

The NPS released the draft EIS on August 19, and accepted public comment through December 15 (a total of 115 days). The agency received 46,500 comment letters.

2000 On October 10, 2000, the *Winter Use Plans and Final Environmental Impact Statement for Yellowstone and Grand Teton National Parks and the John D. Rockefeller, Jr., Memorial Parkway* was released. Comments were accepted until October 31, 2000; the agency received over 11,000 comments on the Final EIS.

On November 22, 2000, Intermountain Regional Director Karen Wade signed the *Record of Decision Winter Use Plan for the Yellowstone and Grand Teton National Parks and the John D. Rockefeller, Jr., Memorial Parkway*. The decision selected alternative G from the FEIS, which would have eliminated snowmobile use from the parks by the winter of 2003-2004 and provided for access via an NPS-managed, mass transit snowcoach system.

On December 6, 2000, the International Snowmobile Manufacturers et.al. sued the Secretary of the Interior, et.al., asking that the decision to ban snowmobiles be set aside on the basis of alleged NEPA process infractions and other alleged process flaws.

On December 18, 2000, the NPS published the proposed rule implementing aspects of the decision relating to the designation of routes available for oversnow motorized access. A 30-day comment period followed the publication.

2001 The NPS published the final rule in the *Federal Register* on January 22, 2001; the agency received over 5,000 comments during the comment period.

On January 31, 2001, a notice was published in the *Federal Register* that delayed the effective date of the rule for 60 days from February 21, 2001, to a new effective date of April 22, 2001.

On June 29, 2001, the Department of Interior and the plaintiffs (ISMA, et.al) reached a settlement agreement. The NPS would prepare a supplemental environmental impact statement (SEIS), to further the purposes of NEPA by soliciting more public comment on the earlier decision and examine alternatives to it (particularly examining four-stroke snowmobiles, which were just becoming commercially available at this time) while maintaining protection of park resources. Additional information from the International Snowmobile Manufacturers Association (ISMA) would be considered, as well as any other new or updated substantive information not available at the time of the earlier decision. The same nine governmental bodies became cooperating agencies along with the U.S. Environmental Protection Agency (EPA).

2002 On February 19, 2002 the Internet version of the DSEIS became available. The NPS accepted public comment through May 29, 2002, receiving nearly 360,000 comment letters.

Additional time was needed to analyze the large volume of public comment and complete the SEIS. Therefore, on March 29 the NPS published a proposed rule to postpone for one year the implementation of existing regulations (the proposed snowmobile ban) in the *Federal Register*. Accepting public comment through May 29, 2002, the NPS received more than 7,700 comments. On November 18, 2002, the final rule to postpone, for one year, the phase-out of snowmobiles in Yellowstone and Grand Teton national parks, and the Parkway was finalized and published in the *Federal Register*. The rule became effective on December 18, 2002. Although the Fund for Animals challenged this rule, the suit was superseded by later lawsuits.

2003 On February 20, the NPS published the *Final Supplemental Environmental Impact Statement*.

On March 25, 2003, Intermountain Regional Director Karen Wade signed the *Record of Decision: Winter Use Plans for Yellowstone and Grand Teton National Parks and the John D. Rockefeller, Jr., Memorial Parkway*.

On December 11, 2003, the NPS published the final rule implementing the Record of Decision in the *Federal Register*. The new decision and rule called for allowing snowmobiles to be used in the parks with limitations: no more than 950 snowmobiles per day in Yellowstone (and up to 150 in Grand Teton/the Parkway), that all machines in Yellowstone (and most of those in Grand Teton) use best available technology (BAT), and that all Yellowstone visitors utilize commercial guides.

The Fund for Animals and the Greater Yellowstone Coalition sued to challenge the March 25 decision in the U.S. District Court for the District of Columbia. On

December 16, 2003, the court vacated the SEIS and December 2003 rule and effectively reinstated the November 18, 2002 rule, which allowed slightly more than half the historic daily snowmobile entries (493 per day in Yellowstone), with requirements that all snowmobiles be led by commercial guides, with the previous snowmobile ban to go into effect in December 2004.

In December, ISMA and the State of Wyoming reopened their lawsuit challenging the snowmobile phase-out in the U.S. District Court of Wyoming. The plaintiffs asked the court to issue a temporary restraining order or preliminary injunction against the NPS to stop implementation of the November 18, 2002, rule banning snowmobile use.

2004 On February 10, 2004, the Wyoming court issued a preliminary injunction preventing the NPS from continuing to implement the 2001 phase-out rule, and directing the park superintendents to issue winter use rules that would be "fair and equitable" to all parties. Grand Teton and Yellowstone revised their superintendents' compendia to allow a total of up to 780 snowmobiles per day into Yellowstone and 140 into Grand Teton and the Parkway. In Yellowstone, the requirement that all snowmobilers travel with a commercial guide remained in effect, and the additional 287 snowmobiles allowed by the Superintendent's Order were required to be best available technology. On October 14, 2004, the Court vacated and remanded the 2000 EIS and ROD and the January 22, 2001, rule to the National Park Service.

With both EISs invalidated, the NPS had no clear rules under which it could operate the parks for the upcoming winter. Consequently, the agency began scoping for an environmental assessment for temporary winter rules for the parks on June 14. Closed on July 13, 2004, the scoping period resulted in 15,082 comment letters.

The NPS published the draft EA on August 20 and accepted public comment through September 20, receiving a total of 95,007 comment documents. Also, the agency published a proposed rule on September 7, and accepted public comments on it through October 7, 2004. A total of 36,715 people commented on the draft rule.

On November 4, 2004, Regional Director Karen Wade signed the "Finding of No Significant Impact" (FONSI), putting into effect winter use plans for the next three winter seasons. On November 10, 2004, the rules to implement the FONSI were published in the *Federal Register*.
Under the FONSI and rule, 720 snowmobiles per day are allowed to enter Yellowstone, all led by commercial guides, and all machines must be BAT. The 140 snowmobiles allowed in Grand Teton will not be required to be guided, but BAT is required with some minor exceptions.

Various litigants filed four different judicial actions against the Temporary Plan or elements of it. First, the Fund for Animals/Bluewater Network and others filed a lawsuit with the U.S. District Court of Washington, DC, asking that the temporary winter use plan be set aside because the NPS failed to answer questions about the effects of groomed trails on animals. The court has yet to rule on this lawsuit. Second, the Wyoming Lodging and Restaurant Association sued

in the U.S. District Court for Wyoming, charging that a "no action" alternative and non-commercial snowmobile use were not considered in the planning process and that by releasing the draft FONSI with the EA, the process was pre-determined. The court ruled against the WLRA in 2005. Third, the GYC and others filed a motion (not a lawsuit) on November 12, asking the U.S. District Court of Washington, DC, to make the NPS's monitoring and adaptive management thresholds set forth in the 2003 rule judicially enforceable. The court declined the motion. Finally, the group "Save Our Snowplanes" sued in the U.S. District Court for Wyoming (on March 29, **2006**) requesting that the decision to ban snowplanes from the frozen surface of Jackson Lake be set aside. The court has not yet ruled on this case.

In fall 2004, Congress inserted language in the Omnibus Appropriations Bill that made the November 10, 2004 rules effective for the upcoming winter. Congress repeated this action in fall, **2005**.

2005 March 29, the group "Save Our Snowplanes" filed suit in Wyoming Federal District Court contesting the phase-out of snowplanes from the frozen surface of Jackson Lake.

On May 26, the Judicial Panel on Multi-District Litigation heard arguments to consolidate the cases in the Wyoming and Washington, DC, District Courts. On June 16, the MDL panel denied the motion to consolidate the ongoing lawsuits. As a result, proceedings continue in both the Wyoming and Washington, D.C., District Courts.

In June, the NPS announced the availability of, "The Ecology of Bison Movements and Distribution in and Beyond Yellowstone National Park: A Critical Review with Implications for Winter Use and Transboundary Population Management," by C. Cormack Gates et al., of the University of Calgary. This report summarized the state of knowledge regarding bison movements in Yellowstone in winter.

On June 24, the NPS formally began the long-term winter use plan and EIS with the beginning of public scoping. Public comments were accepted through September 1, and a total of 33,365 people filed comments.

In spring, the NPS hired a public engagement specialist to produce an assessment of the winter use situation. That firm, Cadence, Inc., of Helena, MT, recommended an open information sharing effort to more effectively involve the public. Throughout that summer and fall, representatives of the NPS met with cooperating agencies and other stakeholders to share information about the ongoing EIS procedure and about Yellowstone in winter. These efforts continue, and the NPS has retained Cadence for ongoing public engagement work.

2006 In March, the NPS held two open houses for interested members of the public, in Bozeman, Mont., and Jackson, Wyo. At these open houses the agency released the tentative alternatives which it would analyze in this EIS.

APPENDIX C. TRAVEL FACTORS

Introduction

The development of a model to distribute use within the parks, based on entrance limits, is necessary in order to understand the impacts of the alternatives on park resources and values. These travel factor models, also called scenarios, were developed in the past for the Temporary Winter Use EA, the SEIS, and the EIS, and were included as appendices to these documents. The scenarios were primarily based on a visitor survey, conducted in the late 1990s, and an oversnow transportation plan. The explanation of the basis for these scenarios may be found on page A-10 of the temporary EA.

The scenarios attempt to predict the total amount of daily recreational traffic on each road segment within Yellowstone and Grand Teton National Parks, by vehicle type. Thus, by looking at the scenarios, one can get a sense of how much snowmobile or snowcoach traffic to expect in a day on each road segment within the parks.

The purpose of the distribution model is similar to the other models (such as the air quality and natural soundscape models) used in this EIS. The models do their best to reasonably replicate reality, but that is not their fundamental purpose. The purpose of the models is to provide a comparison of the relative differences among the alternatives. This helps the decision-maker better understand the magnitude of differences of the environmental consequences of each alternative. The scenarios are also fundamental to the air quality and soundscapes analysis, as they are inputs to these models.

For the development of this new long-term EIS, the scenarios were updated for two major reasons. First, park managers and partners recognize that commercially guided trips may have different visitation patterns than unguided groups. For example, many snowmobile touring businesses currently offer two main destinations for their tours: Old Faithful or Canyon. By contrast, unguided visitors have less predictable visitation patterns. The previous scenarios were developed with data largely from unguided snowmobilers. Most of the alternatives considered in this document require some portion of snowmobile entries to be commercially guided. Thus, there could be differences in the travel and visitation patterns for guided vs. unguided (or non-commercially guided) groups.

Second, the previous scenarios only included in-bound traffic within Yellowstone National Park. They did not include traffic exiting the park.[1] For example, if a group of snowmobiles entered

[1] To illustrate this, note the scenario from the preferred alternative of the EA, on page A-8 of the EA. This scenario shows 428 snowmobiles traveling the West Entrance to Madison road segment, with a daily entry limit for the West Entrance of 400. The scenario (and all others) assumes that the daily entry limit of 400 snowmobiles is reached. A handful of snowmobiles that enter at other entrances, for example the North Entrance, will also traverse the West Entrance to Madison road segment (perhaps to see wildlife along this corridor or visit West Yellowstone), which accounts for the extra 28 snowmobiles beyond 400. However, the majority of those 400 snowmobiles entering through the West Entrance return on this road segment when they leave the park at the end of their tour in Yellowstone. A few will stay overnight in the park or in

Yellowstone at the West Entrance, and traveled to Old Faithful, they would be "counted" by the previous scenarios on their in-bound trip to Old Faithful. After enjoying the geyser basin, if the group returned to the West Entrance to complete their visit for the day, they would not have been "counted" by the previous model as traveling on those road segments a second time. This presents a problem, as it potentially excludes a substantial amount of traffic. This factor alone warranted a re-examination of the assumptions.

Methods Used to Develop the New Scenarios

The primary issue in creating new scenarios for this EIS process is developing factors to distribute traffic along each road segment. For example, of the snowmobiles entering in a single day at the West Entrance, what percent travel to Old Faithful, what percent travel to Canyon, what percent complete the Grand Loop, and what percent go to other destinations in their day of travel in Yellowstone?

To answer these questions, the Yellowstone planning staff considered several sources of information. First, the distribution factors in the EA, SEIS, and EIS were reviewed. In addition, several previous winter visitor surveys were reviewed. Two surveys in particular asked visitors where they went on their trip in Yellowstone, and whether or not they were part of a commercially guided tour.[2] The authors of these surveys were contacted and asked to prepare cross tabulations of where visitors traveling with commercial guides actually went on their visit to the parks. This data illustrated where visitors stated they went on their tour of Yellowstone. Finally, planning staff discussed with several commercial guiding businesses (both snowmobile and snowcoach) where their tours actually go in the park. In addition, Xanterra Parks and Resorts, Yellowstone's largest concessioner, provided data on the destinations of their Old Faithful-based snowmobile and snowcoach tours. This provided real-world confirmation of the survey data and the previous scenario's distribution factors.

After these sources of information were considered, distribution factors were developed. Assumptions were made (based on the above information) about the destinations for the commercially guided tours. For example, an assumption was made that approximately 75% of tours entering the park at the West Entrance have Old Faithful as their primary destination, while 20% have the Grand Canyon of the Yellowstone as their destination. Roughly 5% of visitors have other destinations – perhaps traveling the Grand Loop in a day, or to another entrance. In addition, assumptions were made about other road segments that might be used by groups given those destinations. Continuing the previous example, an assumption was made about the percent of visitors that might have Old Faithful as their primary destination, but also travel up to view Gibbon Falls on the Madison to Norris road segment (not along the normal route between the West Entrance and Old Faithful). Similar projections about use on each road segment were

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another gateway community, but the majority return to their origin at the end of the day. Thus, to account for exit traffic, the figure should be substantially higher than 428 snowmobiles.

[2] The surveys used were: 1) Mansfield, C., F.R. Johnson, R. Whitmore, and D. Phaneuf, October 2003. Winter 2002-2003 Visitor Survey: Yellowstone and Grand Teton National Parks. Prepared by RTI International et al under contract to the National Park Service. 2) Littlejohn, M. February 1996. Visitor Services Project: Yellowstone National Park Visitor Survey, Report 75. University of Idaho, Moscow, ID.

made for each of the oversnow entrances. However, in order to be counted on a road segment, traffic was assumed to travel more than 2-3 miles. For example, if a group of snowmobilers visit Kepler Cascades, located approximately 2 miles from Old Faithful, viewed the Cascades and returned to Old Faithful, they would not have been counted as having used the Old Faithful-West Thumb road segment, since they only traveled such a small portion of it.

In addition, an assumption was made in the analysis that the use limits prescribed by each alternative are reached each day of the peak season (January and February). This assumption was used in the previous planning efforts , and is carried over here. This is a critical assumption because it allows the decision-maker to understand the impacts of the alternatives at their full implementation level.

At first, only in-bound traffic was considered, since this was most consistent with scenarios developed for other planning efforts. Updated distribution models were run for Scenario A – Continue the Temporary Plan, and the results were extremely comparable to the previous scenarios used in the EA, SEIS and EIS. This provided an initial validity check of the new scenarios. Next, the distribution factors were updated to include the out-bound traffic. Again, assumptions were made about what percent of visitors from each entrance overnight at Snow Lodge, complete the Grand Loop, or exit at another entrance (generally a relatively small percent do these activities). Finalized travel factors (or scenarios) were utilized to model air quality and soundscapes for each preliminary alternative.

General Assumptions, by Entrance:

At the forefront, it is critical to note that the assumptions below are intended to only roughly reflect visitation patterns. It is not necessary that these assumptions precisely reflect actual visitation patterns. What is critical is that the same assumptions are used for each alternative's scenarios, which allows comparisons to be made among the alternatives.

West Entrance:

- 75% have Old Faithful as primary destination
- 20% have Canyon as primary destination
- 6% complete the Grand Loop
- 12% overnight at North, South, or East
- 8% overnight at Snow Lodge

South Entrance:

- 75% have Old Faithful as primary destination
- 20% have Canyon as primary destination
- 5% complete the Grand Loop
- 13% overnight at North, West, or East
- 12% overnight at Snow Lodge

East Entrance:

- 20% have Old Faithful as primary destination

- 75% have Canyon as primary destination
- 0% complete the Grand Loop
- 30% overnight at North, South, or West
- 10% overnight at Snow Lodge

North Entrance:

- 70% have Old Faithful as primary destination
- 30% have Canyon as primary destination
- 2% complete the Grand Loop
- 9% overnight at West, South, or East
- 11% overnight at Snow Lodge

Old Faithful:

- 70% of snowmobiles complete the Grand Loop
- 6% of snowcoaches complete the Grand Loop

Distribution factors were entered into a Microsoft Excel spreadsheet to produce the scenario results.

Results

The oversnow vehicle distribution scenarios follow for each alternative. They are broken out by vehicle type – snowmobile or snowcoach (and wheeled vehicle in the case of scenario I). For each scenario, entrance limits are multiplied by the road segment factor to generate the number of vehicles utilizing that road segment. For example, in Scenario A, 5% of snowmobiles entering the park's West Entrance are presumed to travel along the Mammoth to Norris road segment. Given a limit of 400 snowmobiles per day at the West Entrance, this equates to 20 snowmobiles along this road segment from the West Entrance (.05*400=20). The modeling scenarios shown below (A-J) led to development of six preliminary alternatives. These preliminary alternatives have been further refined and are reflected as Alternatives 1 through 6 in this EIS.

Alternative 1a - Continue Temporary Winter Plan with East Entrance Open to OSV trave

Snowmobiles	West Entrance		South Entrance		East Entrance		North Entrance		Old Faithful		Totals
	400		220		40		30		30		720
YELL Road Segment	Factor	Results	Factor	Results	Factor	Results	Factor	Results	Factor	Results	
Mammoth to Norris	0.05	20	0.03	6.6	0.1	4	1.8	54	0.3	9	93.6
West Entrance to Madison	1.8	720	0.05	11	0.1	4	0.15	4.5	0.15	4.5	744
Madison to Norris	0.59	236	0.08	17.6	0.1	4	1.2	36	1	30	323.6
Norris to Canyon Village	0.44	176	0.05	11	0.2	8	0.56	16.8	0.7	21	232.8
Canyon Village to Fishing Bridge	0.34	136	0.45	99	1.4	56	0.36	10.8	0.7	21	322.8
Fishing Bridge to East Entrance	0.02	8	0.05	11	1.6	64	0.02	0.6	0.02	0.6	84.2
Fishing Bridge to West Thumb	0.08	32	0.46	101.2	0.3	12	0.02	0.6	0.7	21	166.8
Madison to Old Faithful	1.41	564	0.47	103.4	0.1	4	1.15	34.5	1.05	31.5	737.4
Old Faithful to West Thumb	0.27	108	1.35	297	0.2	8	0.05	1.5	0.75	22.5	437
West Thumb to Flagg Ranch	0.05	20	1.75	385	0.1	4	0.05	1.5	0.05	1.5	412

Snowcoaches	West Entrance		South Entrance		East Entrance		North Entrance		Old Faithful		Totals
	34		10		3		13		18		78
YELL Road Segment	Factor	Results	Factor	Results	Factor	Results	Factor	Results	Factor	Results	
Mammoth to Norris	0.05	1.7	0.03	0.3	0.1	0.3	1.8	23.4	0	0	25.7
West Entrance to Madison	1.8	61.2	0.05	0.5	0.1	0.3	0.15	1.95	0.48	8.64	72.59
Madison to Norris	0.59	20.06	0.08	0.8	0.1	0.3	1.2	15.6	0.06	1.08	37.84
Norris to Canyon Village	0.44	14.96	0.05	0.5	0.2	0.6	0.56	7.28	0.06	1.08	24.42
Canyon Village to Fishing Bridge	0.34	11.56	0.45	4.5	1.4	4.2	0.36	4.68	0.06	1.08	26.02
Fishing Bridge to East Entrance	0.02	0.68	0.05	0.5	1.6	4.8	0.02	0.26	0	0	6.24
Fishing Bridge to West Thumb	0.08	2.72	0.46	4.6	0.3	0.9	0.02	0.26	0.06	1.08	9.56
Madison to Old Faithful	1.41	47.94	0.47	4.7	0.1	0.3	1.15	14.95	0.6	10.8	78.69
Old Faithful to West Thumb	0.27	9.18	1.35	13.5	0.2	0.6	0.05	0.65	1.3	23.4	47.33
West Thumb to Flagg Ranch	0.05	1.7	1.75	17.5	0.1	0.3	0.05	0.65	1.18	21.24	41.39

Snowmobiles	CDST		Grassy Lake Rd		Jackson Lake		Totals
	50		50		40		140
GRTE Road Segment	Factor	Results	Factor	Results	Factor	Results	
Moran Junction to Flagg Ranch	2	100	0	0	0	0	100
Flagg Ranch west to boundary	0	0	1.9	95	0	0	95
Jackson Lake fishing access	0	0	0	0	2	80	80

Note:
YELL group sizes are modeled at 90% 8 snowmobiles/group and 10% at 17 snowmobiles/group.
GRTE group sizes are modeled at 5, except Jackson Lake which is modeled as a single user.

Alternative 1b - Continue Temporary Winter Plan with East Entrance closed

Snowmobiles	West Entrance		South Entrance		East Entrance		North Entrance		Old Faithful		Totals
	424		256		0		20		20		720
YELL Road Segment	**Factor**	**Results**	**Factor**	**Results**	**Factor**	**Results**	**Factor**	**Results**	**Factor**	**Results**	
Mammoth to Norris	0.05	21.2	0.03	7.68	0.1	0	1.8	36	0.3	6	70.88
West Entrance to Madison	1.8	763.2	0.05	12.8	0.1	0	0.15	3	0.15	3	782
Madison to Norris	0.59	250.16	0.08	20.48	0.1	0	1.2	24	1	20	314.64
Norris to Canyon Village	0.44	186.56	0.05	12.8	0.2	0	0.56	11.2	0.7	14	224.56
Canyon Village to Fishing Bridge	0.34	144.16	0.45	115.2	1.4	0	0.36	7.2	0.7	14	280.56
Fishing Bridge to Lake Butte	0.02	8.48	0.05	12.8	1.6	0	0.02	0.4	0.02	0.4	22.08
Fishing Bridge to West Thumb	0.08	33.92	0.46	117.76	0.3	0	0.02	0.4	0.7	14	166.08
Madison to Old Faithful	1.41	597.84	0.47	120.32	0.1	0	1.15	23	1.05	21	762.16
Old Faithful to West Thumb	0.27	114.48	1.35	345.6	0.2	0	0.05	1	0.75	15	476.08
West Thumb to Flagg Ranch	0.05	21.2	1.85	473.6	0.1	0	0.05	1	0.05	1	496.8

Snowcoaches	West Entrance		South Entrance		East Entrance		North Entrance		Old Faithful		Totals
	34		13		0		13		18		78
YELL Road Segment	**Factor**	**Results**	**Factor**	**Results**	**Factor**	**Results**	**Factor**	**Results**	**Factor**	**Results**	
Mammoth to Norris	0.05	1.7	0.03	0.39	0.1	0	1.8	23.4	0	0	25.49
West Entrance to Madison	1.8	61.2	0.05	0.65	0.1	0	0.15	1.95	0.48	8.64	72.44
Madison to Norris	0.59	20.06	0.08	1.04	0.1	0	1.2	15.6	0.06	1.08	37.78
Norris to Canyon Village	0.44	14.96	0.05	0.65	0.2	0	0.56	7.28	0.06	1.08	23.97
Canyon Village to Fishing Bridge	0.34	11.56	0.45	5.85	1.4	0	0.36	4.68	0.06	1.08	23.17
Fishing Bridge to Lake Butte	0.02	0.68	0.05	0.65	1.6	0	0.02	0.26	0	0	1.59
Fishing Bridge to West Thumb	0.08	2.72	0.46	5.98	0.3	0	0.02	0.26	0.06	1.08	10.04
Madison to Old Faithful	1.41	47.94	0.47	6.11	0.1	0	1.15	14.95	0.6	10.8	79.8
Old Faithful to West Thumb	0.27	9.18	1.35	17.55	0.2	0	0.05	0.65	1.3	23.4	50.78
West Thumb to Flagg Ranch	0.05	1.7	1.75	22.75	0.1	0	0.05	0.65	1.18	21.24	46.34

Snowmobiles	CDST		Grassy Lake Rd		Jackson Lake		Totals
	50		50		40		140
GRTE Road Segment	**Factor**	**Results**	**Factor**	**Results**	**Factor**	**Results**	
Moran Junction to Flagg Ranch	2	100	0	0	0	0	100
Flagg Ranch west to boundary	0	0	1.9	95	0	0	95
Jackson Lake fishing access	0	0	0	0	2	80	80

Note:
For the South Entrance road segment, the travel factor from West Thumb to Flagg Ranch is increased by 0.1 to account for traffic previously modeled as traveling through the East Entrance.

YELL group sizes are modeled at 11 snowmobiles/group
GRTE group sizes are modeled at 5, except Jackson Lake which is modeled as a single user

Alternative 1d - Continue Temporary Winter Plan with East Entrance closed - eliminate 40 entries

Snowmobiles	West Entrance		South Entrance		East Entrance		North Entrance		Old Faithful		Totals
	400		220		0		30		30		680
YELL Road Segment	Factor	Results	Factor	Results	Factor	Results	Factor	Results	Factor	Results	
Mammoth to Norris	0.05	20	0.03	6.6	0.1	0	1.8	54	0.3	9	89.6
West Entrance to Madison	1.8	720	0.05	11	0.1	0	0.15	4.5	0.15	4.5	740
Madison to Norris	0.59	236	0.08	17.6	0.1	0	1.2	36	1	30	319.6
Norris to Canyon Village	0.44	176	0.05	11	0.2	0	0.56	16.8	0.7	21	224.8
Canyon Village to Fishing Bridge	0.34	136	0.45	99	1.4	0	0.36	10.8	0.7	21	266.8
Fishing Bridge to Lake Butte	0.02	8	0.05	11	1.6	0	0.02	0.6	0.02	0.6	20.2
Fishing Bridge to West Thumb	0.08	32	0.46	101.2	0.3	0	0.02	0.6	0.7	21	154.8
Madison to Old Faithful	1.41	564	0.47	103.4	0.1	0	1.15	34.5	1.05	31.5	733.4
Old Faithful to West Thumb	0.27	108	1.35	297	0.2	0	0.05	1.5	0.75	22.5	429
West Thumb to Flagg Ranch	0.05	20	1.85	407	0.1	0	0.05	1.5	0.05	1.5	430

Snowcoaches	West Entrance		South Entrance		East Entrance		North Entrance		Old Faithful		Totals
	34		13		0		13		18		78
YELL Road Segment	Factor	Results	Factor	Results	Factor	Results	Factor	Results	Factor	Results	
Mammoth to Norris	0.05	1.7	0.03	0.39	0.1	0	1.8	23.4	0	0	25.49
West Entrance to Madison	1.8	61.2	0.05	0.65	0.1	0	0.15	1.95	0.48	8.64	72.44
Madison to Norris	0.59	20.06	0.08	1.04	0.1	0	1.2	15.6	0.06	1.08	37.78
Norris to Canyon Village	0.44	14.96	0.05	0.65	0.2	0	0.56	7.28	0.06	1.08	23.97
Canyon Village to Fishing Bridge	0.34	11.56	0.45	5.85	1.4	0	0.36	4.68	0.06	1.08	23.17
Fishing Bridge to Lake Butte	0.02	0.68	0.05	0.65	1.6	0	0.02	0.26	0	0	1.59
Fishing Bridge to West Thumb	0.08	2.72	0.46	5.98	0.3	0	0.02	0.26	0.06	1.08	10.04
Madison to Old Faithful	1.41	47.94	0.47	6.11	0.1	0	1.15	14.95	0.6	10.8	79.8
Old Faithful to West Thumb	0.27	9.18	1.35	17.55	0.2	0	0.05	0.65	1.3	23.4	50.78
West Thumb to Flagg Ranch	0.05	1.7	1.75	22.75	0.1	0	0.05	0.65	1.18	21.24	46.34

Snowmobiles	CDST		Grassy Lake Rd		Jackson Lake		Totals
	50		50		40		140
GRTE Road Segment	Factor	Results	Factor	Results	Factor	Results	
Moran Junction to Flagg Ranch	2	100	0	0	0	0	100
Flagg Ranch west to boundary	0	0	1.9	95	0	0	95
Jackson Lake fishing access	0	0	0	0	2	80	80

Note:
For the South Entrance road segment, the travel factor from West Thumb to Flagg Ranch is increased by 0.1 to account for traffic previously modeled as traveling through the East Entrance.

Alternative 1c will not be modeled because the numbers and operational considerations are adequately modeled by

Alternatives 1d and 1e.

YELL group sizes are modeled at 11 snowmobiles/group
GRTE group sizes are modeled at 5, except Jackson Lake which is modeled as a single user

Alternative 1e - Experimental road closure in Gibbon Canyon

Snowmobiles	West Entrance		South Entrance		East Entrance		North Entrance		Old Faithful		Totals
	400		220		0		30		30		680
YELL Road Segment	**Factor**	**Results**	**Factor**	**Results**	**Factor**	**Results**	**Factor**	**Results**	**Factor**	**Results**	
Mammoth to Norris	0.05	20	0.03	6.6	0.1	0	1.85	55.5	0.15	4.5	86.6
West Entrance to Madison	1.8	720	0.1	22	0.1	0	0.02	0.6	0.3	9	751.6
Madison to Norris	0	0	0	0	0	0	0	0	0	0	0
Norris to Canyon Village	0.05	20	0.03	6.6	0.2	0	1.25	37.5	0.15	4.5	68.6
Canyon Village to Fishing Bridge	0.05	20	0.37	81.4	1.4	0	0.85	25.5	1.25	37.5	164.4
Fishing Bridge to Lake Butte	0.02	8	0.05	11	1.6	0	0.02	0.6	0.02	0.6	20.2
Fishing Bridge to West Thumb	0.15	60	0.43	94.6	0.3	0	0.15	4.5	1.25	37.5	196.6
Madison to Old Faithful	1.8	720	0.5	110	0.1	0	0.02	0.6	0.4	12	842.6
Old Faithful to West Thumb	0.45	180	1.38	303.6	0.2	0	0.13	3.9	1.3	39	526.5
West Thumb to Flagg Ranch	0.1	40	1.75	385	0.1	0	0.02	0.6	0.05	1.5	427.1

Snowcoaches	West Entrance		South Entrance		East Entrance		North Entrance		Old Faithful		Totals
	34		13		0		13		18		78
YELL Road Segment	**Factor**	**Results**	**Factor**	**Results**	**Factor**	**Results**	**Factor**	**Results**	**Factor**	**Results**	
Mammoth to Norris	0.05	1.7	0.03	0.39	0.1	0	1.85	24.05	0.15	2.7	28.84
West Entrance to Madison	1.8	61.2	0.1	1.3	0.1	0	0.02	0.26	0.3	5.4	68.16
Madison to Norris	0	0	0	0	0	0	0	0	0	0	0
Norris to Canyon Village	0.05	1.7	0.03	0.39	0.2	0	1.25	16.25	0.15	2.7	21.04
Canyon Village to Fishing Bridge	0.05	1.7	0.37	4.81	1.4	0	0.85	11.05	1.25	22.5	40.06
Fishing Bridge to Lake Butte	0.02	0.68	0.05	0.65	1.6	0	0.02	0.26	0	0	1.59
Fishing Bridge to West Thumb	0.15	5.1	0.43	5.59	0.3	0	0.15	1.95	1.25	22.5	35.14
Madison to Old Faithful	1.8	61.2	0.5	6.5	0.1	0	0.02	0.26	0.4	7.2	75.16
Old Faithful to West Thumb	0.45	15.3	1.38	17.94	0.2	0	0.13	1.69	1.3	23.4	58.33
West Thumb to Flagg Ranch	0.1	3.4	1.75	22.75	0.1	0	0.02	0.26	0.05	0.9	27.31

Snowmobiles	CDST		Grassy Lake Rd		Jackson Lake		Totals
	50		50		40		140
GRTE Road Segment	**Factor**	**Results**	**Factor**	**Results**	**Factor**	**Results**	
Moran Junction to Flagg Ranch	2	100	0	0	0	0	100
Flagg Ranch west to boundary	0	0	1.9	95	0	0	95
Jackson Lake fishing access	0	0	0	0	2	80	80

Note:

YELL group sizes are modeled at 11 snowmobiles/group

GRTE group sizes are modeled at 5, except Jackson Lake which is modeled as a single user

Alternative 2 - Snowcoach only

Snowmobiles	West Entrance		South Entrance		East Entrance		North Entrance		Old Faithful		Total
	0		0		0		0		0		0
YELL Road Segment	Factor	Results	Factor	Results	Factor	Results	Factor	Results	Factor	Results	
Mammoth to Norris	0.05	0	0.03	0	0.1	0	1.8	0	0.3	0	0
West Entrance to Madison	1.8	0	0.05	0	0.1	0	0.15	0	0.15	0	0
Madison to Norris	0.59	0	0.08	0	0.1	0	1.2	0	1	0	0
Norris to Canyon Village	0.44	0	0.05	0	0.2	0	0.56	0	0.7	0	0
Canyon Village to Fishing Bridge	0.34	0	0.45	0	1.4	0	0.36	0	0.7	0	0
Fishing Bridge to Lake Butte	0.02	0	0.05	0	1.6	0	0.02	0	0.02	0	0
Fishing Bridge to West Thumb	0.08	0	0.46	0	0.3	0	0.02	0	0.7	0	0
Madison to Old Faithful	1.41	0	0.47	0	0.1	0	1.15	0	1.05	0	0
Old Faithful to West Thumb	0.27	0	1.35	0	0.2	0	0.05	0	0.75	0	0
West Thumb to Flagg Ranch	0.05	0	1.75	0	0.1	0	0.05	0	0.05	0	0

Snowcoaches	West Entrance		South Entrance		East Entrance		North Entrance		Old Faithful		Total
	55		25		0		17		23		120
YELL Road Segment	Factor	Results	Factor	Results	Factor	Results	Factor	Results	Factor	Results	
Mammoth to Norris	0.05	2.75	0.03	0.75	0.1	0	1.8	30.6	0	0	34.1
West Entrance to Madison	1.8	99	0.05	1.25	0.1	0	0.15	2.55	0.48	11.04	113.84
Madison to Norris	0.59	32.45	0.08	2	0.1	0	1.2	20.4	0.06	1.38	56.23
Norris to Canyon Village	0.44	24.2	0.05	1.25	0.2	0	0.56	9.52	0.06	1.38	36.35
Canyon Village to Fishing Bridge	0.34	18.7	0.45	11.25	1.4	0	0.36	6.12	0.06	1.38	37.45
Fishing Bridge to Lake Butte	0.02	1.1	0.05	1.25	1.6	0	0.02	0.34	0	0	2.69
Fishing Bridge to West Thumb	0.08	4.4	0.46	11.5	0.3	0	0.02	0.34	0.06	1.38	17.62
Madison to Old Faithful	1.41	77.55	0.47	11.75	0.1	0	1.15	19.55	0.6	13.8	122.65
Old Faithful to West Thumb	0.27	14.85	1.35	33.75	0.2	0	0.05	0.85	1.3	29.9	79.35
West Thumb to Flagg Ranch	0.05	2.75	1.75	43.75	0.1	0	0.05	0.85	1.18	27.14	74.49

Snowmobiles	CDST		Grassy Lake Rd		Jackson Lake		Totals
	0		0		0		0
GRTE Road Segment	Factor	Results	Factor	Results	Factor	Results	
Moran Junction to Flagg Ranch							
Flagg Ranch west to boundary							
Jackson Lake fishing access							

Note:
For the South Entrance road segment, the travel factor from West Thumb to Flagg Ranch is increased by 0.1 to account for traffic previously modeled as traveling through the East Entrance.

Alternative 3 - Eliminate most road grooming

Snowmobiles	West Entrance		South Entrance		East Entrance		North Entrance		Old Faithful		Total
	0		250		0		0		0		250
YELL Road Segment	**Factor**	**Results**	**Factor**	**Results**	**Factor**	**Results**	**Factor**	**Results**	**Factor**	**Results**	
Mammoth to Norris	0.05	0	0	0	0.1	0	1.8	0	0.3	0	0
West Entrance to Madison	1.8	0	0	0	0.1	0	0.15	0	0.15	0	0
Madison to Norris	0.59	0	0	0	0.1	0	1.2	0	1	0	0
Norris to Canyon Village	0.44	0	0	0	0.2	0	0.56	0	0.7	0	0
Canyon Village to Fishing Bridge	0.34	0	0	0	1.4	0	0.36	0	0.7	0	0
Fishing Bridge to Lake Butte	0.02	0	0	0	1.6	0	0.02	0	0.02	0	0
Fishing Bridge to West Thumb	0.08	0	0	0	0.3	0	0.02	0	0.7	0	0
Madison to Old Faithful	1.41	0	0	0	0.1	0	1.15	0	1.05	0	0
Old Faithful to West Thumb	0.27	0	2	500	0.2	0	0.05	0	0.75	0	500
West Thumb to Flagg Ranch	0.05	0	2	500	0.1	0	0.05	0	0.05	0	500

Snowcoaches	West Entrance		South Entrance		East Entrance		North Entrance		Old Faithful		Total
	0		20		0		0		0		20
YELL Road Segment	**Factor**	**Results**	**Factor**	**Results**	**Factor**	**Results**	**Factor**	**Results**	**Factor**	**Results**	
Mammoth to Norris	0.05	0	0	0	0.1	0	1.8	0	0	0	0
West Entrance to Madison	1.8	0	0	0	0.1	0	0.15	0	0.48	0	0
Madison to Norris	0.59	0	0	0	0.1	0	1.2	0	0.06	0	0
Norris to Canyon Village	0.44	0	0	0	0.2	0	0.56	0	0.06	0	0
Canyon Village to Fishing Bridge	0.34	0	0	0	1.4	0	0.36	0	0.06	0	0
Fishing Bridge to Lake Butte	0.02	0	0	0	1.6	0	0.02	0	0	0	0
Fishing Bridge to West Thumb	0.08	0	0	0	0.3	0	0.02	0	0.06	0	0
Madison to Old Faithful	1.41	0	0	0	0.1	0	1.15	0	0.6	0	0
Old Faithful to West Thumb	0.27	0	2	40	0.2	0	0.05	0	1.3	0	40
West Thumb to Flagg Ranch	0.05	0	2	40	0.1	0	0.05	0	1.18	0	40

Snowmobiles	CDST		Grassy Lake Rd		Jackson Lake		Total
	0		50		0		50
GRTE Road Segment	**Factor**	**Results**	**Factor**	**Results**	**Factor**	**Results**	
Moran Junction to Flagg Ranch	0	0	0	0	0	0	0
Flagg Ranch west to boundary	0	0	2	100	0	0	100
Jackson Lake fishing access	0	0	0	0	0	0	0

Note:

YELL group sizes are modeled at 11 snowmobiles/group

GRTE group sizes are modeled at 5, except Jackson Lake which is modeled as a single user

Alternative 4 - Expand Recreational Use

Snowmobiles	West Entrance		South Entrance		East Entrance		North Entrance		Old Faithful		Total
	600		250		100		25		50		1025
YELL Road Segment	Factor	Results	Factor	Results	Factor	Results	Factor	Results	Factor	Results	
Mammoth to Norris	0.05	30	0.03	7.5	0.1	10	1.8	45	0.3	15	107.5
West Entrance to Madison	1.8	1080	0.05	12.5	0.1	10	0.15	3.75	0.15	7.5	1113.75
Madison to Norris	0.59	354	0.08	20	0.1	10	1.2	30	1	50	464
Norris to Canyon Village	0.44	264	0.05	12.5	0.2	20	0.56	14	0.7	35	345.5
Canyon Village to Fishing Bridge	0.34	204	0.45	112.5	1.4	140	0.36	9	0.7	35	500.5
Fishing Bridge to East Entrance	0.02	12	0.05	12.5	1.6	160	0.02	0.5	0.02	1	186
Fishing Bridge to West Thumb	0.08	48	0.46	115	0.3	30	0.02	0.5	0.7	35	228.5
Madison to Old Faithful	1.41	846	0.47	117.5	0.1	10	1.15	28.75	1.05	52.5	1054.75
Old Faithful to West Thumb	0.27	162	1.35	337.5	0.2	20	0.05	1.25	0.75	37.5	558.25
West Thumb to Flagg Ranch	0.05	30	1.75	437.5	0.1	10	0.05	1.25	0.05	2.5	481.25

Snowcoaches	West Entrance		South Entrance		East Entrance		North Entrance		Old Faithful		Total
	50		19		5		17		24		115
YELL Road Segment	Factor	Results	Factor	Results	Factor	Results	Factor	Results	Factor	Results	
Mammoth to Norris	0.05	2.5	0.03	0.57	0.1	0.5	1.8	30.6	0	0	34.17
West Entrance to Madison	1.8	90	0.05	0.95	0.1	0.5	0.15	2.55	0.48	11.52	105.52
Madison to Norris	0.59	29.5	0.08	1.52	0.1	0.5	1.2	20.4	0.06	1.44	53.36
Norris to Canyon Village	0.44	22	0.05	0.95	0.2	1	0.56	9.52	0.06	1.44	34.91
Canyon Village to Fishing Bridge	0.34	17	0.45	8.55	1.4	7	0.36	6.12	0.06	1.44	40.11
Fishing Bridge to East Entrance	0.02	1	0.05	0.95	1.6	8	0.02	0.34	0	0	10.29
Fishing Bridge to West Thumb	0.08	4	0.46	8.74	0.3	1.5	0.02	0.34	0.06	1.44	16.02
Madison to Old Faithful	1.41	70.5	0.47	8.93	0.1	0.5	1.15	19.55	0.6	14.4	113.88
Old Faithful to West Thumb	0.27	13.5	1.35	25.65	0.2	1	0.05	0.85	1.3	31.2	72.2
West Thumb to Flagg Ranch	0.05	2.5	1.75	33.25	0.1	0.5	0.05	0.85	1.18	28.32	65.42

Snowmobiles	CDST		Grassy Lake Rd		Jackson Lake		Totals
	75		75		100		250
GRTE Road Segment	Factor	Results	Factor	Results	Factor	Results	
Moran Junction to Flagg Ranch	2	150	0	0	0	0	150
Flagg Ranch west to boundary	0	0	1.9	142.5	0	0	142.5
Jackson Lake fishing access	0	0	0	0	2	200	200

Note:

This alternative includes 10 private snowcoaches which are modeled at the following entrances:

West Entrance	4
South Entrance	4
East Entrance	1
North Entrance	1

For YELL 25% of snowmobile entries modeled for this alternative are either unguided or non-commercially guided.
For GRTE 50 of the 75 snowmobile entries are modeled as guided. This differs from all other GRTE alternatives, where use is 100% unguided.

YELL group sizes are modeled at 11 snowmobiles/guided group
YELL group sizes are modeled at 5 snowmobiles/unguidedgroup
GRTE group sizes are modeled at 5, except Jackson Lake which is modeled as a single user

Alternative 5 - Unguided Access

Snowmobiles	West Entrance		South Entrance		East Entrance		North Entrance		Old Faithful		Total
	336		168		46		46		29		625
YELL Road Segment	Factor	Results	Factor	Results	Factor	Results	Factor	Results	Factor	Results	
Mammoth to Norris	0.05	16.8	0.03	5.04	0.1	4.6	1.8	82.8	0.3	8.7	117.94
West Entrance to Madison	1.8	604.8	0.05	8.4	0.1	4.6	0.15	6.9	0.15	4.35	629.05
Madison to Norris	0.59	198.24	0.08	13.44	0.1	4.6	1.2	55.2	1	29	300.48
Norris to Canyon Village	0.44	147.84	0.05	8.4	0.2	9.2	0.56	25.76	0.7	20.3	211.5
Canyon Village to Fishing Bridge	0.34	114.24	0.45	75.6	1.4	64.4	0.36	16.56	0.7	20.3	291.1
Fishing Bridge to East Entrance	0.02	6.72	0.05	8.4	1.6	73.6	0.02	0.92	0.02	0.58	90.22
Fishing Bridge to West Thumb	0.08	26.88	0.46	77.28	0.3	13.8	0.02	0.92	0.7	20.3	139.18
Madison to Old Faithful	1.41	473.76	0.47	78.96	0.1	4.6	1.15	52.9	1.05	30.45	640.67
Old Faithful to West Thumb	0.27	90.72	1.35	226.8	0.2	9.2	0.05	2.3	0.75	21.75	350.77
West Thumb to Flagg Ranch	0.05	16.8	1.75	294	0.1	4.6	0.05	2.3	0.05	1.45	319.15

Snowcoaches	West Entrance		South Entrance		East Entrance		North Entrance		Old Faithful		Total
	44		13		3		17		23		100
YELL Road Segment	Factor	Results	Factor	Results	Factor	Results	Factor	Results	Factor	Results	
Mammoth to Norris	0.05	2.2	0.03	0.39	0.1	0.3	1.8	30.6	0	0	33.49
West Entrance to Madison	1.8	79.2	0.05	0.65	0.1	0.3	0.15	2.55	0.48	11.04	93.74
Madison to Norris	0.59	25.96	0.08	1.04	0.1	0.3	1.2	20.4	0.06	1.38	49.08
Norris to Canyon Village	0.44	19.36	0.05	0.65	0.2	0.6	0.56	9.52	0.06	1.38	31.51
Canyon Village to Fishing Bridge	0.34	14.96	0.45	5.85	1.4	4.2	0.36	6.12	0.06	1.38	32.51
Fishing Bridge to East Entrance	0.02	0.88	0.05	0.65	1.6	4.8	0.02	0.34	0	0	6.67
Fishing Bridge to West Thumb	0.08	3.52	0.46	5.98	0.3	0.9	0.02	0.34	0.06	1.38	12.12
Madison to Old Faithful	1.41	62.04	0.47	6.11	0.1	0.3	1.15	19.55	0.6	13.8	101.8
Old Faithful to West Thumb	0.27	11.88	1.35	17.55	0.2	0.6	0.05	0.85	1.3	29.9	60.78
West Thumb to Flagg Ranch	0.05	2.2	1.75	22.75	0.1	0.3	0.05	0.85	1.18	27.14	53.24

Snowmobiles	CDST		Grassy Lake Rd		Jackson Lake		Totals
	50		50		40		140
GRTE Road Segment	Factor	Results	Factor	Results	Factor	Results	
Moran Junction to Flagg Ranch	2	100	0	0	0	0	100
Flagg Ranch west to boundary	0	0	1.9	95	0	0	95
Jackson Lake fishing access	0	0	0	0	2	80	80

Note:
20% of snowmobile entries for this alternative are modeled as unguided, and would be required to enter the park no later than 10:30 a.m. These entries are included in the overall numbers for each entrance.

This alternative also allows up to 626 commercial snowmobiles and 100 snowcoaches per day to account for increased seasonal demand. These increased allowances count against a seasonal limit of 27,540 snowmobiles/5,291 snowcoaches.

YELL group sizes are modeled at 11 snowmobiles/guided group
YELL group sizes are modeled at 5 snowmobiles/unguidedgroup
GRTE group sizes are modeled at 5, except Jackson Lake which is modeled as a single user

Alternative 6 - Mixed Use

Snowmobiles	West Entrance		South Entrance		East Entrance		North Entrance		OF/Norris		Total
	0		250		0		0		100		350
Road Segment	**Factor**	**Results**	**Factor**	**Results**	**Factor**	**Results**	**Factor**	**Results**	**Factor**	**Results**	
Mammoth to Norris	0	0	0	0	0	0	0	0	0	0	0
West Entrance to Madison	0	0	0	0	0	0	0	0	0	0	0
Madison to Norris	0	0	0	0	0	0	0	0	0	0	0
Norris to Canyon Village	1.5	0	0.02	5	0	0	0	0	0.1	10	15
Canyon Village to Fishing Bridge	1.4	0	0.38	95	0	0	0	0	1.7	170	265
Fishing Bridge to Lake Butte	0	0	0	0	0	0	0	0	0	0	0
Fishing Bridge to West Thumb	0.5	0	0.44	110	0	0	0	0	1.7	170	280
Madison to Old Faithful	0	0	0	0	0	0	0	0	0	0	0
Old Faithful to West Thumb	0.48	0	1.42	355	0	0	0	0	1.8	180	535
West Thumb to Flagg Ranch	0.02	0	1.8	450	0	0	0	0	0.1	10	460
GTNP CDST											
GTNP Grassy											
GTNP Jackson Lake											

Snowcoaches	West Entrance		South Entrance		East Entrance		North Entrance		OF/Norris		Total
	0		10		0		0		30		40
	(Start @ Norris)										
YELL Road Segment	**Factor**	**Results**	**Factor**	**Results**	**Factor**	**Results**	**Factor**	**Results**	**Factor**	**Results**	
Mammoth to Norris	0	0	0	0	0	0	0	0	0	0	0
West Entrance to Madison	0	0	0	0	0	0	0	0	0	0	0
Madison to Norris	0	0	0	0	0	0	0	0	0	0	0
Norris to Canyon Village	1.5	0	0.02	0.2	0	0	0	0	0.1	3	3.2
Canyon Village to Fishing Bridge	1.4	0	0.38	3.8	0	0	0	0	1.7	51	54.8
Fishing Bridge to Lake Butte	0	0	0	0	0	0	0	0	0	0	0
Fishing Bridge to West Thumb	0.48	0	0.44	4.4	0	0	0	0	1.7	51	55.4
Madison to Old Faithful	0	0	0	0	0	0	0	0	0	0	0
Old Faithful to West Thumb	0.46	0	1.42	14.2	0	0	0	0	1.8	54	68.2
West Thumb to Flagg Ranch	0.02	0	1.8	18	0	0	0	0	0.1	3	21

Wheeled Vehicles	West Entrance		South Entrance		East Entrance		North Entrance		Old Faithful		Total
	75		0		0		25		0		100
YELL Road Segment	**Factor**	**Results**	**Factor**	**Results**	**Factor**	**Results**	**Factor**	**Results**	**Factor**	**Results**	
Mammoth to Norris	0.3	22.5	0	0	0	0	1.8	45	0.2	0	67.5
West Entrance to Madison	1.7	127.5	0	0	0	0	0.25	6.25	0.8	0	133.75
Madison to Norris	0.4	30	0	0	0	0	1.55	38.75	0.2	0	68.75
Norris to Canyon Village	0	0	0	0	0	0	0	0	0	0	0
Canyon Village to Fishing Bridge	0	0	0	0	0	0	0	0	0	0	0
Fishing Bridge to Lake Butte	0	0	0	0	0	0	0	0	0	0	0
Fishing Bridge to West Thumb	0	0	0	0	0	0	0	0	0	0	0
Madison to Old Faithful	1.5	112.5	0	0	0	0	1.5	37.5	1	0	150
Old Faithful to West Thumb	0	0	0	0	0	0	0	0	0	0	0
West Thumb to Flagg Ranch	0	0	0	0	0	0	0	0	0	0	0

Snowmobiles	CDST		Grassy Lake Rd		Jackson Lake		Totals
	0		50		40		90
GRTE Road Segment	**Factor**	**Results**	**Factor**	**Results**	**Factor**	**Results**	
Moran Junction to Flagg Ranch	0	0	0	0	0	0	0
Flagg Ranch west to boundary	0	0	1.9	95	0	0	95
Jackson Lake fishing access	0	0	0	0	2	80	80

Note:

YELL group sizes are modeled at 90% 8 snowmobiles/group and 10% would be 17 snowmobiles/group.
GRTE group sizes are modeled at 5, except Jackson Lake which is modeled as a single user.

Current Conditions/Actual Use

Snowmobiles	West Entrance		South Entrance		East Entrance		North Entrance		Old Faithful		Total
	153		89		8		5		5		260
YELL Road Segment	**Factor**	**Results**	**Factor**	**Results**	**Factor**	**Results**	**Factor**	**Results**	**Factor**	**Results**	
Mammoth to Norris	0.05	7.65	0.03	2.67	0.1	0.8	1.8	9	0.3	1.5	21.62
West Entrance to Madison	1.8	275.4	0.05	4.45	0.1	0.8	0.15	0.75	0.15	0.75	282.15
Madison to Norris	0.59	90.27	0.08	7.12	0.1	0.8	1.2	6	1	5	109.19
Norris to Canyon Village	0.44	67.32	0.05	4.45	0.2	1.6	0.56	2.8	0.7	3.5	79.67
Canyon Village to Fishing Bridge	0.34	52.02	0.45	40.05	1.4	11.2	0.36	1.8	0.7	3.5	108.57
Fishing Bridge to East Entrance	0.02	3.06	0.05	4.45	1.6	12.8	0.02	0.1	0.02	0.1	20.51
Fishing Bridge to West Thumb	0.08	12.24	0.46	40.94	0.3	2.4	0.02	0.1	0.7	3.5	59.18
Madison to Old Faithful	1.41	215.73	0.47	41.83	0.1	0.8	1.15	5.75	1.05	5.25	269.36
Old Faithful to West Thumb	0.27	41.31	1.35	120.15	0.2	1.6	0.05	0.25	0.75	3.75	167.06
West Thumb to Flagg Ranch	0.05	7.65	1.75	155.75	0.1	0.8	0.05	0.25	0.05	0.25	164.7

Snowcoaches	West Entrance		South Entrance		East Entrance		North Entrance		Old Faithful		Total
	14		5		1		6		3		29
YELL Road Segment	**Factor**	**Results**	**Factor**	**Results**	**Factor**	**Results**	**Factor**	**Results**	**Factor**	**Results**	
Mammoth to Norris	0.05	0.7	0.03	0.15	0.1	0.1	1.8	10.8	0	0	11.75
West Entrance to Madison	1.8	25.2	0.05	0.25	0.1	0.1	0.15	0.9	0.48	1.44	27.89
Madison to Norris	0.59	8.26	0.08	0.4	0.1	0.1	1.2	7.2	0.06	0.18	16.14
Norris to Canyon Village	0.44	6.16	0.05	0.25	0.2	0.2	0.56	3.36	0.06	0.18	10.15
Canyon Village to Fishing Bridge	0.34	4.76	0.45	2.25	1.4	1.4	0.36	2.16	0.06	0.18	10.75
Fishing Bridge to East Entrance	0.02	0.28	0.05	0.25	1.6	1.6	0.02	0.12	0	0	2.25
Fishing Bridge to West Thumb	0.08	1.12	0.46	2.3	0.3	0.3	0.02	0.12	0.06	0.18	4.02
Madison to Old Faithful	1.41	19.74	0.47	2.35	0.1	0.1	1.15	6.9	0.6	1.8	30.89
Old Faithful to West Thumb	0.27	3.78	1.35	6.75	0.2	0.2	0.05	0.3	1.3	3.9	14.93
West Thumb to Flagg Ranch	0.05	0.7	1.75	8.75	0.1	0.1	0.05	0.3	1.18	3.54	13.39

Snowmobiles	CDST		Grassy Lake Rd		Jackson Lake		Totals
	0		20		10		30
GRTE Road Segment	**Factor**	**Results**	**Factor**	**Results**	**Factor**	**Results**	
Moran Junction to Flagg Ranch	0	0	0	0	0	0	0
Flagg Ranch west to boundary	0	0	1.9	38	0	0	38
Jackson Lake fishing access	0	0	0	0	2	20	20

Note:
This alternative models the average numbers of snowmobile and snowcoach daily entries over the following winter seasons:
2003-2004
2004-2005

2005-2006

For snowcoaches, this alternative models emissions of the 2005-2006 fleet*.
Two private snowcoaches were authorized to enter the park during the 2003-2006 winter seasons.

YELL group sizes are modeled at 7 snowmobiles/group
GRTE group sizes are modeled at 5, except Jackson Lake which is modeled as a single user

* On 14 July 2006 the point was clarified that for current conditions, there is no snowcoach BAT requirement for modeling purposes.

Scenario J - Historical Unregulated Conditions

Snowmobiles	West Entrance		South Entrance		East Entrance		North Entrance		Old Faithful		Total
	947		310		62		28		53		1400
YELL Road Segment	**Factor**	**Results**	**Factor**	**Results**	**Factor**	**Results**	**Factor**	**Results**	**Factor**	**Results**	
Mammoth to Norris	0.05	47.35	0.03	9.3	0.1	6.2	1.8	50.4	0.3	15.9	129.15
West Entrance to Madison	1.8	1704.6	0.05	15.5	0.1	6.2	0.15	4.2	0.15	7.95	1738.45
Madison to Norris	0.59	558.73	0.08	24.8	0.1	6.2	1.2	33.6	1	53	676.33
Norris to Canyon Village	0.44	416.68	0.05	15.5	0.2	12.4	0.56	15.68	0.7	37.1	497.36
Canyon Village to Fishing Bridge	0.34	321.98	0.45	139.5	1.4	86.8	0.36	10.08	0.7	37.1	595.46
Fishing Bridge to East Entrance	0.02	18.94	0.05	15.5	1.6	99.2	0.02	0.56	0.02	1.06	135.26
Fishing Bridge to West Thumb	0.08	75.76	0.46	142.6	0.3	18.6	0.02	0.56	0.7	37.1	274.62
Madison to Old Faithful	1.41	1335.27	0.47	145.7	0.1	6.2	1.15	32.2	1.05	55.65	1575.02
Old Faithful to West Thumb	0.27	255.69	1.35	418.5	0.2	12.4	0.05	1.4	0.75	39.75	727.74
West Thumb to Flagg Ranch	0.05	47.35	1.75	542.5	0.1	6.2	0.05	1.4	0.05	2.65	600.1

Snowcoaches	West Entrance		South Entrance		East Entrance		North Entrance		Old Faithful		Total
	20		7		1		5		7		40
YELL Road Segment	**Factor**	**Results**	**Factor**	**Results**	**Factor**	**Results**	**Factor**	**Results**	**Factor**	**Results**	
Mammoth to Norris	0.05	1	0.03	0.21	0.1	0.1	1.8	9	0	0	10.31
West Entrance to Madison	1.8	36	0.05	0.35	0.1	0.1	0.15	0.75	0.48	3.36	40.56
Madison to Norris	0.59	11.8	0.08	0.56	0.1	0.1	1.2	6	0.06	0.42	18.88
Norris to Canyon Village	0.44	8.8	0.05	0.35	0.2	0.2	0.56	2.8	0.06	0.42	12.57
Canyon Village to Fishing Bridge	0.34	6.8	0.45	3.15	1.4	1.4	0.36	1.8	0.06	0.42	13.57
Fishing Bridge to East Entrance	0.02	0.4	0.05	0.35	1.6	1.6	0.02	0.1	0	0	2.45
Fishing Bridge to West Thumb	0.08	1.6	0.46	3.22	0.3	0.3	0.02	0.1	0.06	0.42	5.64
Madison to Old Faithful	1.41	28.2	0.47	3.29	0.1	0.1	1.15	5.75	0.6	4.2	41.54
Old Faithful to West Thumb	0.27	5.4	1.35	9.45	0.2	0.2	0.05	0.25	1.3	9.1	24.4
West Thumb to Flagg Ranch	0.05	1	1.75	12.25	0.1	0.1	0.05	0.25	1.18	8.26	21.86

Snowmobiles	CDST		Grassy Lake Rd		Jackson Lake		Totals
	60		45		60		165
GRTE Road Segment	**Factor**	**Results**	**Factor**	**Results**	**Factor**	**Results**	
Moran Junction to Flagg Ranch	2	120	0	0	0	0	120
Flagg Ranch west to boundary	0	0	1.9	85.5	0	0	85.5
Jackson Lake fishing access	0	0	0	0	2	120	120

Note:

For snowcoaches, this alternative models the fleet circa 1999.

YELL group sizes are modeled at 5 snowmobiles/group.
GRTE group sizes are modeled at 5, except Jackson Lake which is modeled as a single user.

Oversnow Vehicle Miles Traveled Per Day, by Scenario and Road Segment (including miles for Jackson Lake OSV travel)

		Alternative 1a		Alternative 2		Alternative 3		Alternative 4		Alternative 5		Alternative 6			Historical		Current Conditions		Alternative 1b		Alternative 1d		Alternative 1e	
Road Segment	**Mileage**	Snwmble	Coach	Snwmble	Coach	Snwmble	Coach	Snwmble	Coach	Snwmble	Coach	Snwmble	Coach	Wheeled	Snwmble	Coach	Snwmble	Coach	Snwmble	Coach	Snwmble	Coach	Snwmble	Coach
Mammoth to Norris	21	1965.60	35.70	0.00	716.10	0.00	0.00	2257.50	717.57	2476.74	703.29	0.00	0.00	1417.50	2712.15	216.51	454.02	246.75	1488.48	535.29	1881.60	535.29	1818.60	605.64
West Entrance to Madison	14	10416.00	856.80	0.00	1593.76	0.00	0.00	15592.50	1477.28	8806.70	1312.36	0.00	0.00	1872.50	24338.30	567.84	3950.10	390.46	10948.00	1014.16	10360.00	1014.16	10522.40	954.24
Madison to Norris	14	4530.40	280.84	0.00	787.22	0.00	0.00	6496.00	747.04	4206.72	687.12	0.00	0.00	962.50	9468.62	264.32	1528.66	225.96	4404.96	528.92	4474.40	528.92	0.00	0.00
Norris to Canyon Village	12	2793.60	179.52	0.00	436.20	0.00	0.00	4146.00	418.92	2538.00	378.12	180.00	38.40	0.00	5968.32	150.84	956.04	121.80	2694.72	287.64	2697.60	287.64	823.20	252.48
Canyon Village to Fishing Bridge	16	5164.80	184.96	0.00	599.20	0.00	0.00	8008.00	641.76	4657.60	520.16	4240.00	876.80	0.00	9527.36	217.12	1737.12	172.00	4488.96	370.72	4268.80	370.72	2630.40	640.96
Fishing Bridge to East Entrance*	27	2273.40	18.36	0.00	72.63	0.00	0.00	5022.00	277.83	2435.94	180.09	0.00	0.00	0.00	3652.02	66.15	553.77	60.75	220.80	15.90	202.00	15.90	202.00	15.90
Fishing Bridge to West Thumb	21	3502.80	57.12	0.00	370.02	0.00	0.00	4798.50	336.42	2922.78	254.52	5880.00	1163.40	0.00	5767.02	118.44	1242.78	84.42	3487.68	210.84	3250.80	210.84	4128.60	737.94
Madison to Old Faithful	16	11798.40	767.04	0.00	1962.40	0.00	0.00	16876.00	1822.08	10250.72	1628.80	0.00	0.00	2400.00	25200.32	664.64	4309.76	494.24	12194.56	1276.80	11734.40	1276.80	13481.60	1202.56
Old Faithful to West Thumb	17	7429.00	156.06	0.00	1348.95	8500.00	680.00	9490.25	1227.40	5963.09	1033.26	9095.00	1159.40	0.00	12371.58	414.80	2840.02	253.81	8093.36	863.26	7293.00	863.26	8950.50	991.61
West Thumb to Flagg Ranch	24	9888.00	40.80	0.00	1787.76	12000.00	960.00	11550.00	1570.08	7659.60	1277.76	11040.00	504.00	0.00	14402.40	524.64	3952.80	321.36	11923.20	1112.16	10320.00	1112.16	10250.40	655.44
GTNP CDST (Moran to Flagg)	24	2400.00		0.00		0.00		3600.00		2400.00		0.00			2880.00		0.00		2400.00		2400.00		2400.00	
GTNP Grassy (Flagg Ranch/west to ID)	7	665.00		0.00		700.00		997.50		665.00		665.00			598.50		266.00		665.00		665.00		665.00	
GTNP Jackson Lake (fishing access)	37.3	2984.00		0.00		0.00		7460.00		2984.00		2984.00			4476.00		746.00		2984.00		2984.00		2984.00	
Sub Totals		65811.0	2577.2	0.0	9674.2	21200.0	1640.0	96294.3	9236.4	57966.9	7975.5	34084.0	3742.0	6652.5	121362.6	3205.3	22537.1	2371.6	65993.7	6215.7	62531.6	6215.7	58856.7	6056.8
Total Alternative Vehicle Miles in a Day			**68,388**		**9,674**		**22,840**		**105,531**		**65,942**			**44,479**		**124,568**		**24,909**		**72,209**		**68,747**		**64,913**

*****For alternatives where East Entrance is closed a mileage of 10 rather than 27 was calculated for this road segment.

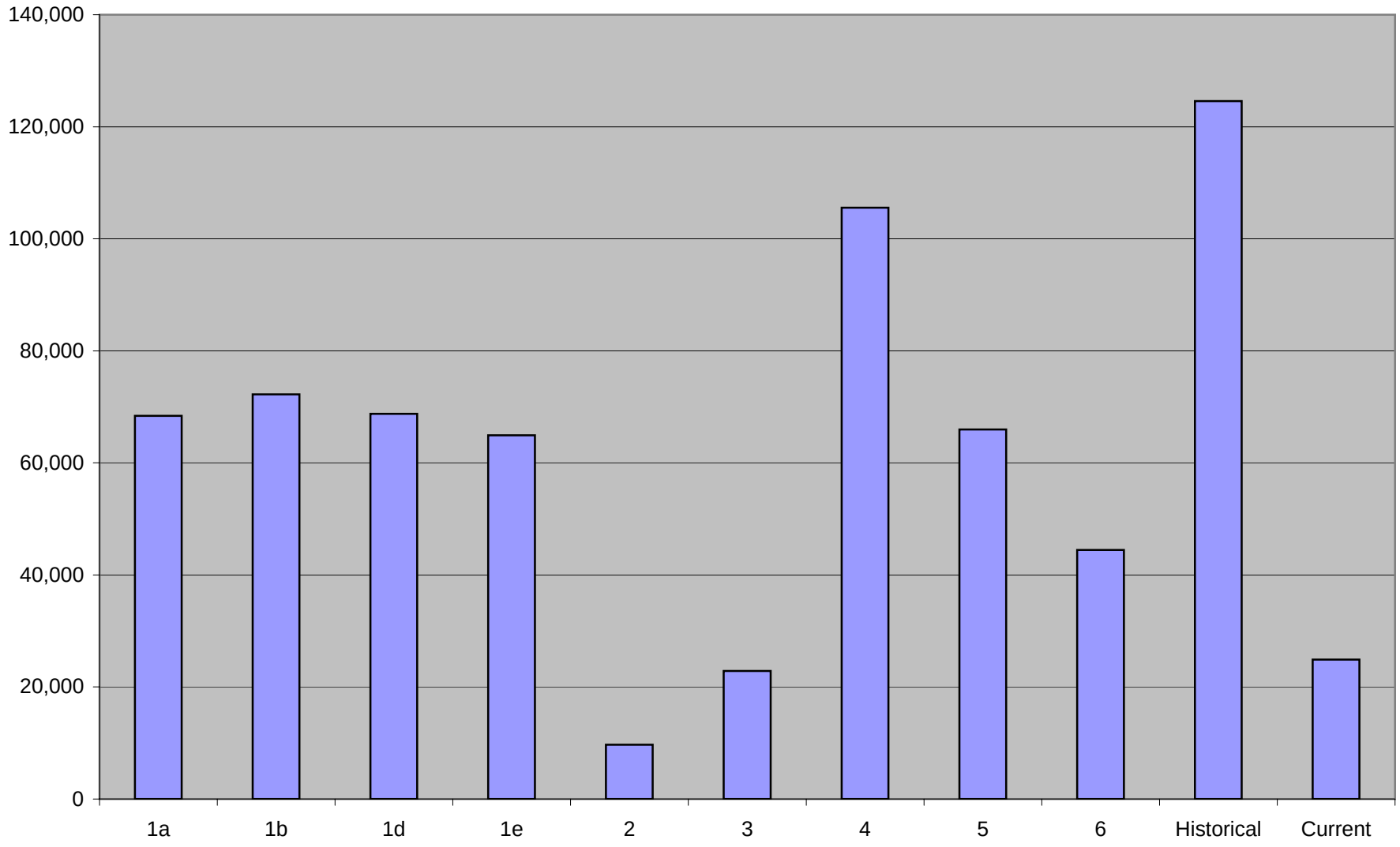
Figures for Chart		
Alternative	1a	68,388
Alternative	1b	72,209
Alternative	1d	68,747
Alternative	1e	64,913
Alternative	2	9,674
Alternative	3	22,840
Alternative	4	105,531
Alternative	5	65,942
Alternative	6	44,479
Alternative	Historical	124,568
Alternative	Current	24,909

Jackson Lake miles by segment origin					
Segment	**Percent use:**	**Signal Mtn.**	**Percent use:**	**Colter Bay**	
1	20	5677.2	15	1012.6	
2	30	918.6	5	5753.9	
3	10	7223.0	17.5	3199.6	
4	10	663.1	17.5	2022.2	
5	10	3004.6	5	2855.2	
6	15	1998.0	5	980.5	
7	5	2999.5	5	2933.0	
8	n/a	1629.6	20	6584.5	
9	n/a	818.7	5	2655.1	
10	n/a	2425.7	5	4590.7	
		27358.0		**32587.3**	**meters**
		17.0		**20.3**	**miles**

17/37.3 = 46% travel originates at Signal Mtn.

20.3/37.3 = 54% travel originates at Colter Bay

OSV miles traveled per day, by alternative



APPENDIX D. MODELING SCENARIOS

	Highlights	Road Grooming	Yellowstone Snowmobile Entry Limits	Yellowstone Daily Snowcoach Entry Limits	Grand Teton Snowmobile Entry Limits	Yellowstone Guiding Requirements	BAT Requirements	Side Roads
Scenario A – Continue Temporary Plan	Allows for nearly historic levels of snowmobile use but requires commercial guides. This scenario mimics the temporary winter use plan currently in place.	Continue road grooming	720 snowmobiles per day West: 400 South: 220 North: 30 East: 40 Old Faithful: 30	78 snowcoaches per day West: 34 South: 10 North: 3 East: 2 Old Faithful/Parkwide: 29	Grassy Lake Rd: 50 CDST: 50 Jackson Lake: 40	100% commercially guided	Current BAT for snowmobiles No BAT for snowcoaches	Firehole Canyon Drive open in afternoon to snowmobiles Lake Butte open to snowmobiles All others snowcoach only

	Highlights	Road Grooming	Yellowstone Snowmobile Entry Limits	Yellowstone Daily Snowcoach Entry Limits	Grand Teton Snowmobile Entry Limits	Yellowstone Guiding Requirements	BAT Requirements	Side Roads
Scenario B – Snowcoach Only	Emphasizes snowcoach access; prohibits recreational snowmobiling. Road grooming would continue. This scenario most closely matches the November 2000 decision.	Continue road grooming	Snowmobiles Prohibited	105 snowcoaches per day West: 46 South: 15 North: 5 East: 4 Old Faithful/ Parkwide: 35	Snowmobiles Prohibited	All Guided	Snowcoach BAT	All open to snowcoaches only

	Highlights	Road Grooming	Yellowstone Snowmobile Entry Limits	Yellowstone Daily Snowcoach Entry Limits	Grand Teton Snowmobile Entry Limits	Yellowstone Guiding Requirements	BAT Requirements	Side Roads
Scenario C – Road Grooming	Prohibits road grooming or packing on most road segments in Yellowstone National Park. The road from the South Entrance to Old Faithful would be the only oversnow motorized access route maintained in Yellowstone.	Only groom South to Old Faithful. All other segments ungroomed and closed to oversnow travel	South: 250	South: 20	Grassy Lake Rd: 50 CDST: Closed Jackson Lake: Closed	100% commercially guided	Current BAT or better for snowmobiles. BAT for coaches	All closed

	Highlights	Road Grooming	Yellowstone Snowmobile Entry Limits	Yellowstone Daily Snowcoach Entry Limits	Grand Teton Snowmobile Entry Limits	Yellowstone Guiding Requirements	BAT Requirements	Side Roads
Scenario D – Experimental Road Closure	Emphasizes research on bison movements and ecology. The road segment between Norris and Madison would not be groomed as an experiment to study the effects of road packing on bison. Allows for continued snowmobile and snowcoach use at nearly historic levels, although travel would not be permitted between Norris and Madison	No grooming from Madison to Norris (and no oversnow access) No recreational oversnow access on Sylvan Pass	680 Snowmobiles/day West: 400 South: 220 North: 30 East: 0 Old Faithful: 30	76 snowcoaches per day West: 34 South: 10 North: 3 East: 0 Old Faithful/ Parkwide: 29	Grassy Lake Rd: 50 CDST: Closed Jackson Lake: 40	100% commercially guided	Current BAT or better for snowmobiles. BAT for coaches	

	Highlights	Road Grooming	Yellowstone Snowmobile Entry Limits	Yellowstone Daily Snowcoach Entry Limits	Grand Teton Snowmobile Entry Limits	Yellowstone Guiding Requirements	BAT Requirements	Side Roads
Scenario E – Enhance Recreational Use	Allows for increased snowmobile use, relative to historic numbers. Commercial guides would be required for most snowmobilers; some could also visit the park after completing a non-commercial guide training course.	Continue road grooming	1,025 snowmobiles/day West: 600 South: 250 North: 25 East: 100 Old Faithful: 50	105 snowcoaches per day West: 46 South: 15 North: 5 East: 4 Old Faithful/ Parkwide: 35	Grassy Lake Rd: No limits CDST: 75 Jackson Lake: 75	70% commercially guided (718) 30% non-commercially guided (307)	Current BAT in Yellowstone BAT for snowcoaches	All side roads to snowmobiles.

	Highlights	Road Grooming	Yellowstone Snowmobile Entry Limits	Yellowstone Daily Snowcoach Entry Limits	Grand Teton Snowmobile Entry Limits	Yellowstone Guiding Requirements	BAT Requirements	Side Roads
Scenario F – Current Conditions/ Actual Use	Allows limited snowmobile and snowcoach use roughly comparable to the winters of 2003-2004 and 2004-2005.	Continue road grooming	315 snowmobiles/day West: 160 South: 100 East: 20 North: 15 Old Faithful: 20	40 snowcoaches per day West: 20 South: 7 North: 4 East: 1 Old Faithful/ Parkwide: 8	Grassy Lake Rd: 20 CDST: Closed Jackson Lake: 10	100% commercially guided	Current BAT for snowmobiles BAT for snowcoaches	Firehole Canyon Drive open in afternoon to snowmobiles Lake Butte open to snowmobiles All others snowcoach only

	Highlights	Road Grooming	Yellowstone Snowmobile Entry Limits	Yellowstone Daily Snowcoach Entry Limits	Grand Teton Snowmobile Entry Limits	Yellowstone Guiding Requirements	BAT Requirements	Side Roads
Scenario G – Unguided Access	Balances snowmobile and snowcoach access and accommodates visitors who wish to have an unguided snowmobile experience.	Continue road grooming	540 snowmobiles/day – 432 com'l, 108 unguided West: 290, 232 com'l; 58 unguided South: 145, 116 com'l; 29 unguided East: 40, 32 com'l; 8 unguided North: 40, 32 com'l; 8 unguided Old Faithful: 25, 20 com'l, 5 unguided	83 snowcoaches per day West: 34 South: 10 North: 3 East: 2 Old Faithful/ Parkwide: 34	Grassy Lake Rd: 75 CDST: 75 Jackson Lake: 40	80% commercially guided 20% unguided, with brief training	Improved BAT for snowmobiles BAT for snowcoaches	Firehole Canyon Drive open in afternoon to snowmobiles Lake Butte open to snowmobiles All others snowcoach only

	Highlights	Road Grooming	Yellowstone Snowmobile Entry Limits	Yellowstone Daily Snowcoach Entry Limits	Grand Teton Snowmobile Entry Limits	Yellowstone Guiding Requirements	BAT Requirements	Side Roads
Scenario H – Seasonal Allocation	Provides maximum flexibility to businesses to respond to visitors' demand on busy days, with limits on the number of visitors that may enter the park each winter season. Businesses can decide how they want to "spend" their seasonal allocation.	Continue road grooming	50,000 snowmobiles per season. (Park-wide average = 588) West: 27,000 (318 day) South: 15,000 (176/day) North: 2,500 (32/day) East: 2,500 (29/day) Old Faithful: 3,000 (35/day) 800 snowmobiles per day maximum as follows: West: 460 South: 250 North: 30 East: 30 Old Faithful: 30	90 snowcoaches per day West: 39 South: 12 North: 4 East: 2 Old Faithful/ Parkwide: 33	Grassy Lake Rd: 75 CDST: Closed Jackson Lake: 40	100% commercially guided	Current BAT or better for snowmobiles BAT for snowcoaches	Firehole Canyon Drive open in afternoon to snowmobiles Lake Butte open to snowmobiles All others snowcoach only

	Highlights	Road Grooming	Yellowstone Snowmobile Entry Limits	Yellowstone Daily Snowcoach Entry Limits	Grand Teton Snowmobile Entry Limits	Yellowstone Guiding Requirements	BAT Requirements	Side Roads
Scenario I – Plowing	Emphasizes plowing Yellowstone's west-side roads to promote economically affordable winter visits for all Americans. Continues to allow snowmobile access thru the South Entrance and on the east side of the park.	Plow Mammoth to West to Old Faithful. Groom Old Faithful to South to Lake to Canyon to Norris. Sylvan Pass would be closed to recreational oversnow access.	Snowmobile Entry Limits: South: 250 Old Faithful: 100 No entry limits for wheeled vehicles.	40 snowcoaches parkwide per day Note: Rubber-tracked snowcoaches entering at West Entrance and traveling to Canyon (for example) would be counted against the parkwide allocation.	Grassy Lake Rd: 50 CDST: Closed Jackson Lake: 40	100% commercially guided – both wheeled and oversnow (ie, commercial buses and vans only for wheeled vehicle access)	Current BAT or better for snowmobiles BAT for snowcoaches	Groomed or plowed depending on location

	Highlights	Road Grooming	Yellowstone Snowmobile Entry Limits	Yellowstone Daily Snowcoach Entry Limits	Grand Teton Snowmobile Entry Limits	Yellowstone Guiding Requirements	BAT Requirements	Side Roads
Scenario J – 1983 Regulations	Returns winter use management to the essentially unregulated conditions of the past. These conditions were found to impair park resources and values.	Continue road grooming	Unlimited	Unlimited	Unlimited Snowplanes allowed on Jackson Lake	No requirements for guides	No BAT requirements	All side roads open to snowmobiles

APPENDIX E. MONITORING AND ADAPTIVE MANAGEMENT THRESHOLDS

Adaptive Management and Monitoring

All alternatives, except 3B, include adaptive management provisions. An adaptive management plan is different from a monitoring plan in that it allows park managers to act when some information exists about a specific resource but conclusive data is currently unavailable. The first step in adaptive management is to develop and implement a management scenario based on the best available information. For example, in this document several alternatives propose a specific limit on the number of winter visitors that can enter the park daily via snowmobile. The next step is to implement an evaluation program to assess the success of the management scenario relative to defined resource thresholds. This evaluation is critical within the framework of adaptive management because of the uncertain results of the initial predictions. Managers then review the results of the evaluation program and may adjust activities or use limits to mitigate unplanned or undesirable outcomes. For example, if the visitor limits set for a park entrance have a greater or lesser effect on resource thresholds than predicted, then the number of visitors allowed to enter the parks could be raised or lowered accordingly.

Monitoring is also a component of all alternatives considered in this document. General resource monitoring applies when adequate information exists to make informed management decisions based on discrete and accepted thresholds. It is the process of collecting information to evaluate if the objectives of a management plan are being realized. General monitoring techniques will be used to assess impacts to public health and safety; geothermal features; water quality; threatened and endangered species; wildlife; and some aspects of visitor experience. The table following in this appendix describes monitoring and adaptive management indicators, locations/zones, preliminary thresholds, methods, and monitoring intensity. The table also identifies possible management actions that will be implemented if thresholds are violated. Some non-emergency actions, such as permanent road closures to protect wildlife or the construction of a new facility, may require additional site-specific NEPA analysis, which includes public involvement. Other actions might be administrative in nature or could be implemented through application of a categorical exclusion under NEPA.

The preliminary thresholds in the table are based in part on the least environmentally damaging conditions that would have been achievable under any of the alternatives considered in the DEIS. One criterion was that the thresholds not exceed a moderate adverse impact level as described in the impact definitions for each topic in this EIS. This does not mean that such a level would be unacceptable or result in impairment, but it does provide managers an early warning when conditions may be moving away from those that are desirable long before they reach an unacceptable level. Monitoring and adaptive management, and management action if these thresholds are violated, will ensure the parks' obligation to preserve resources and values in an unimpaired and acceptable condition is achieved, while allowing for winter use of the parks. Many of these thresholds were derived partly from the results of computational models, and they are preliminary in nature. Therefore, they could be adjusted depending on data resulting from monitoring programs.

APPENDIX F. GOVERNMENT COSTS PER ALTERNATIVE

Cost information to be included later.

APPENDIX G.

Summary of Bison, Snow and Winter Use: A Stakeholder Workshop

MONTANA STATE UNIVERSITY
BIG SKY INSTITUTE

BISON, SNOW AND WINTER USE:

A Stakeholder Workshop to Identify Potential Winter Use Management Effects Studies for the Road Corridor from Madison Junction to Mammoth Hot Springs

January 18-19, 2006
Yellowstone National Park
Heritage Research Center
Gardiner, Montana

Big Sky Institute
106 AJM Johnson Hall
P.O. Box 173490
Bozeman, MT 59717-3490
http://bsi.montana.edu

Tel (406) 994-2374
Fax (406) 994-5122

Mountains & Minds

Bison, Snow and Winter Use: A Stakeholder Workshop to Identify Potential Winter Use Management Effects Studies for the Road Corridor Between Madison Junction to Mammoth Hot Springs, January 18-19, 2006

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Big Sky Institute, P.O. Box 173490, Montana State University, Bozeman, MT 59717
Phone: (406) 994-2374 | Website: http://bsi.montana.edu

1.0 BACKGROUND

1.1 Overview of Winter Use Planning

Winter use in Yellowstone and Grand Teton National Parks and the John D. Rockefeller, Jr., Memorial Parkway (JDR) has been the subject of controversy for many years. From its beginnings in the 1940s, winter use grew slowly until people began touring Yellowstone via snowmobile beginning in 1963. Not long after, snowmobiling caught on and began a long period of rapid growth in popularity. By the 1980s, so many snowmobiles were entering Yellowstone that the National Park Service grew concerned about air and noise pollution issues, wildlife impacts, crowding, and degradation of the visitor experience. In 1990, the agency released a Winter Use Plan Environmental Assessment, which guided winter use for several more years without making any major changes (Yochim 1999).

Concerned about the effects of groomed snowmobile routes on park bison (since the late 1970s, bison have learned to walk upon the hard-packed routes, with uncertain effects on themselves and their population), the Fund for Animals filed suit against the NPS in 1997, alleging that the activity violated several federal laws. The NPS agreed to prepare a new winter use plan and environmental impact statement (EIS). In late 2000, the National Park Service finalized the EIS and issued a Record of Decision that proposed to eliminate both snowmobile and snowplane use from the parks by the winter of 2003-2004, and provide visitor access via a mass-transit snowcoach system. That decision was based on a finding that the snowmobile and snowplane use existing at that time, and the snowmobile use analyzed in the EIS alternatives, impaired park resources and values, thus violating the statutory mandate of the NPS. These changes were completed with a final rule published in the *Federal Register* on January 22, 2001 (Yochim 2004).

That decision was contested in Wyoming District Court, and in 2001 the National Park Service began a Supplemental Environmental Impact Statement focusing on the cleaner and quieter snowmobiles just becoming commercially available at that time. In February 2003, the NPS made a decision to continue allowing snowmobile use under three strict conditions: 1) winter visitation was to be limited to no more than 950 snowmobiles daily in Yellowstone; 2) all snowmobiles would have to use best available technology; and 3) snowmobilers would have to be led by trained guides. That decision was finalized in December 2003 with a new regulation governing winter use in the parks, but was shortly thereafter overturned by the Washington, D.C. District Court, ruling upon another lawsuit. That court ordered the NPS to implement the January 22, 2001 regulation phasing out recreational snowmobiling (the first EIS) (Yochim 2004).

On October 14, 2004, the Wyoming Federal District Court vacated and remanded the first EIS to the NPS, thereby preventing the agency from implementing the snowmobile ban. With no clear rules under which to allow continued winter use, the National Park Service issued an environmental assessment on winter use rules for an interim period, through the winter of 2006-07. The rules allow 720 snowmobiles per day into Yellowstone and 140

per day into Grand Teton National Park. Within Yellowstone, all snowmobiles must be commercially guided, and all must be Best Available Technology (BAT) machines. Preparation of this plan will also allow the NPS to complete a long-term analysis of the environmental impacts of winter use in the parks. The NPS hopes that this long-term analysis will culminate in a long-term decision about winter use in the parks (NPS 2006).

Throughout this complicated legal history, the question of bison use of groomed roadways has played a crucial role. Some have asserted that the corridor between the Firehole Valley (part of the Central bison range) and Mammoth Hot Springs (part of the Northern bison range) could have historically or might still serve as a barrier to bison movements between the Central and Northern winter ranges if the oversnow vehicle roads in this area were not groomed. However, because systematic research has not been carried out on the ability of bison to move through snow under the variety of circumstances present in Yellowstone National Park, this assertion remains subject to several key uncertainties including: a) the threshold depth/density of snow at which low and high density forage-limited bison cannot move through corridors in search of better foraging conditions, b) terrain characteristics (slope, ruggedness) that affect the snow depth/density threshold preventing movements, c) the relationship between winter forage availability and probability of bison movement, and d) the relationship between winter forage availability, bison density and bison over-winter mortality.

Such questions, and the underlying concern about alteration of bison habits and distribution in Yellowstone, were the prompt for the first lawsuit. The NPS's failure to comprehensively address the questions was one of the reasons that the Washington, D.C. federal court struck down the second EIS in 2003. As the agency goes about preparing the new long-term plan and environmental impact statement (EIS) for winter use, the agency will be carefully examining the state of knowledge on whether groomed snowmobile routes have altered bison behavior and distribution.

1.2 Overview of Wildlife - Winter Use Monitoring

To address these uncertainties, the National Park Service in Yellowstone has both monitored bison movements in winter and commissioned an extensive review of the available data on bison movement ecology in Yellowstone. This section discusses the winter monitoring, while the next section discusses the report by Cormack Gates, Ph.D.

Since 1999, Yellowstone National Park (YNP) has monitored the behavioral responses of bison (*Bison bison*), elk (*Cervus elaphus*), and trumpeter swans (*Olor buccinator*) to motorized winter recreation by repeatedly surveying seven groomed or plowed road segments in Yellowstone National Park. During December 2004 through March 2005, >2,100 interactions between vehicles and wildlife groups were sampled, and multinomial logits models were used to identify conditions leading to behavioral responses (White et al. 2005). Responses by these wildlife species to over-snow vehicles were short in

duration, and of minor to moderate intensity, with >81% categorized as no apparent response or look/resume activities, 9% attention/alarm, 7% travel, and 3% flight or defense. Analyses of similar data collected during 1999-2004 indicated the likelihood of active responses by wildlife increased significantly if (1) wildlife were on or near roads, (2) more vehicles were in a group, (3) wildlife groups were smaller, (4) ungulates were in meadows instead of forest or geothermal habitats, (5) interaction times increased, (6) wildlife were traveling instead of resting, and (7) humans dismounted vehicles and/or approached wildlife. The likelihood of an active response by bison or elk decreased as cumulative visitation increased, suggesting that these ungulates habituated somewhat to motorized recreation. There was no evidence of population-level effects to ungulates from motorized winter use because estimates of abundance either increased or remained relatively stable during three decades of motorized recreation prior to wolf colonization in 1998. Thus, White et al. (2005) suggest that the likelihood of active responses by wildlife can be diminished by (1) restricting travel to predictable routes and times, (2) reducing the number of vehicles in groups, (3) reducing the number and length of stops to observe wildlife, (4) stopping vehicles at distances >100 meters, and (5) preventing human activities away from vehicles.

1.3 Overview of the Gates Report

Yellowstone National Park also commissioned an extensive analysis of the available data on bison movement ecology at the park. To ensure that the analysis was removed from the local politics surrounding the park, Yellowstone National Park appointed as principal investigators respected Canadian wildlife biologists Drs. Cormack Gates and Brad Stelfox. Together with several of their colleagues from the University of Calgary, Gates and Stelfox conducted the study resulting in the April 2005 report "The Ecology of Bison Movements and Distribution in and Beyond Yellowstone National Park: A Critical Review with Implications for Winter Use and Transboundary Population Management" (Gates 2005, colloquially referred to as "the Gates Report").

The Gates Report represents an interdisciplinary approach combining a review of published and unpublished literature on ungulate movement ecology at Yellowstone National Park and elsewhere, interviews with "key informants" versed in the ecological and social aspects of the controversy, and development of a systems model to simulate the effects of various mid-winter scenarios upon bison distribution.

As the Gates Report notes:

> "Yellowstone National Park is the only area in the lower 48 states where bison have existed in a wild state since prehistoric times. Bison occupied the region encompassing the park from shortly after recession of the last glaciers 10,000 to 12,000 years ago, until they were nearly extirpated by market and subsistence hunting, and poaching by 1900. Yellowstone National Park is not a self contained

> ecosystem, covering only 8,983 km^2 or slightly more than 10% of the Greater Yellowstone Ecosystem (80,503 km^2).
>
> Distribution, movements and population dynamics of large mammal populations need to be viewed at spatial scales significantly larger than Yellowstone National Park itself in the context of historic spatial patterns, habitat composition, and landscape configuration and connectivity. Also, ecological processes play out over many decades so the consequences of some management actions may not be fully comprehended at shorter time scales."

The report concludes that bison in Yellowstone National Park attempt to compensate for declining per capita food resources with range expansion, thereby maintaining a relatively stable instantaneous density. These range expansions emanate from the Park's five key bison winter ranges:

> "…The central bison herd uses Pelican Valley (55 km^2), Mary Mountain (e.g. Hayden/Madison-Firehole, 152 km^2), and West Yellowstone (80 km^2). The northern herd occupies Lamar Valley (234 km^2), and Gardiner basin (98 km^2). These ranges are connected by five primary movement corridors including Firehole-to-Mammoth (59 km), Firehole to West Yellowstone (21 km), Gardiner basin to Lamar (river route 15.2 km; road route 11.4 km), Mirror Plateau (Pelican to Lamar, 30 km), and the shortest corridor Pelican to Hayden (8 km). Range expansion at Yellowstone National Park has been gradual, rather than pulsed as described for another erupting bison population in northern Canada. Learning the presence of destination habitat (familiar areas) has likely played a significant role in the development of calculated migration and increasingly fluid movements of bison between ranges.
>
> Since the early 1990s Central Range bison have migrated in increasing numbers north to Blacktail Deer Plateau and the Gardiner basin in winter using a new route associated with the road allowance between Madison Junction and Mammoth. Inter-range movements of bison should not generally be constrained by winter snowpack in non-road grooming scenarios during most winters. The notable exception to this rule is thought to be the Firehole-Mammoth corridor that may serve as a barrier during all non-road grooming scenarios." (Gates et al. 2005)

The Gates Report also notes that the population dynamics of many of the Park's ungulate species entail spatial use across its boundaries. Although a majority of historical migration routes for bison, elk, and pronghorn have been eradicated by increasing anthropogenic impacts in the last century (Berger 2004), ungulate migrations continue to persist in response to seasonal variability in forage quality and availability.A combination of factors is believed to affect limitations in forage which drive density-dependent range expansion and transboundary movements by bison in the winter. These include previous summer precipitation, snowpack conditions, and herbivore density (i.e., forage demand).

The report also explains that bison at Yellowstone National Park occur in two subpopulations – the northern and central herds – each defined and named by their primary wintering grounds. Both the Northern and Central Ranges are characterized by large areas of continuous habitat connected by movement corridors through forested areas with patches of suitable forage. However, the northern range contains a significant amount of lower elevation winter range. The snowpack on the northern range is generally shallower at similar elevations to central interior ranges. Also, the central ranges are generally flatter, so the northern range has a greater amount of south facing slopes that reduce snow accumulations even further. Conversely, the Central ranges receive much deeper and more persistent snowpacks, and contain a higher proportion of geothermally-influenced areas that also act as winter refuge/foraging areas.

Bison from the Central ranges began to establish a pattern of movement to the Gardiner Basin winter range beginning in the late 1980's and early 1990's (Taper and Meagher 2000 as presented in the Gates report). The Gates Report states that bison appear to travel on roads during winter where they coincide with natural corridors defined primarily by terrain, and to some degree by habitat features. Bison appear to make calculated migratory movements to boundary winter ranges based on acquired knowledge of the landscape. Some individuals consistently use the same winter ranges while others change from year to year. It was suggested by Gates et al that the Madison Junction to Mammoth Hot Springs corridor does *not* align with a pre-existing, natural corridor for bison: "The calculated migration of Central Range bison to the Northern Range would likely not have developed in the absence of the groomed road between Madison Junction and Mammoth" (Gates 2005:ix).

The systems model used in the Gates Report simulates the effects of different ecological scenarios and management actions upon bison population size and movements in mid-winter. To serve as a basis for the model's development, the authors outlined the postulated drivers of the system in a graphical representation called an Impact Hypothesis Diagram (IHD). The authors then organized a series of workshops, employing the Delphi process, in which key informants ranked the importance of each variable in the IHD. These weights were then combined into indices of corridor permeability that were determined for both road grooming and non-grooming scenarios over a 100-year simulation period. Three models from the workshops were used to compose a "majority average model".

Although the majority average model predicted that winter bison movements would be maintained in three of the four primary corridors in the absence of road grooming, it suggested the corridor from Madison Junction to Mammoth to be effectively impermeable in many winters without road grooming. This reflects a majority opinion among the key informants that bison would be unable to penetrate accumulated snowpack on an ungroomed road along the 6-km length of Gibbon Canyon. As the Gates Report states, "The road segment through the Gibbon Canyon is the single area in the park where

snow cover in combination with steep terrain may deter bison movements in the absence of grooming and snow compaction by over snow vehicles" (Gates 2005:253). Given that the herd now has knowledge of the northern range as a destination, however, not all are convinced that the canyon represents an absolute barrier in non-grooming scenarios. Some key informants to the Gates Report (2005) believed that if bison began packing a trail through the canyon in early winter, they could maintain the passage through the season without grooming and in spite of increasing snowpack. Other informants speculated that bison may be able to pass through the canyon along areas where geothermal activity reduces snow accumulation. A third contention is that a power line running 1-km east of the road may provide bison with a viable, alternative passage through the canyon.

Given this uncertainty, the extensive northward movements of bison from the central herd in certain years, and the likelihood of lethal management actions for individuals that cross the northern boundary, the Gates Report recommends that "An adaptive management experiment should be designed to test permeability of the Firehole-to-Mammoth corridor under varible [*sic*] snow conditions, with a specific focus on the road section between the Madison Administrative Area and Norris Junction." More specifically, the experiment should "… test the hypothesis that the Central population's movement to the Northern Range is possible only with grooming of the snow pack on the road, in particularly in the Gibbon Canyon." Such an experiment should be designed to "test the effectiveness of unaltered snow pack as a barrier to winter movements between the Central and Northern Ranges in relation to varying environmental conditions including forage production, winter severity, and population size" (all quotes from Gates 2005:253).

1.4 Workshop Rationale

Acting upon the recommendation described above, the National Park Service invited the Big Sky Institute at Montana State University to organize a two-day workshop to evaluate the assertion that the Firehole-Mammoth corridor serves as a barrier to bison movements between the Central and Northern winter ranges during non-road grooming scenarios. The workshop had the objective of identifying, through a coarse-filter analysis, a focal suite of hypothesis-driven questions to serve as a foundation for research and management experiments that can be practicably implemented. Held January 18-19, 2006 at the YNP Heritage Research Center in Gardiner, Montana, the workshop involved a wide array of bison researchers and biologists (see Appendix B). The outcomes of the workshop will be used to inform the development of alternatives being considered by the ongoing winter use planning effort for Yellowstone NP, Grand Teton NP, and John D. Rockefeller, Jr. Memorial Parkway, and may subsequently serve as the basis for a "Request For Proposals" to conduct research and management experiments addressing this issue.

2.0 IMPACT HYPOTHESIS DIAGRAM

2.1 Heuristic Problem Statement

During day one of the workshop, participants identified three initial heuristic uncertainty statements including:

- There is uncertainty about the role of mechanical snow compaction on the maintenance of established winter migration in the Madison to Mammoth movement corridor.
- There is uncertainty about the role of mechanical snow compaction on movement pathway selection by bison.
- There is uncertainty about the mechanisms underlying winter movements of bison, including late winter/early spring initiation of forage growth.

The majority of workshop participants concluded that the key Gates Report adaptive management experiment recommendation (see Section 1.3 above) should underpin the following overarching heuristic problem statement to guide the remainder of the workshop:

> *There is uncertainty about the role of mechanical snow compaction on the maintenance of established bison winter migration in the Madison to Mammoth movement corridor.*

2.2 What is an Impact Hypothesis Diagram?

An Impact Hypothesis Diagram (IHD) is a conceptual graphical model that illustrates how the physiographic, ecological, and/or anthropogenic factors in a system interact and influence the likelihood of a resulting environmental action (in this case inter-range winter bison movements in Yellowstone). The IHD developed during this workshop includes 43 ecosystem variables classified as Relative Constraints, Natural Variation, and Management Levers. Connecting linkages between variables are represented as arrows and were classified as Direct Influences or Feedback Loops. To translate an IHD into a quantitative model, each arrow between variables in the IHD would be defined mathematically through weighting and/or as based on empirical relationships acquired from the relevant literature (see Gates 2005). This workshop did not attempt to translate the conceptual IHD into a quantitative model.

2.3 Impact Hypothesis Diagram for the Madison Junction to Mammoth Corridor

The IHD for winter bison movement in the Madison Junction to Mammoth Hot Springs Corridor is shown in Figure 1. This IHD shows the many factors that workshop participants believe underpin movement by bison from Yellowstone's Central Interior to other winter ranges. The

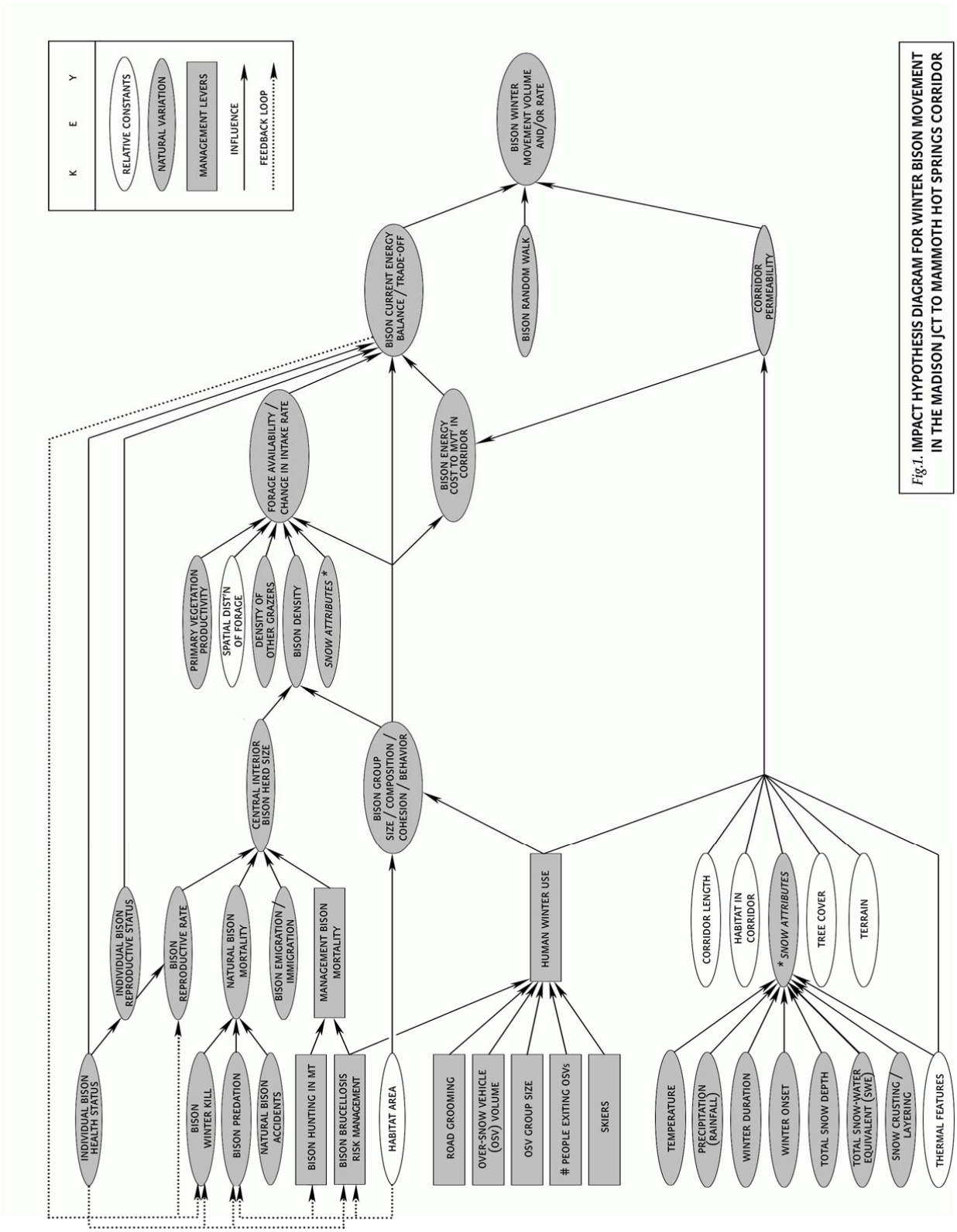

Fig.1. **IMPACT HYPOTHESIS DIAGRAM FOR WINTER BISON MOVEMENT IN THE MADISON JCT TO MAMMOTH HOT SPRINGS CORRIDOR**

scoping of IHD variables was begun on the first day of the workshop, and the graphical IHD was developed with the input of all participants in the second day of the workshop.

In general, there are four primary clusters of IHD elements that underpin winter bison movement from the Central Interior winter ranges:

1) *Central Interior Bison Herd Size* - In the upper left section of the IHD are those biophysical factors and managerial actions which affect the herd's size. The biophysical factors primarily cascade to the balance between reproduction and natural mortality, with emigration and immigration playing an important role as well. The primary management action (i.e. human action) affecting this herd's size at present is brucellosis risk management at the park boundary.

2) *Bison Energetics* - Central herd size is in turn one of many factors influencing the second grouping, the various energetic components in the upper right section of the IHD. When bison decide to undertake winter movement, they are effectively deciding that the cost of movement—not an inconsequential cost, given the depths of snow in Yellowstone in winter—will be balanced by the returns. That balance depends on a host of other factors: the individual animal's health and reproductive status; forage availability (which is a function of the herd's size and several other factors, including primary production); bison group size, cohesion, and behavior; and the cost of actual movement in a snow-covered landscape. Simply put, when the animal perceives that a distant foraging area offers greater energy returns than its current situation combined with the cost of moving, it is likely to undertake the movement.

3) *Human Use* - The next cluster of movement factors comprise the various human uses of the Madison to Mammoth area, shown in the middle left portion of the diagram. Winter human use includes the various forms of recreation which people enjoy in the Yellowstone area, along with the supporting activities for such recreation (such as snowmobile trail grooming), and characteristics of such activities (such as the size of snowmobile and/or skier groups). Winter human use can affect both bison group characteristics as well as the permeability (to bison) of the movement corridor.

4) *Edaphic Variables* - Finally, a number of physical and geographic factors influence bison movement, and are shown in the bottom left portion of the IHD. Such things as snow attributes (themselves a factor of many different winter weather phenomena) and relative geographical constants like tree cover, thermal feature distribution, and corridor length are all factors influencing the corridor's permeability to bison movement.

Winter bison movement, then, is a function of many different human and biophysical

factors. Workshop participants also recommended inclusion of a variable called "random walk." This is a placeholder to account for the unpredictable, such as the natural bison tendency to explore, as well as other unaccountable factors. As suggested by the IHD, human activities are factors in two of the four primary clusters of drivers of bison movement. However, human activities dominate only one of those clusters. Moreover, road grooming for oversnow vehicle travel, the specific subject of much litigation, is only one of many human activities influencing bison movement. The relative importance of grooming within the context of the many human activities taking place in and around Yellowstone is, at this time, extremely difficult to quantify, as is the relative importance of all other such human activities compared to the importance of ecological or physiographic influences.

3.0 HYPOTHESIS DRIVEN QUESTIONS

3.1 Overarching Working Hypothesis Statement

An established tenet of modern science is that a good hypothesis must include:

- A *response variable* (a variable that may alter in response to a changing situation),
- An *action* (causing the variable to change),
- A *mechanism* (an explanation of why the change will cause a response), and
- The *actual response* (the change in behavior one expects to see if the variable is changed).

Utilizing the overarching problem statement presented in Section 2.1 above, the majority of workshop participants suggested the following overarching working hypothesis:

> *With termination of a groomed over snow road surface, the cumulative ecological costs of bison movement from the Central Range to the Northern Range would exceed the advantage of doing so and winter movements along the Madison to Mammoth road corridor would significantly decline*.

In this overarching working hypothesis:

- The *response variable(s)* can be one or more of the elements displayed in the IHD that yield the cumulative ecological costs of bison movement (do they, or do they not, underpin bison movement from the Central Range to the Northern Range?)
- The *action* to be studied is the termination of road grooming, and whether that causes a response among bison.
- The *mechanism* to explain the change in behavior is that the cumulative ecological costs of movement would then become too high relative to the gains to be acquired.
- Finally, the *actual response* is that bison movements along this road corridor would vary (continue without change, increase, decrease, or cease altogether).

3.2 Hypothesis Driven Questions

Workshop participants also developed the following list of questions driven by the above overarching working hypothesis:

- Will instantaneous bison movement volume and rates increase as per capita forage intake rate declines?
- If road grooming were stopped, would the energetic costs of bison movement exceed its benefits, bison nutritional condition decline, bison fecundity decline, and/or the rate of bison population growth decline?
- If road grooming were stopped, would bison select alternate pathways to the same destination?
- If bison do not move to the north, will their movement rates to the west change, resulting in either an increase in the Central Yellowstone bison population density or an increase in management control operations on the west boundary?
- If the Mammoth to Madison (or Madison to Norris) roads are closed to public travel, would over-snow vehicle travel shift to other road sections, and, if so, would there be increased visitor-wildlife interactions in those areas (assuming the same level of permitted use)?
- In the absence of road grooming, will bison movement rates be proportional to snow conditions, and is there a maximum depth of snow (or snow water equivalent) that will stop movement?
- If road grooming stopped, would bison continue to use the same pathway, maintaining it at their own energetic expense?
- In years with early forage senescence and constant population size, will more bison move because senescence results in a drop in the energy available to bison from the forage?
- Does bison nutritional status before winter influence their movement during winter?
- During years with lower water supplies due to drought, will bison physiological condition be reduced, making more individuals likely to move north along the road corridor?
- Will heavy snow crusting reduce forage availability and also drive bison movement?
- Could physical barriers increase the energetic cost of bison movement from the Central Interior to the Northern Range during periods with high snow?

Big Sky Institute, P.O. Box 173490, Montana State University, Bozeman, MT 59717
Phone: (406) 994-2374 | Website: http://bsi.montana.edu

4.0 MANAGEMENT EFFECTS STUDIES

4.1 Majority Report

Workshop participants reached a consensus that management effects studies are warranted to address the overarching working hypothesis presented in Section 3.1 above. Indeed, this action was previously proposed. Readers are referred to a settlement agreement approved on October 27, 1997 in Washington D.C. federal court that called for the NPS to prepare an environmental assessment evaluating the closure of groomed road segments in YNP to study the effects of groomed roads on bison movements. The agency completed an environmental assessment in November 1997 evaluating options for temporary closures of sections of the road system in winter including the section identified here (NPS 1997).

4.1.1 Adaptive Management Experiments

A passive adaptive management experiment[3] herein could evaluate the effectiveness of unaltered snow as a barrier to winter movements between the Central and Northern Ranges in relation to known and varying environmental conditions including forage production, winter severity, and population size. The workshop group felt that the primary prediction is that in the absence of grooming, bison movement rates will be proportional to snow conditions, and there exists a snow water equivalent (SWE) maximum that would completely stop bison movement.

The majority of workshop participants agreed that the most effective approach would be to cease grooming on part or all of Madison to Mammoth corridor ("part" could be the road section from Madison Housing Area to Norris Junction; workshop participants did not reach resolution over whether the entire Mammoth to Madison road segment should be closed or just the section from Madison Housing Area to Norris Junction) and to measure bison responses and predictor variables (e.g., snow conditions).

In summary, the majority report included the following key recommendations:

1. The proposed adaptive management experiment should include cessation or modification of over snow grooming on part or all of Madison Junction to Mammoth corridor and measure response variables and actual responses to increase understanding of management effects that may underpin bison movement.

2. The proposed adaptive management experiment should utilize historic data on bison movement to account for a pre-treatment baseline.

[3] As used here, a *passive* adaptive management experiment is one whereby conclusions could not be made regarding mechanisms for changes in state, in contrast to an *active* management experiment in studies are designed to interpret mechanisms that underlie changes and evaluate their outcomes against objectives.

3. Potential modifications of current road grooming practices could include delayed onset of over-snow grooming to test if bison will push through un-groomed snow, novel grooming patterns or techniques of new routes to test if bison will follow an alternative groomed surface, and/or alternative grooming from Norris to Mammoth to permit limited administrative travel only.

4. Multi-year research is required to encompass variability in the system and provide replications. There is no one-year management experiment solution.

5. The proposed adaptive management experiment should be paired with new research to determine what un-groomed snow attributes (e.g. depth, SWE, crusting, layering) may limit or prevent bison movement. Possible directions for new research could include manipulative experiments, observational research, analysis of existing data, simulation modeling (including energetics), passive adaptive management, and active adaptive management. This new research should include long-term studies to evaluate what size of winter storm imposes limits on bison movement, artificial snow treatment (to allow replicates), and backtracking studies (e.g. across variable snow conditions, forage availability, group size and type, physical conditions).

6. The park should utilize existing data (including pending research publications on bison movement ecology from Dr. Robert Garrott's team at Montana State University—note that these publications were not available for consideration at this workshop) and new research recommended herein, to translate the conceptual IHD developed at the workshop (e.g. developed specifically for the Madison Junction to Mammoth Corridor) into a quantitative model.

The proposed adaptive management experiment does not have a control area against which observational data can be compared. Consequently, the temporal change of terminating grooming can only provide observational data of a weak inferential nature to tell managers whether the advent of road grooming in the early 1970s has indeed altered bison distributions and migrations in Yellowstone (Green 1979).

4.1.2 Control Experiments

A second proposed set of experiments could use controlled environments to determine the maximum snow threshold for bison movements—that depth and density of snow that turns bison away from a desired path. It would then be possible to determine whether the Madison-Mammoth corridor ever receives such snow thresholds. If this corridor does, these controlled experiments would suggest that, once these snow conditions are reached and assuming the bison

do not already have trail systems in place through the corridor, they would not be able to use this movement corridor in the absence of grooming. Conversely, if this corridor rarely or never receives such thresholds, such experiments would suggest that the termination of road grooming would not result in a decline in bison movements on this pathway—that bison would be able to pack and maintain their own trails on or parallel to this road corridor. In either case, actual termination of road grooming would be necessary for assessment of the impact of snow thresholds on the permeability of this corridor to bison movement.

The majority report included the following proposals for the design of a control experiment:

1. One study design could include a two-phased study. In the first phase, an artificial snow treatment would be employed (to allow replicates) along this road corridor or elsewhere to determine the depth and/or density of snow (SWE) at which bison movement is deterred. The second phase would then examine historical data on snow conditions and their variability, forage availability, group size and type, and physical condition to see if conditions resembling the artificial snow treatments have occurred in the past on this road section.

2. An alternative study design may be possible given current and impending road construction in the Gibbon Canyon. The National Park Service rebuilt the road from Madison Junction to Norris Junction a few years ago, except for a small portion around Gibbon Falls. There, the NPS plans to build a new road parallel to the old one, but on the canyon rim. The old road will be removed. Currently, part of the new, 1.5-mile-long road is in place (a section about a mile long, beginning north of Gibbon Falls), but a bridge over the Gibbon River remains to be constructed, along with about a half-mile of new road around Gibbon Falls itself. It may be possible, depending on the schedule of road construction, to erect a temporary gate at the new bridge to make the new road alignment more difficult for bison to access from the south. The old road alignment, familiar to bison, would not be groomed, while the new one would be. If such a gate is possible, it could test whether bison would maintain their familiar route on the old road alignment (un-groomed by people, but familiar to bison), would stop using the canyon altogether (because a snow threshold precludes such movement and the gate prevents them from learning that a new route is available), or whether they would merely go around the gate (such as by fording the river and climbing the bluffs on either side of the north bridge abutment) and on to the new groomed route (hypothetically more attractive to them, but not familiar to them). For this design to be effective, a snow pack (preferably near normal) would need to be present when the gate was closed.

Note that while there could be other controlled experiments, only the above two were recommended by the majority of workshop participants.

4.2 Minority Report

One member of the workshop presented a considerably different management experiment that was generally acknowledged as infeasible. That member suggested that the NPS strongly reduce the combined Northern and Central Range Yellowstone bison population with concomitant termination of over-snow road grooming on the Madison to Norris road section (but preferably throughout the park, with the possible exception of the road from Old Faithful to the South Entrance only). Once these actions were accomplished, it was predicted that the bison population size and distribution would fluctuate naturally in the absence of human perturbation. It was predicted by that workshop participant that these actions would erase the bison memory of the groomed road corridors and allow bison to forage, move, and reproduce as naturally as possible, without the presumed artificiality of the Madison to Mammoth groomed road corridor.

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Appendix A: Workshop Agenda ***(as planned; the actual proceedings varied in sequence but not in content.)***

January 18 -	Wednesday
8:30AM	Welcome – Glenn Plumb
8:40-9:00	Winter Use Planning Overview – Mike Yochim
9:00-9:30	Overview of 2005 "Gates" Report – Cormack Gates
9:30-10:00	Overview of recent GPS bison movement data – Rick Wallen
10:00 – Noon	Group Discussion: Develop an Impact Hypothesis Diagram scaled to the Firehole to Mammoth corridor with a specific focus on the road section between the Madison Administrative Area and Norris Junction - Facilitated by Cormack Gates
Noon – 1PM	Catered Lunch at HRC and informal discussion
1:00-2:00	Group Discussion (Continued): Impact Hypothesis Diagram - Facilitated by Cormack Gates
2:00-4:30	Group Discussion: Identify Hypothesis Driven Questions - Facilitated by P.J. White
January 19 -	Thursday
8:30AM	Welcome – Glenn Plumb
8:40-10:00	Group Discussion (Continued): Hypothesis Driven Questions - Facilitated by P.J. White
10:00-Noon	Group Discussion: Identify Potential Research and Management Experiments - Facilitated by Kathy Tonnessen
Noon – 1PM	Catered lunch at HRC and informal discussion
1PM-4PM	Group Discussion: Finalize and Recommend Hypotheses, Research, and Management Experiments - Facilitated by Glenn Plumb

Appendix B: Workshop Attendees and Email Contact

Workshop Organizing Committee:

Lisa Graumlich (Big Sky Institute); lisa@montana.edu
Aaron Jones (Big Sky Institute); aaronjones@montana.edu
Glenn Plumb (Yellowstone National Park); glenn_plumb@nps.gov
Kathy Tonnessen (Rocky Mountain CESU); kathy_tonnessen@nps.gov
Mike Yochim (Yellowstone National Park); mike_yochim@nps.gov

Workshop Recorder:

Julia Nelson (Montana State University); juls_nelson@yahoo.com

Workshop Participants:

Keith Aune (Montana Fish, Wildlife and Parks); kaune@mt.gov
John Borkowski (Montana State University); jobo@math.montana.edu
Mike Coughenour (Colorado State University); mikec@nrel.colostate.edu
Bob Garrott (Montana State University); rgarrott@montana.edu
Cormack Gates (University of Calgary); ccgates@nucleus.com
Amy McNamara (Greater Yellowstone Coalition); amcnamara@greateryellowstone.org
Mary Meagher (Yellowstone National Park - retired); mmmeagher@aol.com
Tom Olliff (Yellowstone National Park); tom_olliff@nps.gov
Dan Reinhart (Yellowstone National Park); dan_reinhart@nps.gov
DJ Schubert (Animal Welfare Institute); schubertaz@comcast.net; dj@awionling.org
Rick Wallen (Yellowstone National Park); rick_wallen@nps.gov
PJ White (Yellowstone National Park); pj_white@nps.gov

Invited individuals unable to attend:

Jason Bruggeman (Montana State University); jbruggeman@backpacker.com
Troy Davis (Yellowstone National Park); troy_davis@nps.gov
Sarah Dewey (Grand Teton National Park); sarah_dewey@nps.gov
Peter Gogan (USGS-Biological Resources Division); peter_gogan@usgs.gov
Dave Klein (University of Alaska); ffdrk@uaf.edu
Tim Reid (Yellowstone National Park); tim_reid@nps.gov

Appendix C. List of Workshop Administrative Record Resources.

Nelson, J. 2006. Written transcript of "Bison, Snow and Winter Use: A Stakeholder Workshop to Identify Potential Winter Use Management Experiments for the Road Corridor Between Madison Junction to Mammoth Hot Springs, January 18-19, 2006." 35 pp. On file at the Yellowstone National Park Management Assistant Office, Mammoth Hot Springs, WY, 82190.

NPS. 2006. Rocky Mountain Cooperative Ecosystem Studies Unit Task Agreement entitled "Winter Use Management – Bison Workshop." On file at the Yellowstone National Park Management Assistant Office, Mammoth Hot Springs, WY, 82190.

Gates, C. 2006. PowerPoint presentation entitled "The ecology of bison movements and distribution in and beyond Yellowstone National Park: A critical review with implications for winter use and transboundary population management." Presented at "Bison, Snow and Winter Use: A Stakeholder Workshop to Identify Potential Winter Use Management Experiments for the Road Corridor Between Madison Junction to Mammoth Hot Springs, January 18-19, 2006." On file at the Yellowstone National Park Management Assistant Office, Mammoth Hot Springs, WY, 82190.

Gates, C. 2006. PowerPoint presentation entitled "Hypotheses, Recommendations, and Predictions." Presented at "Bison, Snow and Winter Use: A Stakeholder Workshop to Identify Potential Winter Use Management Experiments for the Road Corridor Between Madison Junction to Mammoth Hot Springs, January 18-19, 2006." On file at the Yellowstone National Park Management Assistant Office, Mammoth Hot Springs, WY, 82190.

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Yochim, M. 2006. PowerPoint presentation entitled "Winter Use Planning at Yellowstone and Grand Teton National Parks." Presented at "Bison, Snow and Winter Use: A Stakeholder Workshop to Identify Potential Winter Use Management Experiments for the Road Corridor Between Madison Junction to Mammoth Hot Springs, January 18-19, 2006." On file at the Yellowstone National Park Management Assistant Office, Mammoth Hot Springs, WY, 82190.