ENVIRONMENTAL ASSESSMENT

FOR

PERMANENT CLOSURE OF THE FORMER MOUNT MCKINLEY NATIONAL PARK TO SNOWMOBILE USE

United States Department of the Interior
National Park Service
Denali National Park and Preserve

November 9, 1999

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PURPOSE AND NEED

The National Park Service (NPS) is proposing a special regulation to permanently close to the use of snowmobiles the part of Denali National Park and Preserve known as the former Mount McKinley National Park (old park). Section 1110(a) of the Alaska National Interest Lands Conservation Act (ANILCA) opens all conservation system units in Alaska to snowmobile use for "traditional activities." The NPS contends that no "traditional activities," such as hunting, trapping, berry picking, or fishing, occurred in the old park prior to ANILCA or were logically connected to snowmobile use. The closure to snowmobile use within the old park would be consistent with the park's long-standing management strategy for this area of the park and preserve. This regulation would provide an enforceable mechanism to prevent snowmobile use in that area in order to protect and preserve the resource values of the old park, including its wildlife, wildlife habitat, wilderness, and other natural resources. And, it would strengthen park's ability to manage the area to provide opportunities for solitude and non-motorized winter activities within this area.

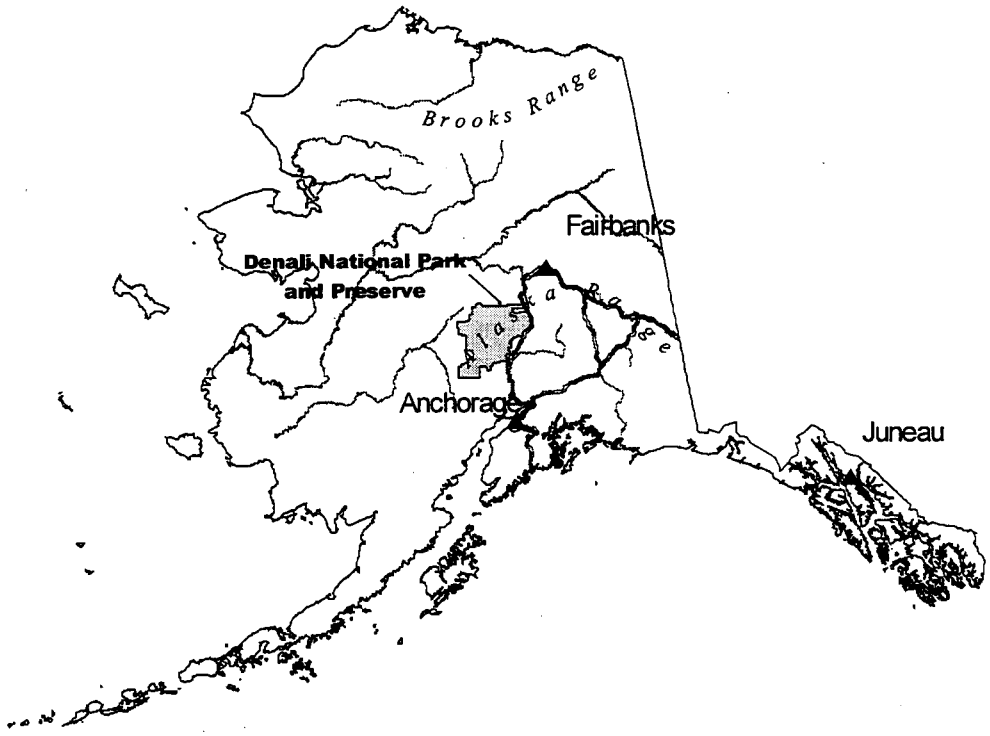
One of the primary purposes of establishing Denali National Park and Preserve was to provide protection for wildlife and habitat. Since 1917, when Mount McKinley National Park was established, NPS has managed the old park as a wildlife refuge, promoting minimal disturbance of natural wildlife conditions while developing opportunities for wildlife viewing and other recreation activities.

In 1980, with the enactment of ANILCA, Congress expanded Mount McKinley National Park by adding approximately 2.4 million acres of public lands, established some 1.3 million acres of public lands as a preserve, and redesignated the combined areas as Denali National Park and Preserve. The legislative history of ANILCA directed that the old park was "intended to be [a] large sanctuar[y] where fish and wildlife may roam freely, developing their social structures and evolving over long periods of time as nearly as possible without the changes that extensive human activities would cause." (Report of the Senate Committee on Energy and Natural Resources, Report No. 96-413, p.137) The proposed snowmobile use closure applies to the approximately two-million-acre pre-ANILCA portion of Denali National Park and Preserve known as the old park.

The old park historically has been managed for non-motorized winter recreation such as dog mushing, snowshoeing, and cross-country skiing. No history of authorized general public snowmobile use for any activity had been established in the old park and, prior to the passage of ANILCA, the old park was closed to snowmobiles. Enactment of ANILCA left this general prohibition of snowmobile use in the old park area intact unless the snowmobile use was for the purpose of conducting a "traditional activity" [Sec. 1110(a)]. Snowmobile use unconnected with a "traditional activity" did not fall within the terms of Section 1110(a) and, thus, remained prohibited in the old park. However, the NPS has not promulgated a regulatory definition for "traditional activities."

Alaska and Denali National Park and Preserve

Figure 1



Roads

National Park Service
Denali National Park and Preserve
GIS

100 0 100 200 300 400 Miles

1 : 15,746,100 1 inch = 248.52 miles

The definition of "traditional activity" in the proposed rule (Appendix B) is:

> The term traditional activity means an activity that generally and lawfully occurred in a unit or geographically defined area of a unit prior to enactment of ANILCA and that was typically associated with that region as an integral and established part of a utilitarian Alaska lifestyle or cultural pattern.

In applying this definition to the old park, the NPS is unable to identify any specific traditional winter activities. The examples of traditional activities identified in the House and Senate Committee reports are subsistence and sport hunting, trapping, fishing, and berry picking. Sport and subsistence hunting, trapping, and other subsistence uses were historically prohibited in the old park. No general use of fishing or berry picking has taken place in the winter.

Technological advances have enabled snowmobilers to reach and, recently, enter some corridors in the old park in a limited number of drainages on the south side of the Alaska Range. In fact, over the past 6 years, numerous incursions into the old park have occurred, particularly in these drainages. Lack of a clear definition of traditional activities, along with improved technology and increased snowmobile use, could result in detrimental effects on the resources and values of the old park and could compromise the ability of the park to manage this area of the park and preserve for the purposes prescribed in law.

The proposed permanent closure would not affect the park and preserve's approximately four-million-acre ANILCA additions, where snowmobile use is permitted for traditional activities, and for travel to and from villages and homesites, subject to reasonable regulations. This proposed permanent closure would follow a 12-month temporary closure of most of the old park instituted in February 1999. The temporary closure was based on a finding of detriment to resource values from the use of snowmobiles.

This environmental assessment (EA) addresses that portion of the proposed regulations not already addressed in other environmental documents, namely the proposed permanent closure of the old park to snowmobile use. It evaluates the potential environmental impacts of the proposed closure along with three alternatives. This EA has been prepared in accordance with NEPA and regulations of the Council on Environmental Quality (40 CFR 1508.9).

BACKGROUND

Statutory Authorities and Policy Obligations: The NPS Organic Act and ANILCA

In 1917 Congress established Mount McKinley National Park to "set apart as a public park for the benefit and enjoyment of the people . . . for recreation purposes by the public and for the preservation of animals, birds, and fish and for the preservation of the natural curiosities and scenic beauties thereof . . . said park shall be, and is hereby established as a game refuge". (39 Stat 938). The establishment of the area was meant to prevent damage from new types and levels of use brought on by rapid changes in technology and access. Additions to the park were made in 1922 and 1932 to provide increased protection for park values and, in particular, wildlife. Since

1917, the park has been managed pursuant to the NPS Organic Act of 1916 and subsequent amendments.

The NPS Organic Act directed the Secretary of the Interior and NPS to manage national parks and monuments to "conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations." (16 U.S.C. 1.) The Organic Act also granted the Secretary the authority to implement "rules and regulations as he may deem necessary or proper for the use and management of the parks, monuments and reservations under the jurisdiction of the National Park Service." (16 U.S.C. 3.) In 1978, amendments to the NPS Organic Act expressly articulated the role of the national park system in an effort to ensure ecosystem protection. The amendments further enforced the primary mandate of preservation by stating: "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, except as may have been or shall be directly and specifically provided for by Congress." (16 U.S.C. 1-a1.) In meeting its responsibilities under the Organic Act, NPS need not wait for actual damage to occur before taking protective action to prevent degradation to wildlife and other natural resources [Wilkins v Department of the Interior, 995 F.2d 850, 853 (8th Cir. 1993); New Mexico State Game Commission v Udall 410 F.2d 1197 (10th Cir. 1969).]

The NPS Management Policies (1988) interpret laws and regulations and guide decision making within park units. With regard to the spectrum of resources and values to be protected, the Management Policies state:

> "The individual parks contain various tangible natural and cultural features such as animals, plants, waters, geologic features, historic buildings and monuments, and archeological sites. They also have intangible qualities such as natural quiet, solitude, space, scenery, a sense of history, sounds of nature, and clear night skies that have received congressional recognition and are important components of people's enjoyment of parks. These *Management Policies* use the term resources and values to mean the full spectrum of tangible and intangible attributes for which parks have been established and are being managed." (NPS Management Policies, 1988, p.1:3)

With regard to implementing the "unimpaired" mandate of the Organic Act, the Management Policies state:

> "The word 'unimpaired' plays an important role in the conservation of resources and providing for present-day public enjoyment. Both physical resources, such as wildlife and geologic features, and intangible values, such as scenic vistas and solitude, may be impaired...It is NPS policy to treat potential impairments in the same manner as known impairments. When there is thought to be potential for resource impairment, actions will

be based on strategies that retain the resource in an unimpaired condition until such time as doubts are resolved." (NPS Management Policies, 1988, p.1:3-1:4)

In 1980, approximately 3.7 million acres of new park and preserve lands were added to Mount McKinley National Park through ANILCA, and the entire area was re-designated as Denali National Park and Preserve [ANILCA Sec. 202 (3) (a)]. Protection of wildlife, undisturbed ecosystems, and opportunities for wilderness recreation is specifically mentioned within the overarching purposes of ANILCA Section 101. The legislative history also states that certain NPS units in Alaska, including the old park portion of Denali National Park and Preserve, " . . . are intended to be large sanctuaries where fish and wildlife may roam freely, developing their social structures and evolving over long periods of time as nearly as possible without the changes that extensive human activities would cause." (Report of the Senate Committee on Energy and Natural Resources, Report No. 96-413, p.137.) The values of solitude and the challenge of remote wilderness also are specifically mentioned in the legislative history in connection with all national park units in Alaska. (Ibid., pp. 137-8.)

Virtually the entire old park (95%) was designated as wilderness by ANILCA. The term "wilderness" when used in ANILCA is meant to have the same meaning as its use in the Wilderness Act [ANILCA Sec. 102 (13)]. Except as otherwise expressly provided for in ANILCA, wilderness designated by ANILCA is to be administered in accordance with the Wilderness Act (ANILCA Sec. 707).

Section 203 of ANILCA directs that the new and re-designated units of the National Park System be administered pursuant to the Organic Act and its later amendments, subject to valid existing rights and, as appropriate, under section 1313 and the other applicable provisions of ANILCA.

Statutory and Regulatory Framework Specific to ANILCA Section 1110(a)
Prior to ANILCA, snowmobile use in Alaska national parks was permitted only at NPS's discretion, and snowmobile use was not allowed in the old park. Decisions on the allowance of snowmobile use were controlled by regulation and executive orders related to the administration of park areas under the Organic Act and its amendments or the Wilderness Act in areas where wilderness was designated. [Title 36 CFR, Part 2.18 (formerly 2.34) and Executive Orders 11644 and 11989] The use was not allowed unless specifically permitted. The agency discretion to treat snowmobile use as prohibited unless specifically allowed was superceded in ANILCA Section 1110(a), which applies to all conservation system units, including NPS administered areas. The methods of transport specifically mentioned in Section 1110(a) (i.e., for traditional activities) are snowmobiles, motorboats, airplanes, and non-motorized surface transportation methods. The legislative history indicates that the limitation of this particular area of agency discretion was a primary purpose of this section of ANILCA on special access (Report of the Senate Committee on Energy and Natural Resources, Report No. 96-413, p.248 and p.299.)

The language "notwithstanding any other provision of this Act, or other law…" allows certain provisions of Section 1110(a) to modify specific sections of the Wilderness Act that prohibit motorized use in designated wilderness. Section 1110(a) applies to all conservation system units,

including designated wilderness. The Department of the Interior has interpreted this to mean that Section 1110(a) applies to Denali wilderness areas and that no exception is granted for the old park (51 FR 31619, 31627, September 4, 1986). However, the Department of the Interior has acknowledged that the opening of the pre-ANILCA areas, including the Denali wilderness areas, was an inadvertent result of the legislation rather than an intentional action by Congress, and that this should be corrected. In a Department of the Interior news release dated April 6, 1983, Deputy Under Secretary of the Interior, William P. Horn, announced a proposal to close the pre-ANILCA NPS units to motorized use:

> Prior to ANILCA, the critical wildlife habitat and natural resource areas of the three units (Katmai, Glacier Bay, and Mount McKinley) were essentially closed to motorized access . . . Congress inadvertently opened these areas to this kind of use. By re-establishing the historical public use restrictions, the National Park Service seeks to correct the action and restore the historical level of resource protection.

Section 1110 (a) does not grant absolute access, however. The significant effect of Section 1110(a) is that snowmobile use is an authorized form of access for certain activities in ANILCA conservation system units. In wilderness, the use of snowmobiles is no longer subject to the earlier individual-oriented, wilderness pre-existing use type test. Rather, if the activity that the snowmobile is being used for is a traditional activity that generally occurred in the area prior to its designation as a unit, then the use of a snowmobile for that activity is allowed until specifically prohibited. (Report of the Senate Committee on Energy and Natural Resources, Report No. 96-413, p.248.)

No definition of the term "traditional activity" is provided in ANILCA. However, the legislative history of ANILCA lists four examples of traditional activities: subsistence and sport hunting, fishing, and berry picking. (Senate Committee on Energy and Natural Resources, Report No. 96-413, p.247-248.) Trapping also is referred to as a traditional activity in Senate Energy Committee mark-up (August 1, 1978, pgs. 56 & 62). Other discussions indicate that general recreation, absent of a connection to resource gathering, was not considered to be a traditional use. As far back as 1981, in the implementing regulations to ANILCA, NPS cautioned "[p]rospective snowmobile users [to] note that the legislative history of Section 1110(a) defines a traditional activity in terms of a use generally occurring in a park area prior to its designation." (46 FR 3184, June 17, 1981)

In 1986, the Department of the Interior promulgated 43 CFR 36.11 to implement Section 1110(a). Responding to comments suggesting that "traditional activities" should be defined, the Department stated:

> Because these regulations apply to a number of areas under the administrative jurisdiction of three agencies, it has been decided that it would be unwise, and perhaps impossible to develop a definition that would be appropriate for all areas under all circumstances. Exactly what "traditional activities" are must be decided on a case-by-case basis. Once the agencies have had the opportunity to review this question for each area under their

administration, it may be possible to specifically define "traditional activities" for each area. (51 FR 31627, September 4, 1986)

The NPS suggested a definition of "traditional activity" in the 1986 General Management Plan (GMP) for Denali National Park and Preserve (see p. 195). The old park was closed for many years to this activity by way of Superintendent's Orders (Compendium) based on an interpretation that recreational snowmobiling was not a traditional activity in the old park. (Compendium, Denali National Park and Preserve, May 8, 1997.) This interpretation was restated in the current temporary rule that also closed the area of the old park to traditional activities (Statement of Finding: Temporary Closure of the Former Mount McKinley National Park Area of Denali National Park and Preserve to the Use of Snowmobiles for Traditional Activities, February 3, 1999.)

Considering these examples in the context of the old park, NPS is unable to identify any specific traditional winter activities. Sport and subsistence hunting, trapping, and other subsistence uses were historically prohibited in the old park. No general use of fishing or berry picking has taken place in the winter.

In addition to authorizing the use of snowmobiles for traditional activities, Section 1110(a) of ANILCA also authorizes the use of snowmobiles "for travel to and from villages and homesites." The legislative history indicates that concern over the large size of the new units, which would overlay pre-existing activities and travel routes, prompted the inclusion of this provision. (Comments by Senator Stevens, p. 65-66, Senate Energy Committee mark-up, August 1, 1978.) The old park has no villages or homesites or other non-federal patented land within its boundary, does not effectively surround any villages or homesites and was never used as a snowmobile route to a village or homesite prior to ANILCA. In the 19 years since the passage of ANILCA, only one use under this provision is known to have occurred, when an individual unsuccessfully attempted to cross the old park to a Kantishna inholding. All homesites or villages outside the boundary of the old park (including Kantishna) have reasonable alternate routes for snowmobile access that have been used frequently for such access.

For snowmobiles, travel also is limited to periods of adequate snowcover or frozen river conditions. The objective of this requirement is to limit damage to resource values such as vegetation and soils. A suggested depth of "generally 6 to12 inches or more" is included in the regulations implementing Section 1110(a) [(43 CFR 36.11(a)(2)]. However, no specific standard for adequate snowcover has been established for Denali National Park and Preserve.

In addition to the aforementioned limitations, the use of a snowmobile is subject to reasonable regulations by the land manager to protect the "natural and other values" of the unit. The legislative history also reiterates the ability to regulate to protect the "values" of the area (Report of the Senate Committee on Energy and Natural Resources, Report No. 96-413, p.299). Section 1110(a) also contains a procedural requirement that must be met before a closure can take effect. A notice and hearing in the vicinity of the affected area is required, as well as the preparation of a finding that shows the use would be detrimental to the resource values of the unit or area. The

legislative history indicates that agencies retained the authority to completely close certain areas within a unit where it is necessary to protect the values of the unit (Report of the Senate Committee on Energy and Natural Resources, Report No. 96-413, p.299).

History of Snowmobile Use in Denali National Park and Preserve

The old park, which constitutes approximately one-third (2.2 million acres) of the land area of Denali National Park and Preserve, has been closed to snowmobile use by the general public. The winter use of mechanized equipment by the general public did not regularly occur in the old park from the time Mount McKinley National Park was established in 1917 to 1970, largely due to the remoteness of the area and the lack of dependable equipment. The park's administrative use of mechanized equipment in the winter for patrols and maintenance of facilities also was limited and was phased out by 1974 in favor of dog teams, the historic means of winter access in the park since its establishment. A concession contract for passenger and freight transport by dog team was developed in 1974, consistent with this historic means of winter access for the area. Current endorsement of the park's policy regarding winter access into the old park is manifested in three commercial dog sled tour businesses within the park, all of which depend on wilderness values for experiential aspects of their services.

In 1970 when snowmobile use became both a more common activity and a concern to park managers, the old park was closed to public snowmobile use under a nationwide regulation. From 1970 to 1980, illegal incursions into the old park by snowmobile users were sporadic and minimal. The NPS enforced the regulation by regular patrols, the posting of signs, visitor education, and issuance of violator warnings. As snowmobile technology evolved during the 1980's and early 1990's, more individuals began to use the lands in and near Denali National Park and Preserve for snowmobiling. Incursions into the old park still were infrequent.

Snowmobile use in and near the old park area began to increase in the early 1990's. This growing use occurred simultaneously with an increase in snowmobile sales and use throughout Alaska. In addition, the character and pattern of the use also changed. Snowmobile manufacturers began production of more reliable, higher performance vehicles that could access steep terrain and travel greater distances. Snowmobile use within Alaska changed from a utilitarian form of access for the traditional activities discussed in ANILCA, such as hunting and trapping, to a new and popular recreational activity in and of itself (Photo 1). During the past 6 years, these changes have resulted in numerous incursions into the old park, specifically in a limited number of drainages on the south side of the Alaska Range. Concern about new pressures on park resources increased with publication of a newsletter article urging recreationists to travel throughout the former Mount McKinley National Park area (Alaska Snow Rider, Volume 9, Issue 6, October 1998).

Temporary Closure and Legal Challenge

On February 3, 1999, NPS instituted a temporary closure of portions of the old park to the use of snowmobiles for traditional activities (NPS, 1999). To enforce the closure, NPS allocated administrative resources to prevent the degradation of the natural resources and other values of the old park area.

Based on information available, analysis of public hearing testimony, and analysis of nearly 1,500 written comments, NPS found that snowmobile use for traditional activities within the old park "would be detrimental to the resource values of the unit or area," pursuant to 43 CFR 36.11(h). The superintendent, therefore, implemented a 1-year closure in the old park to the use of snowmobiles for traditional activities. The intent of the closure was to prevent harm to the resource values of the old park, including its wildlife, wildlife habitat, and other natural resources; its opportunities for the conduct of non-motorized recreational activities undisturbed by motorized activities; and its opportunities for quiet and solitude. Two corridors in the old park, one in the Cantwell Creek area and another in the Bull River/Easy Pass area, were excluded from the temporary closure to foster opportunities for information gathering.

A number of public comments indicated concern that the resource evaluation and legal basis used in the finding for the temporary closure could serve as a precedent for closures in other areas in Alaska. Section 1110(a) of ANILCA applies only to the conduct of traditional activities within conservation system units. The management of the remaining portions of Denali or other conservation system units in Alaska to snowmobiles for non-traditional activities is unaffected by the decision to impose a 1-year closure of the old park to snowmobile use.

The Alaska State Snowmobile Association Inc., et. al. (ASSA), as plaintiffs and the Wilderness Society et. al. (WS), as defendant-intervenors have presented various legal challenges to the temporary closure of the old park in Federal District Court. The ASSA contends that NPS violated the mandated snowmobile access expressly provided for in Section 1110(a) of ANILCA, failed to consider less restrictive alternatives, and failed to complete an environmental assessment and provide the adequate public participation required by NEPA. The WS contends that NPS failed to abide by NEPA (i.e., evaluate the effects of the temporary closure in an environmental assessment) and that NPS violated the Wilderness Act by allowing snowmobile use in the two corridors left open by the temporary closure.

ISSUES AND IMPACT TOPICS

Issues and impact topics are identified and form the basis for environmental analysis in this EA. A brief rationale is provided for each issue or topic that is analyzed in the environmental consequences section. Issues and topics considered but not addressed in this document also are identified.

Air and Water Quality

Snowmobile use may degrade the pristine air and water quality which currently exist within the old park. Specific concerns include:

- Air pollution due to emissions from two-stroke engines.
- Deposition of two-stroke engine emissions into snowpack.
- Alteration of the water chemistry of streams and rivers due to unburned hydrocarbons from incomplete combustion and from raw petroleum products from leaky engines, leading to a degradation of water quality.

Photo 1. Snowmobiling Adjacent to Denali National Park and Preserve--The Type of Snowmobile Use That Occurs in the Park.

Vegetation, Soils, and Wetlands
Snowmobile use could adversely affect tundra and other vegetation communities, including wetlands, and sensitive permafrost soils in the old park. Specific concerns include:

- Vulnerability of soils and vegetation to snowmobile use due to typically low precipitation north of the Alaskan Range, resulting in insufficient snow cover to protect these resources.
- Sensitive permafrost soils may be damaged.
- Compacting of snow by snowmobiles, particularly in areas of frequent use, would decrease insulating characteristics of snow and allow frost to penetrate deeper under trails, causing a delay in snowmelt and a delay or preclusion of seed germination, leading to a change in species composition and plant density.
- Abrasion and breakage of exposed vegetation, including seedlings, shrubs, and young trees, due to snowmobile traffic.

Wildlife Values and Habitat
Snowmobile use could result in impacts to wildlife behavior, distribution, and abundance. Specific concerns include:

- Wildlife exposure to snowmobiles can cause behavioral changes deleterious to the health of the animals.
- Wildlife abandonment of preferred habitat.
- Harassment leading to alteration of wildlife population distributions.
- Disturbance to bears in their dens.
- Snowmobile tracks creating snow barriers to the movements of subnivean (situated or living under the snow) animals.
- Crushing of small mammals, particularly subnivean animals.
- Compacted trails could change distribution patterns of moose, caribou, and other animals by providing energy-efficient travelways.
- Degradation of aquatic biological communities due to degraded water quality.

Cultural Resources:

- Winter access to the old park via snowmobiles could result in increased numbers of snowmobiles using the old park and increase the risk of vandalism to 13 cabins on the National Register of Historic Places, others eligible for nomination, and other structures that have incomplete documentation.
- Many archeological sites are at the ground surface and could be exposed to increased disturbance because of increased snowmobile use.

Recreation, Visitor Use, and Wilderness Values
Snowmobile use could result in impacts to recreation, visitor use and wilderness values. Specific concerns include:

- User conflicts between snowmobile users and non-motorized recreationists such as cross-country skiers, skijorers, and dog mushers.
- Snowmobile use could diminish the wilderness values, including natural quiet, solitude, and undisturbed vistas, that are the foundation of the experience for the historic winter users of the old park.
- Snow compaction with subsequent soil compaction would make some winter trails visible in the summer.
- Diminished ability for the park to protect designated wilderness.
- Many members of the public expressed concern that closing any portion of Denali National Park and Preserve to snowmobile use would be a violation of ANILCA.
- Many members of the public expressed concern that opening any portion of Denali National Park and Preserve to snowmobile use would be a violation of ANILCA and the Wilderness Act.

Subsistence Use

- Snowmobile access to the old park could cause change in the presence and distribution of animals such as moose, furbearers, and ptarmigan in areas of the park and preserve where subsistence activities are authorized.

Park Management

Snowmobile use could result in impacts to park management. Specific concerns include:

- The public and NPS have identified the need to define "traditional activities "[ANILCA § 1110(a)] for snowmobile use within the old park. Disagreement exists regarding the definition of this term, leading to confusion and disagreement about whether snowmobiling in the old park is an allowed use.
- The old park's value as a reference site for ecological studies would be compromised by snowmobile use.
- Snowmobile use in the old park would result in additional administrative needs for enforcement and resource studies and monitoring.

ISSUES CONSIDERED AND ELIMINATED FROM FURTHER CONSIDERATION

Effects on Threatened and Endangered Species

The Endangered Species Act requires an analysis of impacts on all federally listed threatened and endangered species, as well as species of special concern. In compliance with Section 7 of the Act, the U.S. Fish and Wildlife Service (USFWS) was consulted. No Federally designated threatened or endangered species are known to occur within Denali National Park (pers. comm. Larry Bright, USFWS, Fairbanks, Alaska).

Floodplain Management

Executive Order 11988, Floodplain Management, directs federal agencies "to avoid to the extent possible the long and short term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct or indirect support of floodplain development wherever there is

a practicable alternative." Neither the proposed action nor its alternatives would affect floodplains or floodplain management.

Economics
The proposed action is not expected to adversely affect the economy of the local or regional area. Any economic benefits to the local or regional economy from snowmobiling would be the same whether the old park is closed to snowmobile use or not because the small numbers of snowmobilers displaced from the old park due to the proposed closure likely would use other areas nearby.

Effects on Minority and Low-Income Populations and Communities:
Executive Order 12898 requires federal agencies to incorporate environmental justice into their missions by identifying and addressing disproportionately high and adverse human or environmental effects of their programs and policies on minorities and low-income populations and communities. Neither the proposed action nor the alternatives would result in significant direct or indirect negative adverse effects on any minority or low-income populations or communities.

DESCRIPTION OF THE ALTERNATIVES

This EA describes the proposed action (closure of the old park to snowmobile use) and three alternatives for managing snowmobile use in the old park.

Elements Common to All Alternatives
The following elements are common to the four alternatives presented in this EA:

Related Park Planning
Any special regulation or action related to the use of the park's backcountry would be reviewed in the Environmental Impact Statement for the General Management Plan Amendment for the Backcountry (GMP Amendment/Backcountry EIS). A draft plan and EIS should be available for public review in fall 2000.

Resource Management
The NPS will initiate additional studies on snowmobile use within Denali National Park and Preserve, including studies on the effects of snowmobile use on park resources and values.

Visitor Protection
General regulations for the operation of snowmobiles in NPS areas are published in 36 CFR 2.18. The regulations in Section 2.18 (a), (b), and (d) would apply to all alternatives except the proposed action. These regulations: (1) require compliance with state laws which do not conflict with park regulations; (2) prohibit excessive noise; (3) prohibit racing and operating a snowmobile in excess of 45 miles per hour; (4) prescribe age limitation for the operation of a snowmobile, and; (5) require safe operations of snowmobiles similar to the requirements for the operation of other motor vehicles. The provisions of Section 2.18 (c), describing areas of parks

open for snowmobile use, are superceded in Alaska park units by the special access provisions of ANILCA (see 43 CFR 36.11).

Alternatives

Alternative 1: No Action
Under the No Action Alternative, after the temporary closure expires on February 3, 2000, snowmobile use in the old park would continue (Figure 2).

Snowmobile use for traditional activities would be contingent on a determination by the superintendent of sufficient snow depth (generally 6-12 inches or more) to protect the underlying vegetation and terrain and on public notification of that determination [43 CFR 36.11(a)(2)].

Alternative 2: Partial Closure of the Old Park to Snowmobile Use
Under this alternative, the old park would be closed to the use of snowmobiles north of the crest of the Alaska Range and southwest of the drainage divide of the West Fork of the Chulitna River (Figure 3). This action would leave about 180,000 acres of the approximately two million acre old park open to snowmobile use for traditional activities. The area left open to snowmobile use has experienced virtually all of the past snowmobile use in the old park.

Snowmobile use would be contingent on a determination by the superintendent of sufficient snow depth (generally 6-12 inches or more) to protect the underlying vegetation and terrain and on public notification of that determination [43 CFR 36.11(a)(2)].

Alternative 3: Temporary Closures of the Old Park to Snowmobile Use
Under this alternative, a series of 12-month temporary closures would be instituted to the use of snowmobiles in the old park (Figure 2). The temporary closures would be based on a finding of detriment to park resources, as in the present temporary closure. In addition, as required by Section 1110(a) of ANILCA, hearings would be scheduled for public testimony and a finding would be published to support each temporary closure action. Unlike the 1999-2000 temporary closure, no snowmobile use corridors would be made available in the Cantwell Creek and Bull River-West Fork Chulitna Rivers areas.

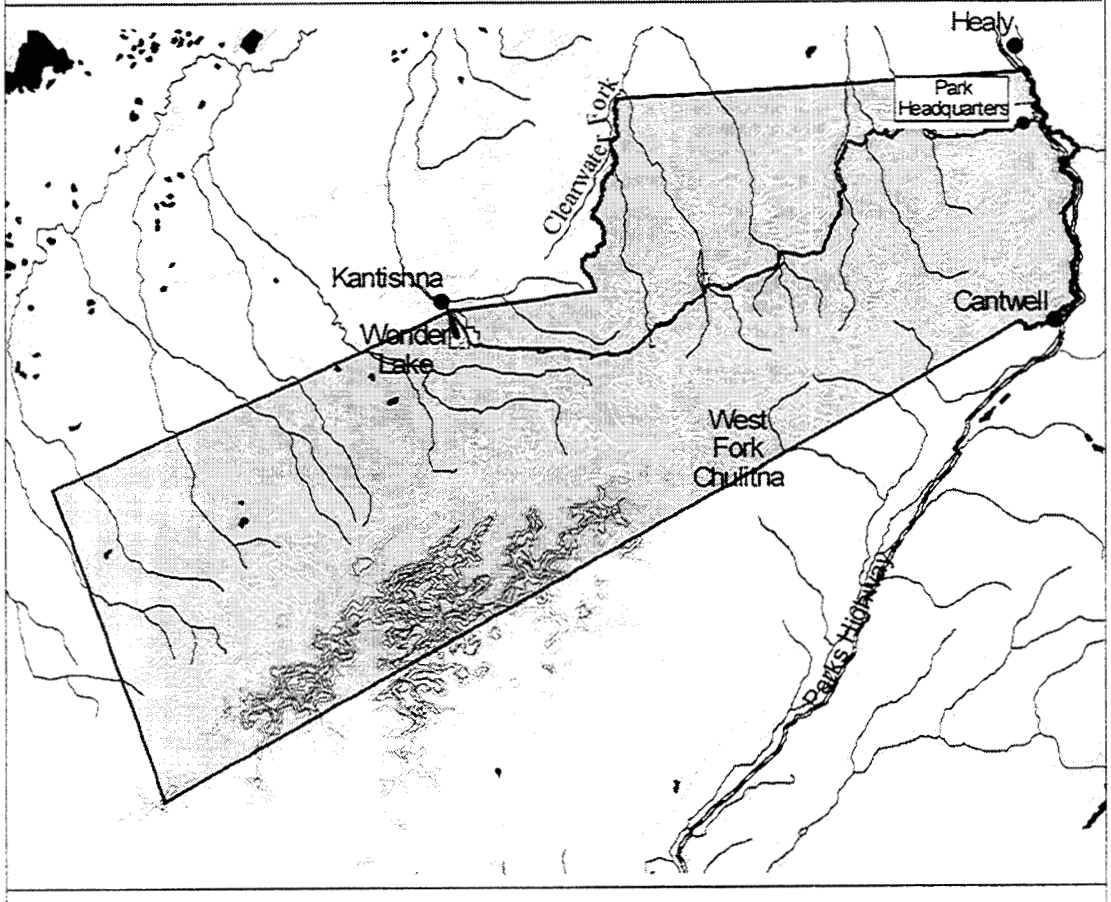
Alternative 4: Permanent Closure of Old Park to Snowmobile Use (Preferred Alternative)
Under this alternative, the old park (Figure 2) would be closed by regulation to the use of snowmobiles. "Traditional activities," within the context of the old park and section 1110(a) of ANILCA, is defined in the proposed regulation and is assumed as part of this alternative.

Alternatives Considered and Eliminated from Further Consideration

The NPS considered whether the park should establish a designated route for recreational snowmobile use along the Denali Park Road (Figure 4). Many national parks have established such routes, but they are limited by 36 CFR 2.18 to routes and water surfaces used by motor vehicles or motorboats during other seasons and require a special regulation for each park unit.

Old Park - Former Mt. McKinley National Park

Figure 2



Wilderness Boundary

Old Park Boundary

Map Location

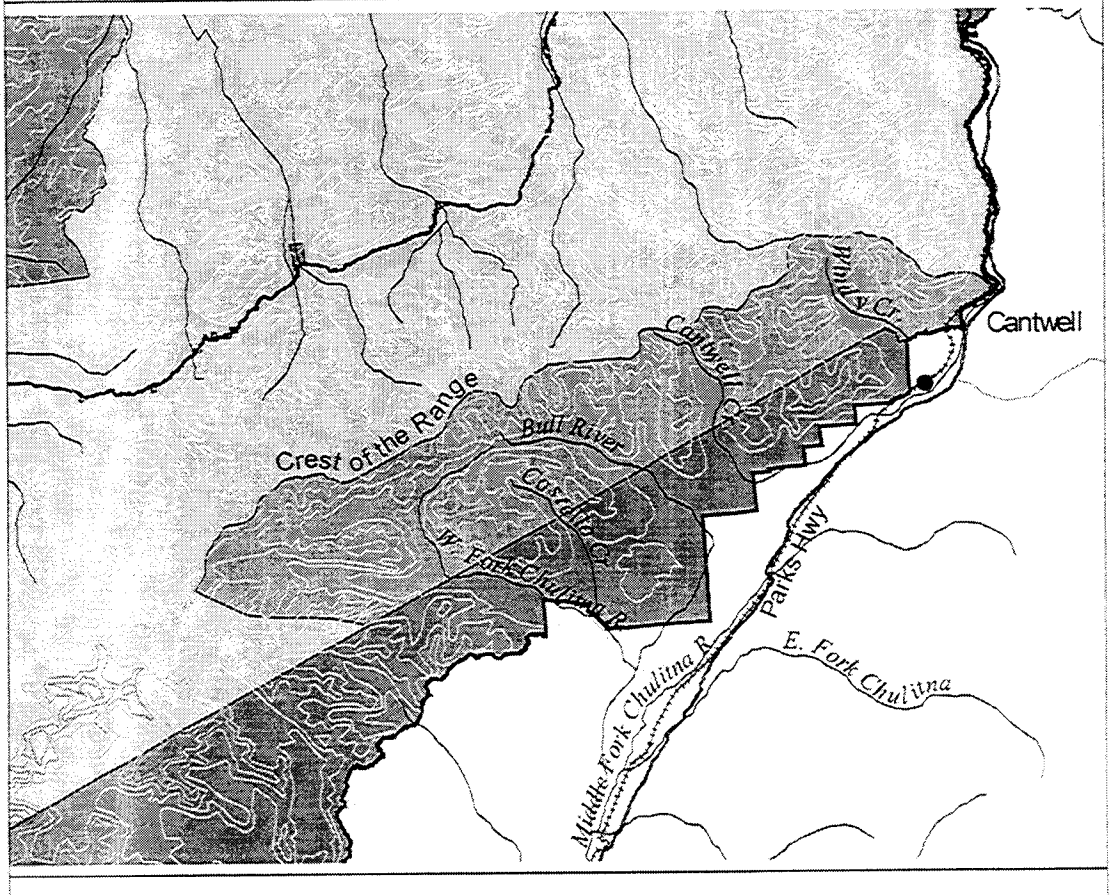
National Park Service
Denali National Park and Preserve
GIS

7.5 0 7.5 15 Miles

1:948360 1 inch = 14.97 miles

Old Park - From Cantwell to W. Fork Chulitna

Figure 3



Park Outline

Park Boundary

Park

Partial Opening Area, Alternative 2

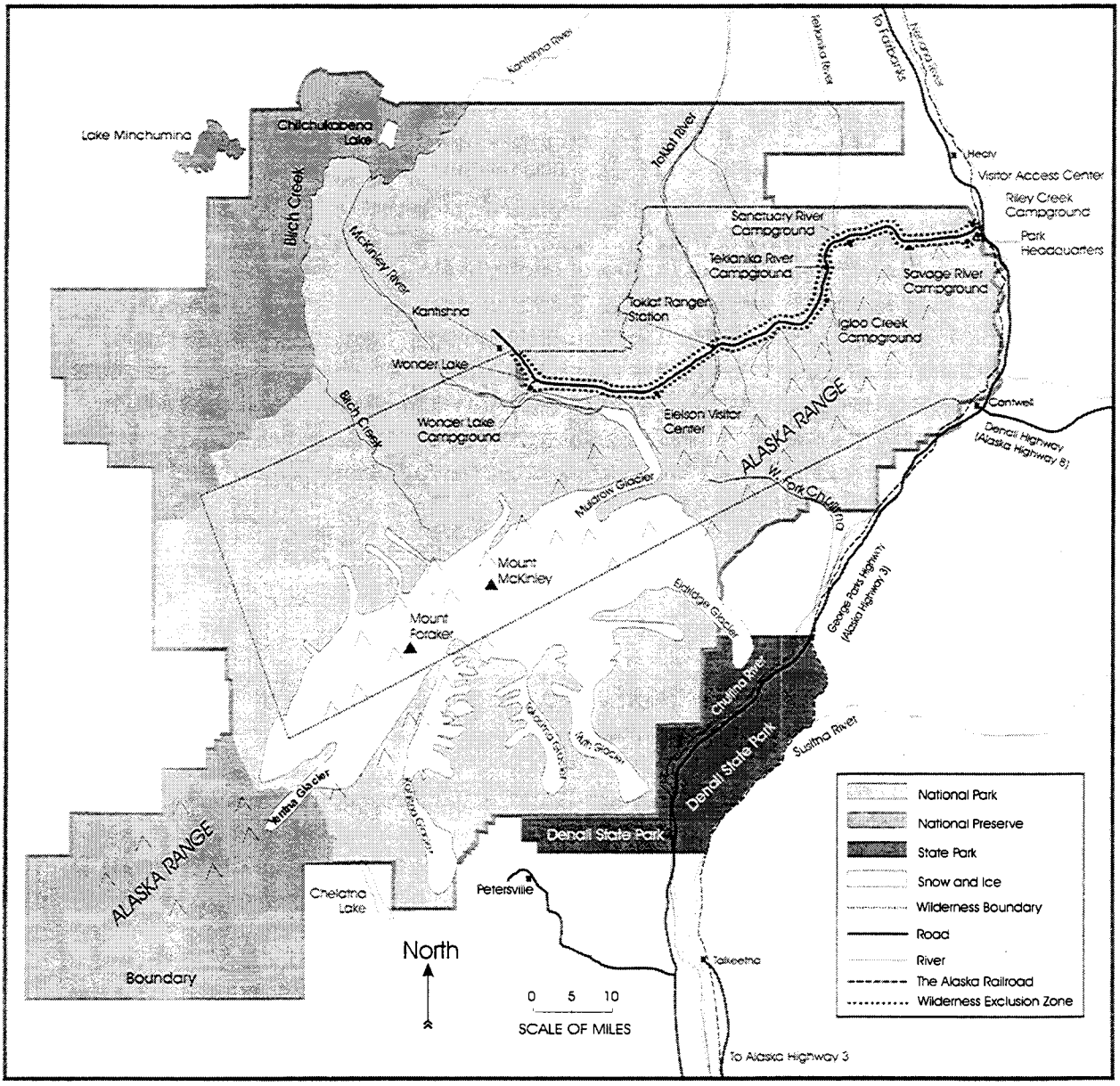
Park and Wilderness

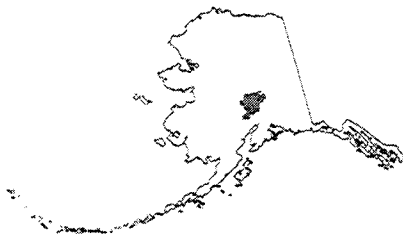
Map Location

National Park Service
Denali National Park and Preserve
GIS

7.5 0 7.5 Miles

1:504524 1 inch - 7.16 miles





Location in Alaska

Figure 4

PARK/REGION

Denali National Park and Preserve

U.S. Department of the Interior • National Park Service

The old park has a history of non-motorized access during the winter and snowmobile use was prohibited in the old park from 1970 until the passage of ANILCA in 1980. Enactment of ANILCA left this general prohibition of snowmobile use in the old park intact unless the snowmobile use was for the purpose of conducting a "traditional activity" [Section 1110(a)]. Establishing a designated route for recreational snowmobile use along the Denali Park Road would be inconsistent with the park's natural and aesthetic values and management objectives. Based on the scientific studies reviewed in the 1999 Statement of Finding for the temporary closure of most of the old park to snowmobiling, recreational snowmobiling along this corridor would disturb wildlife. In addition, many areas of the road would not lend themselves to the safe operation of a snowmobile. Long stretches of the road are often blown free of snow. Some stretches of the pavement and gravel sections are under sloping ice as aufeis progresses through the winter, and some stretches are under steeply sloping wind-blown drifts that fill in the road cuts and match the existing steep terrain contours.

THE AFFECTED ENVIRONMENT

The proposed action would affect the approximately two million acre old park.

The following documents contain descriptions of the environment of the old park. They are incorporated by reference and summarized below:

- The 1986 Denali General Management Plan (GMP), Land Protection Plan, and Wilderness Suitability Review, guides the general management of the park and the protection of park natural and cultural resources. The plan contains a review of the suitability of park lands for wilderness preservation. It also describes the park's natural and cultural environments and existing visitor use.

- The 1988 Final Environmental Impact Statement (EIS)/Wilderness Recommendation for Denali National Park and Preserve evaluates four alternatives for additional wilderness designation within the unit. It contains a concise description of the park's natural and cultural environments and visitor use patterns.

- The 1996 Park Entrance Area and Road Corridor Development Concept Plan (DCP)/EIS amends the park's 1986 GMP. It contains an updated description of the park's natural and cultural environments and visitor use, focusing on the park road corridor.

- The 1996 South Side Denali DCP/EIS amends the park's 1986 GMP. It contains an updated description of the park's natural and cultural environments and visitor use patterns, focusing on the portion of the park and preserve which lies south of the Alaska Range.

- The 1999 Spruce Creek Access Draft EIS evaluates a proposal for improved access to a 20-acre private inholding in the Kantishna Hills of Denali National Park and Preserve. It contains

updated information about resources in the Kantishna Hills, as well as summaries of parkwide resources.

Park Resource Information Summary

Climate and Snowfall

The old park is located in two of Alaska's major climatic zones. The Alaska Range influences climate by blocking the air that sweeps inland from the Gulf of Alaska and Bristol Bay. A continental climate is formed to the north of the range, while a transition climate is formed to the south. The north is characterized by less precipitation and greater fluctuations in temperature (hotter in summer and much colder in winter) than the area to the south.

Temperatures in winter can reach minus 60 degrees Fahrenheit during high pressure, low wind events. Cold air tends to settle down from mountain slopes so that the slopes are almost always warmer in winter than valley bottoms. Peaks above 8000 feet are above winter inversions and remain cold. Wind movement on mountain slopes increases wind chill so that the effective temperature can be much lower than in protected areas.

During late February, March, and early April, temperatures moderate and are often at, or above, freezing during the day. At park headquarters the March mean maximum is 24 degrees and mean minimum is 1 degree. The April mean maximum is 38 degrees and the mean minimum is 16 degrees. The diurnal range averages 21 degrees at park headquarters, with a higher range in the spring and summer and a lower average range in the fall and winter.

Precipitation is greater on the south side of the Alaska Range than on the north side. The average annual snowfall at park headquarters (north of the range) is approximately 80 inches, with similar amounts seen at Wonder Lake. On the south side, at Summit near Broad Pass, the average is 119 inches per year. At higher elevations in the Alaska Range, snowfall can exceed 400 inches per year. Snowfall is evenly distributed from October through February at park headquarters (average 12 inches per month), with lower averages for September, March, April, and May. Normal snowpack throughout the region averages between 20 and 40 inches by springtime, although at higher elevations the snowpack is deeper where wind and terrain allow it to accumulate.

Air and Water Quality

Denali National Park and Preserve is designated as a Federal Class 1 air quality area. Air quality in the park is generally very good, and no cases of exceeding the National Ambient Air Quality Standards have been documented. The exceptional air quality and lack of nearby city lights provide conditions that are outstanding for daytime panoramic views and winter night sky visibility. The park and preserve is managed to achieve the highest attainable air quality levels and visibility standards consistent with mandates specified by ANILCA, the NPS Organic Act, and the Clean Air Act.

The surface waters of Denali National Park and Preserve are generally pristine and have not been adversely affected by development. Activities in certain portions of the park have resulted in temporary, localized degradation of water quality, such as in the Kantishna Hills mining area. Analysis of surface water chemistry indicates pristine conditions in all areas studied outside the Kantishna Hills, including all watersheds in the old park (Edwards and Tranel 1995; Stottlemyer and McLoone 1990). Little information exists regarding the presence, quality, or extent of subsurface aquifers.

Vegetation, Soils, and Wetlands

Vegetation within the park is similar to that found throughout the interior of Alaska. The five major vegetation associations within the park and preserve are low brush-bog, bottomland spruce-poplar forest, upland spruce-hardwood forest, moist tundra, and alpine tundra.

Treeline in the old park can range from 2000 feet on the colder soils of the broad ridges on the north side of the Outer Range to 3700 feet within tributary drainages of protected river valleys. Treeline on the southside of the park can range from 2800 feet in the Windy Creek and Cantwell Creek areas of the old park to approximately 1000 feet along the Yentna River in the southwest preserve. Above treeline, a shrub zone of willows, shrub birch and alders extends another 200 to 400 feet higher in elevation.

Soil types within the area vary as a result of parent material, topography, and vegetative cover. Soils in the park can be generally classified as mountain and tundra soils, bog soils, and forest soils. Mountain or tundra soils form directly from bedrock and the slow accumulation of organic matter. The sparseness of these soils is attributable to cold weather extremes and steepness of slopes. Bog soils consist of clay and glacial moraine and are poorly drained. Over time, this causes the accumulation of plant material and often peat layers. Forested areas within the park typically have soils of sandy and silty clay with humus layers supporting mosses and lichens.

Wetlands are found throughout the old park except in high mountain areas. Wetland communities include riparian areas adjacent to streams and lakes, shallow tundra ponds, wet tundra, wet scrub shrub, and forested wetlands. Wetlands serve as important resting, feeding, and nesting areas for resident and migratory birds, as well as important foraging areas for large mammals such as moose.

Permafrost is intermittently present throughout the lowlands north of the Alaska Range and is continuous at higher elevations both north and south of the range. Detailed studies of the extent of permafrost in lowland areas to the south of the range have not been made, but during the construction of wells, roadcuts, and other past developments within the region permafrost has been found at varying depths.

Permafrost essentially consists of soil, rock, or other earth materials at a temperature of 32 degrees Fahrenheit or colder for two or more consecutive years. A delicate balance exists between permafrost and the active layer above it. Thus, changes in the vegetative mat, snow, or other characteristics of the upper layer can significantly alter the thermal regime with resultant changes at ground level. For example, removal of vegetation increases the release of heat from the ground in

the winter and allows increased heat absorption into the ground in summer, and this can cause the melting of permafrost. In addition, an increase in solifluction, or soil movement, is possible. These phenomena can cause heaving, sagging, soil slumping, and erosion at the surface during successive periods of freeze and thaw in the active layer.

Wildlife Values and Habitat

Two primary reasons Mount McKinley National Park was established in 1917 were to protect the outstanding assemblage of wildlife resources and to allow natural processes to continue unaltered by human activities. Outstanding opportunities exist to view Dall sheep, caribou, grizzly bear, and moose, as well as more elusive species such as wolves, lynx, and wolverine, in natural settings. Denali supports a large mix of smaller carnivores including coyote, red fox, river otter, marten, and least weasel; rodents including arctic ground squirrel, red squirrel, hoary marmot, northern flying squirrel, beaver, muskrat, porcupine, red-backed vole, tundra vole, northern bog lemming, two lagomorphs, snowshoe hare, collared pika; and insectivores including masked shrew.

Denali is also home to a variety of subarctic breeding birds and offers visitors unique viewing opportunities of these species. Park visitors can observe gyrfalcon, northern goshawk, northern hawk owl, great grey owl, northern shrikes, and three species of ptarmigan. A suite of neotropical and paleotropical migrants, including northern wheatear, arctic warbler, blackpoll warbler, merlin, and peregrine falcons, and over 130 species of other migratory birds, including golden eagles, American dippers, long-tailed jaegers, surfbirds, and harlequin ducks, breed each season in Denali.

Moose – Moose habitat in the old park is typically vegetated habitat below the 4000 foot elevation. Open and closed shrub communities are the preferred habitat. The overall population north of the range has remained relatively constant since 1986, with overall densities of 0.4-0.5 moose per square mile. However, moose densities vary geographically from about 1.0 moose/sq. mile in the eastern foothills to 0.1 moose per square mile in the northwestern spruce flats. South of the range, moose are more abundant within broad drainages. Moose are hunted throughout the south side of the range during September and, in some areas, the hunting season remains open through part of the winter. Most calving takes place from about 5 May to 5 June.

Caribou – The Denali caribou herd numbers approximately 2000 animals and ranges over most of the area north of the range and areas south of the range east of Mount McKinley. Calving since 1980 has mostly occurred in the foothills north of the slopes of Mount McKinley. During the 1970's, calving and post-calving centered on the area between Cantwell and the West Fork of the Chulitna. Calving occurs from about 5 May to 1 June with over 75 per cent of the calves born during the first two weeks of the calving season.

Important caribou winter ranges include the Stampede flats just north of the old park and treeline areas in the vicinity of Slippery Creek, Birch Creek and the Foraker River within the old park. In years of low snowfall, caribou tend to winter at lower elevations in these areas, whereas when above average snowfalls occur they are more likely to use windblown ridges outside the old park along the north side of the Outer Range, the Stampede Hills, and the Kantishna Hills.

Grizzly and Black Bears – Both grizzly and black bears inhabit the old park. Grizzly bear density for most of the park north of the Alaska Range is estimated at 37 per 1000 square kilometers, or about 200 bears in the 7000 square kilometer study area (USGS, unpublished, 1995). There are no grizzly bear and black bear density estimates for the old park areas south of the crest of the Alaska Range, but grizzly bear and black bear density for the Dunkle Mine and Tokositna areas of the park is estimated roughly as low to medium (South Side Denali DCP/EIS, NPS, 1996). Preferred habitat for black bear is forested areas. Grizzly bears are most often found in high elevation tall shrub, low shrub, and alpine tundra communities.

Most park grizzly bears den in high alpine areas and are dormant from October until April. Adult male bears can emerge from their dens anytime after 1 April. Females with cubs often emerge later in April and May. Upon emerging from their dens, grizzly bears often seek winter-killed ungulates and newborn young of ungulates (i.e., moose and caribou) and Dall sheep.

Wolves – Wolves, usually within packs, exist in and out of the park on both sides of the Alaska Range. The number of wolves in Denali National Park and Preserve was approximately 80 in March 1998, with most of them active in the old park. The young are born from late April through mid-May in dens excavated into hillsides. During periods of low winter snowfall, when prey are in good nutritional condition, wolf numbers tend to drop due to low pup production and survival, and high dispersal and mortality of older wolves. When winters are severe and prey is more vulnerable, the wolf population can quickly increase by higher pup production and reduced dispersal of young adults. For example, the park's wolf population more than doubled during 1987 through 1990 when winter snowfalls were particularly severe (Spruce Creek Access Draft EIS, 1999).

Dall Sheep - Sheep populations have remained stable in the old park for the past few decades with declines in some years of heavy snowfall offset by increases in other years. Alpine slopes to 6000 feet are productive habitat in summer. Sheep require areas with windblown or thin snowcover for grazing grasses and browsing dwarf shrub vegetation in winter.

Snowshoe Hares and Lynx – Snowshoe hares live in forested and tall shrub habitat within the old park. Their population follows a 7 to 11 year cycle. Lynx primarily feed on snowshoe hare. Snowshoe hare abundance also influences golden eagle productivity in Denali (McIntyre and Adams, 1999). Lynx and other predator/raptor populations may decline during the lows of the hare cycle. Lynx hunt near snowshoe hare trails, using concealment and quiet patience to surprise foraging hares. Both predator and prey have evolved large feet to spread their weight on the snow surface.

Ptarmigan – Three ptarmigan species (willow, white-tail and rock ptarmigan) are abundant in the old park. Ptarmigan often use willow thickets associated with riparian areas in winter. These birds are an important food source for wintering raptors and breeding raptors, such as golden eagles, in spring. Ptarmigan often protect themselves from the deepest winter cold by burrowing into the light snow and using the snow as additional insulation.

Wolverine – These large weasel family members occur in alpine and other areas of Denali National Park and Preserve. Wolverines scavenge carcasses and hunt marmots and other small mammals and birds. They have also been observed chasing larger predators off of kills. No estimate of their numbers has been reported for Denali, including the old park, but they have been seen throughout the old park in summer, and their tracks are regularly seen by backcountry travelers in winter.

Cultural Resources

The Denali region of Alaska has fostered a rich prehistory and history of human occupation. The exact extent of human activity is not yet fully known. Early bands of inhabitants were likely migratory, following herds such as caribou, and leaving scanty remains at their temporary camps and game lookout points.

Miners of gold and other metals and minerals, such as silver and antimony, have historically criss-crossed the Alaskan backcountry and founded communities, leaving isolated workings behind. The historic mining community of Kantishna in the northern park additions presently has no operating mines or winter residents, although summer lodge operations interpret the cultural mining heritage of the area to 10,000 visitors each summer. Many historic structures in Denali National Park and Preserve have been found eligible for inclusion on the National Register of Historic Places. Since 1917, administration of the old park has depended on ranger patrol cabins, both along the park road and inside the perimeter of the old park. Fifteen of these historic cabins are either on the National Register of Historic Places or are eligible for nomination.

Recreation, Visitor Use, and Wilderness Values

The health of Denali National Park and Preserve's naturally-regulated ecological system is the foundation for one of the world's finest wildlife viewing opportunities. The possibility of seeing bear, wolves, caribou, moose, Dall sheep, and other animals against the backdrop of a spectacular subarctic, alpine landscape and vegetation is the cornerstone of a multimillion-dollar tourism industry in Alaska. Wildlife populations in the old park are available for unparalleled viewing opportunities precisely because they have been protected for decades from intrusive interactions with humans. The opportunity to see natural predator-prey interactions is one of the primary visitor attractions at the old park.

The primary visitor activity is a shuttle or tour bus ride along the Denali Park Road. Bus trips offer excellent opportunities to view wildlife, and on a clear day, provide spectacular views of Mount McKinley. Approximately 80 per cent of the close to 400,000 park visitors arrive in June, July, and August, and more than 95 per cent of visitation is along the park road corridor.

Visitation from October to April is light. There were approximately 1400 visitors recorded in 1998/1999 during these months. (NPS monthly public use reports, unpublished). This number derives generally from visitor contacts in the park headquarters area and in the backcountry. Visitation likely is undercounted because visitor counting is not occurring at this time of year in the same way as it is during summer. Use of the old park for winter activities is limited by the distance to population centers, few daylight hours, and cold weather. Use by skiers, dog mushers, and other visitors increases in the spring. During the 1990's, park dog mushing patrols have contacted between

100 and 200 skiers and dog mushers annually along interior routes paralleling the Denali Park Road, the Windy Creek/Foggy Pass areas, or on the northern route through the Stampede/Clearwater Fork corridor to Kantishna and Wonder Lake. (Park staff reports, unpublished)

The number of possible entry points by snowmobile into Denali National Park and Preserve and the speed by which snowmobile users travel make it difficult to contact users and make accurate estimates of use in the park. Counts of vehicles at the George Parks Highway pullouts adjacent to the park in 1999 indicated an estimate of at least 1500 to 2000 visits by snowmobile users in March and April, especially in the southern park additions either in the Cantwell to West Fork of the Chulitna River area or Tokositna River area. Approximately six snowmobile groups used the corridors in the old park left open during the 1999 temporary closure (NPS, unpublished, 1999).

The Wilderness Act of 1964 (P.L. 88-577) describes wilderness as an area "untrammeled by man…without permanent improvements or human habitation, which is protected so as to preserve its natural conditions…with the imprint of man's work substantially unnoticeable…[with] outstanding opportunities for solitude or a primitive and unconfined type of recreation." Other specified mandates include administration of the wilderness areas to leave them as "undeveloped Federal land retaining its primeval character and influence" "unimpaired for future…enjoyment as wilderness" with "no…form of mechanical transport."

Section 701 of ANILCA designated about 95 per cent of the old park as Denali wilderness. The old park provides outstanding opportunities for primitive unconfined recreation, including nature study, backcountry camping, wilderness and wildlife photography, mountain climbing, cross-country skiing, snowshoeing and dog mushing. The old park is one of the few places in Alaska where visitors of all ages and abilities can experience wilderness first-hand. In summer, visitors can experience the wilderness on its own terms or have an opportunity to confront it in a safe and controlled environment from a bus on the park road. In winter, when the park road is closed to motorized traffic, all contact with the wilderness comes with the expectation that motorized vehicles will not be used to make access easy and that mechanized equipment will not be used to limit the impacts of the elements on one's visit.

Denali National Park and Preserve's Statement for Management identifies the park's wilderness recreation values:

> Denali offers superlative opportunities for primitive wilderness recreation. Outstanding cross-country hiking, backcountry camping, and winter touring possibilities are available for one willing to approach the area in its natural condition. This huge park contains large, almost entirely trailess areas where evidence of human use is minimal to nonexistent. These backcountry conditions are in contrast to most Lower 48 wilderness areas where maintained trails, designated campsites, footbridges, and signs are the norm. (Statement for Management, Denali National Park and Preserve, September 1995, p.11)

The old park provides a unique resource to those members of the public who seek solitude, natural quiet, and a non-motorized winter recreational experience because it is relatively accessible, compared to the rest of Alaska. Low density, non-motorized winter recreation has developed in this area through the last 82 years of NPS management. There is no other similar large, naturally-regulated ecosystem in the entire 375 million acres of Alaska that is as free from motorized use in the winter months.

Furthermore, Denali National Park and Preserve fills a special gap on the nationwide recreation opportunity spectrum.

> All national park system units, by virtue of planning and administrative decisions, fall somewhere in that spectrum, which ranges from highly pristine, remote and sparsely used lands to highly developed, readily accessible, and intensively used recreation areas. Denali's legislative mandates and administrative history place the park toward one end of that spectrum with parks that can be characterized as wild, rustic, and expansive. Denali rests somewhere between the extremely remote, lightly used Alaska national park units and the large, wilderness parks of the Lower 48 states that are highly accessible and more developed. (Ibid. at p.9)

Snowmobile use in and near the old park area began to increase in the early 1990's. This increased use occurred simultaneously with an increase in snowmobile sales and use throughout Alaska. In addition to increased snowmobile activity, the character and pattern of the use also changed. Snowmobile manufacturers began production of more reliable, higher performance vehicles that could access steep terrain and travel greater distances. Snowmobiling changed from a utilitarian form of access into a new and popular recreational activity in and of itself. During the past 6 years, this change in the type of use, the increased capability and reliability of snowmobiles, and the increased numbers of snowmobile users, have resulted in numerous incursions into the old park in a limited number of drainages on the south side of the Alaska Range.

Subsistence Use
Subsistence activities are not permitted in the old park. See Appendix A.

Park Management.
The management of Denali National Park and Preserve is guided by the 1916 NPS Organic Act, which establishes the legal framework for management of the entire national park system, and directs the Secretary of the Interior and the NPS to manage national parks and monuments to "conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations."

The establishment of Mount McKinley National Park by Congress in 1917 was meant to protect this unique resource from new types of use brought on by rapid changes in technology and access, such as the construction of the Alaska Railroad and the market hunting for Dall sheep.

Park management also is guided by the 1978 Amendments to the NPS Organic Act (92 Stat. 163), which expressly articulate the role of the national park system in the effort toward ensuring ecosystem protection and state: "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, except as may have been or shall be directly and specifically provided for by Congress." Other direction can be found in executive orders, laws, and regulations including: the National Parks and Recreation Act of 1978, the Clean Air Act, Executive Orders 11644 and 11989, and NPS regulations (36 CFR 2.18(a), (b), and (d).

In compliance with its statutory mandates, including the park's enabling legislation, and agency policies, Denali National Park and Preserve, is managed: to provide protection for geologic, scenic, wildlife, habitat, and water resources and unaltered ecosystems; to provide for subsistence opportunities in the ANILCA additions; to maintain opportunities for scientific research in undisturbed ecosystems; to preserve wilderness resource values; and to provide for recreational opportunities by the visiting public.

The primary purpose of Denali National Park and Preserve and, in particular the old park, is to protect the intact and naturally-functioning subarctic ecosystem, which has outstanding opportunities for wildlife viewing and wilderness recreation (Strategic Plan for Denali National Park and Preserve, 1997). The legislative history of ANILCA directed that the old park was "intended to be [a] large sanctuar[y] where fish and wildlife may roam freely, developing their social structures and evolving over long periods of time as nearly as possible without the changes that extensive human activities would cause." (Report of the Senate Committee on Energy and Natural Resources, Report No. 96-413, p.137) This purpose has been supported repeatedly in discussions with the public during the development of recent park planning documents (i.e., South Side Denali Development Concept Plan (DCP) and Park Entrance Area and Road Corridor DCP). The area of the old park is one of the most important natural areas in the world because it has been protected from most consumptive or otherwise altering uses for more than 82 years, and still functions as a naturally-regulated system.

One of the greatest long-term values of the old park is the possibility of recording and gaining understanding of a naturally-functioning subarctic system. This largely undisturbed area is regularly referred to as a comparison site in scientific studies throughout the circumpolar region. The old park has been designated an International Biosphere Reserve for its unique scientific values. It has also been selected for long-term ecological monitoring by NPS and other federal agencies because of its historic level of protection and ecological integrity.

Key management factors over the last thirty years that have contributed to retaining the opportunity to see the unparalleled array of Alaska wildlife from the Denali Park Road include the policies of: 1) restricting private vehicles on the park road in the summer, 2) continuing the

prohibition of snowmobile use in the old park in the winter, 3) limiting and educating backcountry users, and 4) encouraging the dispersal of backcountry users.

Impact Table

Issues	Alternatives			
	1 -- No Action	2 -- Partial Closure	3 -- Temporary Closures	4 -- Permanent Closure
Air and Water Quality	Snowmobile use would diminish the old park's high level of air and water quality. Localized high readings of carbon monoxide would occur near operating snowmobiles.	The same impacts as Alternative 1 but limited to and concentrated in a 180,000-acre area.	No impacts are anticipated.	No impacts are anticipated.
Vegetation, Soils, and Wetlands	Damage from snowmobile use is likely at some locations due to low and non-uniform snow cover. Snowmobile use would result in artificial changes in soil temperature, soil moisture content, and vegetation species composition on routes used repeatedly. Snowmobile use would increase the creation of permanent trails, soil erosion, and damage or loss of vegetation. Continued use would delay recovery once the damage to soils and vegetation occurred. Damage would be greatest for those meadows and open slopes on the south side of the park, where multiple adjoining trails developed.	The same impacts as Alternative 1 but limited to and concentrated in a 180,000-acre area.	No impacts are anticipated.	No impacts are anticipated.
Wildlife Values and Habitat	Some amount of intentional and unintentional harassment of animals likely would be unpreventable. Stress would increase for park wildlife in winter, especially when deeper or crustier snow cover makes travel difficult for wildlife but easier for snowmobiles. Wintering bird populations would be disturbed by snowmobiles. Stress due to human disturbance during nesting activities for early migratory species could cause nest abandonment. Denali's small mammal population could be adversely affected, depending on the amount of snowmobile use in the old park.	The same impacts as Alternative 1 but limited to and concentrated in a 180,000-acre area.	No impacts are anticipated.	No impacts are anticipated.

Impact Table (cont.)

Issues	Alternatives			
	1 -- No Action	2 -- Partial Closure	3 -- Temporary Closures	4 -- Permanent Closure
Cultural Resources	Anticipated increases in snowmobile use would increase the opportunity and potential for vandalism and destruction of cultural resources.	The same impacts as Alternative 1 but limited to the two cabins near Windy Creek.	No impacts are anticipated.	No impacts are anticipated.
Recreation, Visitor Use, and Wilderness Values	Increased snowmobile use would curtail or eliminate the opportunity for non-motorized recreation in the old park, which is dependent on natural quiet, solitude, and natural vistas.	The same impacts as Alternative 1 but limited to and concentrated in a 180,000-acre area.	Same as Alternative 4.	Loss of the opportunity to operate a snowmobile in the old park would be a negative effect for those who desire that experience and a positive effect for those who desire an experience devoid of mechanized equipment. However, since the vast majority of Alaska accessible from the road system is presently open to snowmobile use, this loss would not be significant. Those individuals desiring an experience in the park within the guidelines and expectations of the Wilderness Act would have an area available.
Subsistence Use	Increased traffic to the old park, originating mostly in Broad Pass, would diminish subsistence opportunities for small game and trapping in the park additions.	Increased traffic to the old park, originating mostly in Broad Pass, would diminish subsistence opportunities for small game and trapping in the park additions.	Same as alternative 4.	Snowmobile use would be redirected to park additions and areas east of the Parks Highway. No impacts are anticipated to subsistence opportunities.

Impact Table (cont.)

Issues	Alternatives			
	1 -- No Action	2 -- Partial Closure	3 -- Temporary Closures	4 -- Permanent Closure
Park Management	Park-specific studies would be required regarding the effects of snowmobile use on wildlife, vegetation, wilderness resources, and conflicts with other winter visitors. Additional funding would be required to accomplish these studies. A public information and education effort focussed on safe use of snowmobiles and resource protection and preservation would be needed. Additional funding could be required to conduct this outreach effort. Enforcement of regulations to promote safe operation of snowmobiles in a park, published at 36 CFR 2.18, would require staffing above existing levels. Additional funding would be needed.	The same impacts as Alternative 1 but limited to and concentrated in a 180,000-acre area. A public information and education effort would be needed similar, but perhaps reduced in scope, to that required for the no action alternative. An increase would be anticipated in expenditures to enforce the snowmobile closure in the majority of the old park. Additional funding may be needed to accomplish this, but not as much as for Alternative 1.	Same as Alternative 4, except additional staff time and effort would be required to renew the closure each year.	An increase in expenditures would be anticipated to enforce the snowmobile closure in the old park. Additional funding may be needed to accomplish this, but not as much as for Alternatives 1 and 2.

ENVIRONMENTAL CONSEQUENCES

Introduction

This section describes the environmental consequences of each of the four alternatives. Because impacts under the No Action Alternative would be the most in type, magnitude, and intensity, the environmental consequences of that alternative are described in most detail. The consequences of the other alternatives generally are described in comparison to those of the No Action Alternative.

Under Section 1110(a) of ANILCA, as well as other laws, NPS has a responsibility to ensure that any new activity or change in existing activities does not have a detrimental effect on resource values. Section 1110(a) provides for closure by the Secretary of the Interior if use "would be detrimental to the resource values of the unit or area." Thus, in meeting its responsibilities, NPS need not wait for actual damage to occur before taking protective action to prevent degradation to wildlife and other natural resources.

An evaluation of the rapid changes in the level, type, and pattern of snowmobile use is necessary at this time to insure that the resource values of the old park are being adequately protected relative to this change. Local studies related to specific conditions found in the old park would be the best information on which to base this evaluation, but the growth in snowmobile use is so recent that local studies in Alaska are just now being conducted. Much of the available research data on snowmobile effects comes from areas outside of Alaska where the level of use increased as early as the late 1960s. This increase caused concern for resource values and created conflict among user groups. Consequently, this is the available information base that was primarily used in this evaluation.

Despite the lack of local studies, legitimate conclusions can be drawn by combining existing information on the resources of the old park with the available research on snowmobile effects gathered in other areas. Research on snowmobile effects was reviewed to identify the primary mechanisms of impact such as changes in animal activity levels or habitat use, alterations of plant growing conditions, or noise intrusion on other user groups. These predominant mechanisms of impact were then compared with the local studies and the previously described resource values of the Denali area to see if there was a significant likelihood of similar interactions. Sufficient similarities were found to support the conclusion that the results from other research are transferable to the assessment of probable impacts from increased snowmobile use in the old park, and that the evaluation of impacts in this EA could be conducted using this information.

Cumulative Effects Considerations

Cumulative effects are defined as the incremental impacts on the environment resulting from adding the proposed action (or alternative) to other past, present, and reasonably foreseeable future actions. Cumulative impacts may result from singularly minor but collectively significant actions taking place over a long period of time (CEQ sec. 1508.7).

The following activities have, are, or may reasonably be expected to occur and contribute to cumulative effects. The effects of these actions are evaluated, as applicable, in the cumulative effects analysis for each alternative, and the increment of effect the proposed action (or alternative) contributes to cumulative effects is identified.

North of the Alaska Range, where air quality sampling has been ongoing in Denali since 1980, anthropogenic pollution is consistently worse in the late winter and early spring than in summer, when most park visitation occurs. While the amount of pollution is small relative to most rural areas of the contiguous 48 states, the seasonal pattern is indicative of a circumpolar pollution phenomenon called arctic haze. Originating primarily from industrial sources in the mid- to high latitudes of Europe and Asia, arctic haze contains sulfates, nitrates, heavy metals, pesticides, and other contaminants (Shaw, 1995). There also is growing evidence that in the spring, Asian pollutants are transported to Denali via pathways separate from those associated with arctic haze (Catherine Cahill, pers. comm.)

Recreational use of the old park accelerated after the completion of the George Parks Highway in 1972. A backcountry unit system, with overnight limits, went into effect in 1974 for areas of the park north of the Alaska Range and between Windy Creek and the West Fork of the Chulitna River on the south side of the Alaska Range. The backcountry units have not had significant increased use by backpackers since the late 1970s because the system has been near capacity each summer night. No major alterations to the current hiking use levels are anticipated. The south side units of the old park remain the most underused within the system. Summer day hiking continues to increase, although most day hiking is within two miles of the park road.

No guiding currently exists or is anticipated for winter touring by motorized vehicle in the park. Three concession permits have been issued within the past two years for dog sled operations into the old park and park additions. Use under these permits has been light, although at full use not more than one party at a time would be expected to be along the road corridor west of the Savage River, with a similar level of use in the northwestern park and preserve additions.

The most significant anticipated change is the continued increase in recreational snowmobile use, particularly in the park additions. Changes in technology will continue to make this form of winter access more useable for larger numbers of people. These changes, in combination with increased marketing of winter tourism as well as general population growth within Alaska, create a high probability for more snowmobile use in the area.

Vehicular access in the old park is presently limited to the George Parks Highway and 3 miles of the park road to headquarters between October 1 and late March. Sometime in late March, the park road begins to open, as the snow is plowed and ice is removed. The park road generally is not entirely open until late May. No changes to this pattern are planned.

Alternative 1: No Action

Under this alternative, there would be no change from current management practices. Snowmobile use would continue to grow, especially on the south side of the park. The impacts of current and anticipated snowmobile use on park resources are described below.

Air and Water Quality

Impacts to air and water quality are summarized in Table 3-1.

Table 3-1 Summary of Air and Water Quality Impact Causes and Effects

Impact Cause	Effect on Air and Water Quality
Snowmobile emissions	Air and water pollution in the old park from carbon monoxide, hydrocarbons, and other pollutants emitted by snowmobiles.

General Impacts to Air and Water Quality

Snowmobile use has negative effects on air quality. Snowmobile emissions include hazardous air pollutants and volatile organic compounds. Snowmobile two-stroke engines emit about 30 per cent of the consumed fuel unburned through the exhaust (Hagemann and VanMouweik, 1999). Snowmobile hydrocarbon emissions far exceed emissions from most other motor vehicles (Fussell 1997). The U.S. Environmental Protection Agency estimates that snowmobiles and ATVs produce about 15 per cent of all hydrocarbons emitted by mobile sources (U.S. EPA, 1999). Snowmobile use also contributes to pollution from refueling, accidental spills, and on-trail maintenance.

Measurement of operating snowmobile exhaust has shown carbon monoxide measurements that are about 1,000 times higher than automobile exhaust under similar operating speeds (Fussell, 1997). The two-cycle engines used in snowmobiles are known to emit high levels of hydrocarbons in the exhaust. Discharge from these two-stroke engines can lead to indirect pollutant deposition into the top layer of snow and subsequently into the associated surface and ground water (Adams 1975, Ferrin and Coltharp 1974). Hagemann and VanMouwerik (1999) found that there is a potential risk to aquatic life from snowmobile emissions but that the risk could not be quantified because of a current lack of water quality data. A study by Adams (1975) showed that high concentrations of lead and hydrocarbons were found in pond water adjacent to trails during the week following ice-out. This study also found that "fingerling brook trout showed lead and hydrocarbon uptake from surface water and food chain feeding as well as reduced stamina."

Specific Impacts to Denali's Air and Water Quality

Localized, short-term high concentrations of carbon monoxide and other air pollutants would occur in areas where snowmobiles were used. Snowmobile use would diminish the old park's air quality. This diminishment of air quality likely would be below the federal standards for pollution. However, those standards do not consider that most backcountry areas of Denali have had little exposure to pollution. Those standards do not take into account that many of Denali's visitors come to the park with high expectations of being in a non-polluted area. Public testimony

leading up to the current temporary closure specifically mentioned that detrimental effects from snowmobile exhaust limited the ability to enjoy park resource values. Any diminishment of air quality, even if measurements are below the standard level of pollution, becomes extreme to those visitors.

Unburned hydrocarbons would accumulate on the snow surface and eventually wash into streams and lakes. This could cause localized degradation of the high water quality of the old park. This diminishment to water quality likely would be below the federal standards for pollution, but additional research is needed to establish that standards are not being violated. Also, those standards do not consider that most backcountry areas of Denali have had little exposure to pollution and that many of Denali's visitors come to the park with high expectations of being in a non-polluted area. Any diminishment of water quality, even if measurements are below the standard level of pollution, becomes extreme to those visitors.

Even minor impacts to water and air quality from non-point source pollution would have impacts on the current importance of the old park as a significant site for long-term monitoring.

Cumulative Effects
Pollution from snowmobile traffic would be in addition to the pollution contributed by busses, administrative traffic, and transport of industrial pollutants from Eurasia. In winter, snowmobiles likely would be the largest contributor to adverse air quality in the old park. No other water pollution sources besides snowmobiles have been identified for the backcountry in the old park. The ability to use Denali as a long-term reference site for pollution studies could be compromised by the addition of pollutants from snowmobiling.

Vegetation, Soils, and Wetlands
Impacts to vegetation and soils are summarized in Table 3-2.

Table 3-2 Summary of Vegetation, Soils, and Wetlands Impact Causes and Effects

Impact Cause	Effect on Vegetation, Soils, Wetlands
Snowmobile use in vegetated areas	• Changes in species composition and plant density. • Abrasion and breakage of exposed vegetation, including seedlings, shrubs, and young trees.
Snowmobile trail creation and snow compaction	• Indirect impacts from compacted trails formed by snowmobiles affecting the subnivean environment by causing temperature reductions and changes in snowpack characteristics and subsequent impacts on vegetation, including wetland vegetation. • Compacted winter trails would cause snow melt delay, deeper frost penetration, and delay or preclusion of seed germination. • Sensitive permafrost soils could be damaged. • Typical low precipitation north of the Alaskan Range could result in insufficient snow cover to protect resources.

General Vegetation, Soils, and Wetlands Impacts

Snowmobiles can cause considerable abrasion and breakage of exposed vegetation, including seedlings, shrubs, and young trees (Neumann et al., 1974) (Photo 2). Even when there is adequate snowcover to prevent direct abrasion of vegetation, the compacted trails formed by snowmobiles affect the subnivean environment by causing major temperature reductions and changes in snowpack characteristics (Pesant et al. 1985). These changes alter species composition, change plant density, delay the melting of compacted winter trails, and provide moisture over a longer period of time to the vegetation in the trail area (Pesant et al. 1985). Changes in moisture and growing season are important in a northern environment where the growing season is already extremely short. These temperature reductions can change soil surface microstructure, which reduces the suitability of a site for seed germination, the storage organs of perennial plants, and spring flower viability (Wanek and Schumacher 1975; Keddy et al. 1979).

Wanek and Schumacher (1975) also reported:

> "Temperature data collected over the past years have clearly established that the environment beneath the snow compacted by snowmobiles is substantially colder than that under natural snow cover. Even during comparatively mild winters, plant growth and flowering is retarded. During winters of average severity, large numbers of perennial herbs having fleshy subterranean organs are likely to perish where snowmobiles travel. This mortality is due to significantly colder soil temperatures producing intracellular ice crystals which cause cytolysis, tissue dehydration, or extracellular ice masses which disrupt tissues."

Other investigators (Keddy et al., 1979) report that adverse effects to subarctic ecology may result from snow compaction, which would affect the availability of seeds and modify subnivean rodents' seed predation patterns. Rongstad (1980) also reported delayed flowering and lower soil bacteria and elimination of some plants due to snow compaction.

Soil compaction increases surface runoff, reduces infiltration, and impedes gas exchange between soil and air. Compacted soils inhibit root growth and adversely affect soil organisms.

> "...(D)irect mechanical effect of snowmobiles on vegetation at or above the snow surface can be severe. The most significant effects include death of saplings or broken leaders of young plantation trees covered by snow; breakage or abrasion of woody stems and trunks; bruising and stripping of bark of pliable stems; and damage to exposed tree roots. These effects result in increased susceptibility to desiccation. These effects ...are more commonly associated with off-trail (snowmobile) riding" (Ontario Federation of Snowmobile Clubs, 1994).

Greller (1974) found that one source of destruction is the scraping of the soil, where snow is lacking, by the skis and rubber/metal tracks. This removes soil lichens, rock lichens, and causes damage to leaves and stems of other plants.

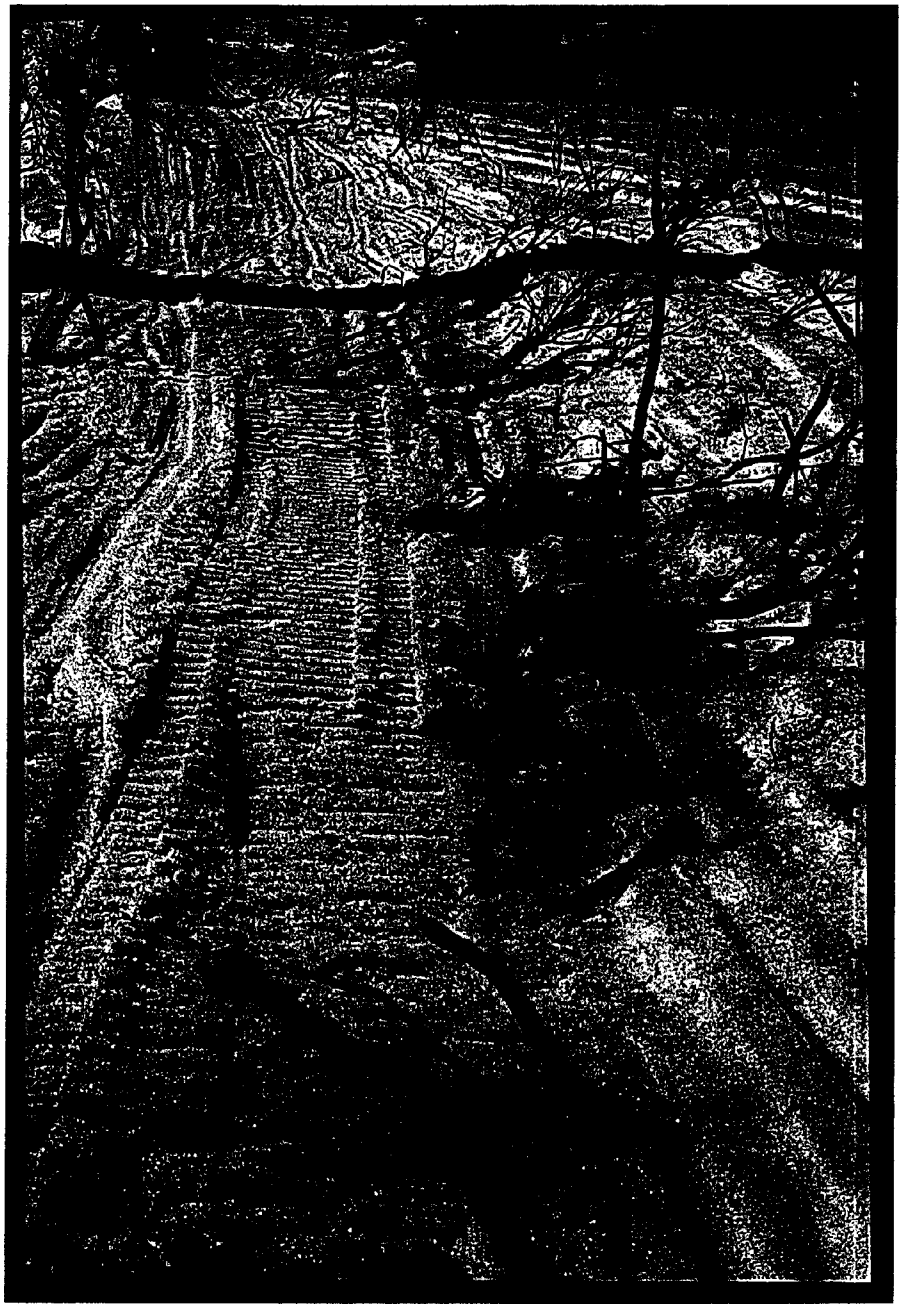


Photo 2. Vegetation Damage Due to Snowmobile Traffic

One study on snowmobile impact to vegetation has been conducted in Alaska (Tietz, 1996). The study did not find a loss of vegetative cover from one season of snowmobile traffic. While the study is important because it was conducted in Alaska, the methodology differs from the other studies previously discussed. No measurements of the vegetation that was actually subjected to snowmobile traffic were taken prior to applying the use. The assessment that there was no damage was based on an extrapolation from surrounding vegetation. No measurements were taken to see if the compacted snow observed in the experimental treatment trails remained on the vegetation longer than the snow that was adjacent to the trail. Also no soil temperature data was collected. The results of this work are not sufficient to conclusively say that the impacts observed in other areas would not also occur in Alaska.

Denali Specific Vegetation, Soils, and Wetlands Impacts
Staff observations of snow pack conditions at Denali indicate that adequate snow cover to protect vegetation does not occur uniformly over an area. This is due to variation in terrain, snow depth, and snow pack characteristics such as crusts, snow density, or layers within the snowpack. Therefore, any level of use allowed in an area likely would cause damage to vegetation at some locations.

Simply having enough snow to cover vegetation may not be adequate to protect vegetation. Staff observations of the snow conditions at Denali indicate that snowmobile tracks may sink down well into snowpack depending on the characteristics of the snowpack. Consequently, vegetation that may appear to be protected actually may be susceptible to abrasion.

Field observations in the Denali area show that the snowpack lasts longer and is more compacted and dense in snowmobile trails (Photo 3). Trail formation would adversely affect the Denali ecosystem by creating artificial changes in soil temperatures and moisture content and vegetation species composition along routes used repeatedly. Where the snow depth is shallower, such as is generally the situation on the north side of the Alaska Range or in wind-scoured snow free zones, widespread damage to exposed soil, plants, and lichens likely would occur.

Use across open areas, such as meadows, lakes, or open slopes, typically is not confined to single narrow corridors. Staff observations indicate that snowmobile use often occurs in the form of multiple parallel trails, in some cases as much as 100 meters wide and extending for over 2 miles (Photos 4 and 5). The expansiveness of these trail corridors multiplies the potential impacts of snowmobile use on vegetation and soils.

Impacts from snowmobile use to the sensitive vegetation and permafrost soils of the subarctic found in the old park would increase the creation of permanent trails, soil erosion, damage or loss of vegetation, and the delay or permanent prevention of recovery once the impact to soils and vegetation occurred.

Cumulative Effects
The vegetation, soils, and wetlands of the old park are subject to air and water pollution from motorized vehicles within the park. The impacts to vegetation from the summer use of vehicles

Photo 3. Compacted Snow from a Winter Trail Remaining Late into Spring

Photo 4. Multiple Snowmobile Trails Leading into Denali National Park and Preserve Which Continue into the ANILCA Addition to the Park (See Photo 5).

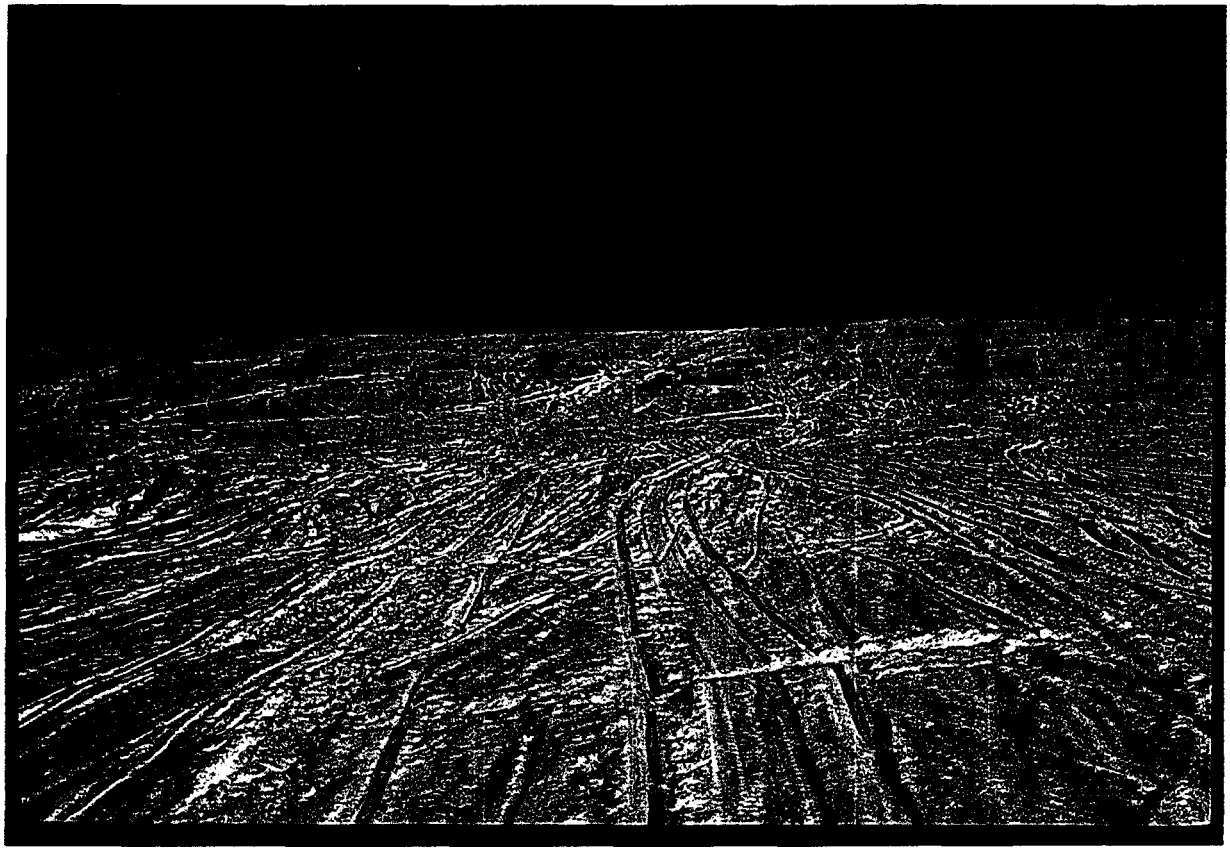


Photo 5. Multiple Snowmobile Trails in Denali National Park and Preserve

in the park are limited to the road corridor and are largely unchanged in magnitude since the road was built 70 years ago. Vegetation growing on the park road fill slopes or backslopes tends to grow faster due to increased soil warmth and road runoff, although this impact is restricted to the road corridor. Vegetation impacts from off-road hiking is at equilibrium due to limits which have stabilized use for the past 20 years.

Most damage to vegetation, soils, and wetlands would be from snowmobile use. No mechanized vehicles in the backcountry of the old park other than snowmobiles come in direct contact with the vegetation and soils. Snowmobile use would represent a widespread new source of impacts to vegetation from human use in the backcountry. If trails through vegetation, such as willows, were created through winter snowmobile use, those trails could be selected for use by summer hikers, creating more use and damage along trail corridors.

Wildlife Values and Habitat
Impacts to wildlife distribution, abundance, behavior, and their habitat consistently have been identified as major concerns by the public and in the scientific literature. Impacts are summarized in Table 3-3.

Table 3-3 Summary of Wildlife Values and Habitat Impact Causes and Effects

Impact Cause	Effect on Wildlife
Snowmobile noise, odor, and vehicular intrusion into wildlife habitat	• Stress resulting from intrusion could cause wildlife to abandon their preferred habitat. • Wildlife flight response to snowmobiles would result in adverse stress and energy expenditure during the winter season when energy expenditure can already be high.
Snowmobile trail creation and snow compaction	• Snowmobile tracks compressing the snow could adversely affect subnivean animals by creating snow barriers to movement or a loss of individual animals. • Compacted trails would change distribution patterns by providing energy efficient travelways.
Snowmobile collisions and intentional harassment of wildlife	• Wildlife may abandon their preferred habitat. • Individual animals may be killed or injured.

Snowmobile impacts to wildlife can be both direct and indirect. Direct impacts include intentional harassment, injuring, and killing of wildlife. Indirect impacts include stress from disturbance, changes in distribution, and elimination of use of preferred habitat.

Direct Impacts on Wildlife Values and Habitat
Some direct impacts from harassment (stress, displacement, abandonment of preferred habitat), both purposeful and unintended, would be unavoidable under this alternative. The large area that would be open to travel would make the prevention of intentional harassment through patrols essentially impossible. The random cross-country nature of travel and the rates of speed that likely would occur would make unintended harassment of wildlife inevitable.

General Stress Impacts on Wildlife Values and Habitat

Natural effects (e.g. weather and predators) or anthropogenic effects (i.e., human-influenced) may have an influence upon an animal's energy balance or stress level which may, in turn, influence survival, productivity, and immune function. Several studies have been conducted that show the direct impact of repeated snowmobile use on wildlife behavior and levels of physiological stress (Aune 1981; Dorrance et al., 1971; Freddy et al., 1986; Moen et al., 1982; Neumann and Merriam, 1972; Rudd and Irwin, 1985; Simpson, 1987; Tyler, 1991; Voyageurs National Park, 1996). Many of these studies showed behavioral effects on the same species that occur at the old park area of Denali. These studies indicate that exposure of wildlife to snowmobile use can result in behavioral alteration, habitat avoidance, and increased energy expenditures. These changes could occur at critical times when animals are under extreme stress due to winter privations. Energy conservation during winter is crucial. As winter progresses, animals can experience an energy deficit, as more energy is used to survive than is replenished. The survival of individual animals depends on the severity of energy expenditures as well as the animal's energy stores.

Even in those studies that did not examine or demonstrate long-term abandonment, animals still showed an alteration in activity patterns and increase in movements that elevated energy expenditures (Eckstein et al., 1979; Richens and Lavigne, 1978). During public meetings on the current temporary closure, some members of the public stated that they did not see animals move in response to snowmobile passage. It is possible that some animals may become habituated enough to snowmobile traffic to remain near a regular snowmobile use area. Research indicates that it is also possible that these animals still may be experiencing considerable stress in those situations (Moen et al., 1982). This study noted that there was no reduction in either the magnitude of the heart rate response or the time of return to a normal rhythm. Other studies have noted that what appears to be habituation could also be the decrease in animal response to a particular stimulus through time as a result of the progressive weakening of an animal's physical condition throughout the winter and/or the need to preserve critical winter energy stores (Richens and Lavigne, 1978).

Research indicates that additional stress from disturbance by increased human activity could have a detrimental effect on bears during this critical period of time (Goodrich and Berger 1994; Watts and Jonkel 1989). Recreational activities may cause stress to bighorn sheep, which leads to increased heart rate and energy expenditure (MacArthur et al., 1982).

Stress Impacts on Denali Wildlife Values and Habitat

Under this alternative there would be many additional miles of snowmobile trails and increased snowmobile activity levels throughout all types of habitats. This area of previously protected habitat is particularly vulnerable to increased disturbance given the easy access afforded by its close proximity to the George Parks Highway. This new pattern of use would leave little opportunity for wildlife avoidance and refuge. This major change in the level and extent of human activity in this historically undisturbed winter environment would represent a significant change from the long-standing patterns of non-intrusive human interaction with wildlife and

could affect many individual animals over a large area. Consequently, the stress created by alterations in winter habitat use or energy expenditures would occur at a level of more than just a few individuals adjacent to a single trail.

Any increase in stress through added energy expenditure or loss of preferred habitat is a concern in the difficult times of winter. Generally, animals such as caribou and moose are in good condition during the winter, but this may vary significantly depending on environmental factors such as snow depth or crusts. During difficult winters when snowfall is deep, stress to wildlife that are already weak could be more pronounced due to contact with snowmobiles. Snow conditions that are bad for wildlife may be good for travel by snowmobile. Snowmobile use is likely to occur at greater intensity and reach into more areas when there is good snow cover. Effects on individual animals would occur. The occurrence of any population-level effects would likely depend upon the severity of the winter as well as the level and spatial extent of snowmobile use. Any effects would most likely occur during mid to late winter when wildlife is more likely to be in a nutritionally-stressed condition. For example, bears, which are present and den in the old park, emerge from their dens in spring when snow cover often is still adequate for snowmobiling.

Many raptors, including gyrfalcons, golden eagles, northern goshawks, northern hawk owls, great horned owls and boreal owls, begin their nesting activities in early March in Denali when snow cover often is adequate for snowmobiling. If additional stress caused by human disturbance occurred during this critical portion of the nesting cycle, it would disturb nesting raptors and could cause nest abandonment.

If changes in birth rate and survival of young and mortality of older animals occurred, it could, in turn, cause changes in predator/prey relationships. These changes would compromise the value of the old park as a site for comparative studies. Also, any changes related to increase stress would be difficult to distinguish from the effects of natural stress. The introduction of yet another variable could further complicate the research that is being conducted in the old park areas because it would be difficult to determine what changes are related to natural process or human activities. Currently, human activity in the old park is negligible and confined to a limited corridor of use. This alternative would change that situation and possibly alter the ability to use the old park as a control site for important scientific studies.

General Impacts on Wildlife Distribution and Behavior
Wolves: A recent report (Olliff et al., 1999) makes the following statement regarding impacts on wolves:

> Some information exists on specific effects of winter recreation on gray wolves. Most information, however, is available from data on the effects of other human activities. Paquet et al. (In Press) found that winter movements of wolves in Canadian parks were influenced by human activities. Winter activities that compact snow cover, such as snowmobiling, cross-country skiing, and maintenance of winter roads, provided feasible routes for wolves into areas that were usually inaccessible because of deep snow (more

than 15.5-19.5 inches). The consequences of this are that there may be modifications to wolf/prey interactions and habitat use as well as differences in landscape movements between groups of prey (Paquet et al., In Press).

A 4-year study in Voyageurs National Park, Minnesota found that snowmobiles were adversely affecting wolves through displacement and disturbance (Voyageurs National Park, 1996):

> It is reasonable to assume a disturbance threshold exists where repeated avoidance by or displacement of an animal may result in: (1) more permanent displacement of the wolf or wolves; (2) impacting an individual animal's winter energy budget as to adversely affect productivity or survival; or (3) conditioning the animal to avoid certain areas.
>
> Information in this report does not prove harm to wolves, but the fact that wolves consistently avoided snowmobiles indicates it is prudent for NPS to close important wolf foraging areas to winter use until a better understanding of wolf/snowmobile interactions can be determined.

Deer: A significant negative correlation between the number of deer seen along a 10-kilometer trail and low intensity snowmobile use was observed in Minnesota (Dorrance et al., 1975). Dorrance (1975) suggests that deer home ranges may increase in the presence of snowmobiles. Other studies observed changes, but the movements away from preferred habitat were only temporary (Eckstein et al., 1979; Richens and Lavigne, 1978).

Moose: Surveys and research show that animals at Denali National Park and Preserve seek specific habitats in winter to help them survive. Moose, for example, seek out certain types of willow stands. The inability to use these important areas could have serious consequences at this stressful time of the year. Observations by Alaska Department of Fish and Game biologists in the Talkeetna Mountains near Denali National Park and Preserve indicate that increasing recreational snowmobile use is beginning to alter moose use of preferred treeline willow habitats (pers. comm., Herman Griese, ADF&G). In another area, one of the benefits cited for the shortening of a winter hunt near Lake Clark was that there would be less stress to cow moose in gestation from hunters on snowmobiles searching for bull moose through a longer winter season (USFWS, 1999).

Dall Sheep: Several sources cite the loss of habitat and the use of traditional migration routes as concerns associated with bighorn sheep (Constan, 1975; Horejsi, 1976; Reisenhoover et al., 1988; EPFW, 1993). Various recreational activities are known to cause displacement from preferred habitats (Horejsi, 1976; Hicks and Elder, 1979) and fleeing when approached by people (MacArthur et al., 1982). Similar reactions by Dall sheep could be expected when confronted with other forms of human activity such as the presence of snowmobiles.

Bears: A study that examined the disturbance to grizzly bears by seismic survey activities (operation of aircraft, track-mounted drill rigs, geo-phone vehicles, Bombardiers, and snow mobiles) while bears were denning (Reynolds et al., 1984). The report concluded that only

minimal disturbance occurred, however, none of the activities took place immediately at den sites. A study of winter recreation and its effects on hibernating black bears (Goodrich and Berger, 1994) showed that some bears abandoned dens and cubs in response to disturbance and all but one bear remained active after abandonment. Knight (1976) documented an incident where snowmobiles may have disrupted a denning grizzly bear causing the bear to relocate to a second den site. Areas that previously were inaccessible to snowmobiles, including areas used by grizzly bears for denning, would become more accessible in the future as improvements in snowmobile technology allow machines to travel further and faster than was possible in the past. Any impacts that are occurring to denning bears would likely increase in the future because of this.

Wolverine: Denning wolverines appear sensitive to human disturbance in the denning area. Copeland (1996) believes that technological advances in over-snow vehicles and increased interest in winter recreation has likely displaced wolverines from potential denning habitat and will continue to threaten a possibly limited resource. In the Lolo National Forest, Montana, female wolverines in the area are presumed to have abandoned any potential denning areas that experience snowmobile use (USFS, 1998). In an Idaho study (Copeland, 1996), snowshoers caused den abandonment in a cirque basin. Snowmobile use would likely cause den abandonment and probably have a larger disturbance zone because of greater noise, speed and range of movement. Technological advances could also increase the potential for impact to this species in the future.

Lynx: The U.S. Fish and Wildlife Service stated in a proposed rule (63 FR 36993-37013) to list the lynx in the Contiguous United States as a Threatened Species that:

> Elevated levels of human access into forests are a significant threat to Canada lynx because they increase the likelihood of lynx encountering people, which may result in displacement of lynx from their habitats and/or possible injuries or deaths by intentional or unintentional shooting, trapping, and vehicle accidents (Hatler, 1988; Thiel, 1987; Brittell et. al., 1989; Koehler and Brittell, 1990; Brocke et. al., 1991; Andrew, 1992; Washington Department of Wildlife 1993; Brocke et. al., 1993; M. Hunter, University of Maine, pers. comm., 1994). Human access into Canada lynx habitat in many areas has increased over the last several decades because of increasing human populations and increased construction of roads and trails and the growing popularity of snowmobiles and offroad vehicles. In the interior Columbia River basin of Washington, Oregon, Idaho, and Montana, increased human access has decreased the availability of areas with low human activities, which are important to large forest carnivores, including lynx (U.S. Forest Service and Bureau of Land Management, 1997).
>
> Competition during late winter, a time when lynx are already nutritionally stressed, may be especially detrimental to lynx (Koehler and Aubry, 1994). Snowmobile trails and roads that are maintained for winter recreation and forest management activities enable coyotes and bobcats to access lynx winter habitat (Koehler and Aubry, 1994). Snowmobile use in the Great Lakes and Rocky Mountain/Cascades regions has resulted

> in an increase in both human presence and the prevalence of packed snow corridors in lynx habitat. The increased snowmobile use and the increased area in which snowmobiles are used likely diminishes habitat quality for lynx, and also decreases the lynx's competitive advantage in deep snow. This results in an increased threat posed by competitors, as a result of the increase in hard-packed snow trails.

(Note: Lynx populations are considered to be natural and healthy within the old park at this time.)

Characteristics of snowmobiling including dispersal over the landscape, operation at night when lynx are active, alteration of the mobility and distribution of snowshoe hares, and winter operations all point to the activity as being potentially adverse to lynx (Olliff et al., 1999).

Snowshoe Hares and Red Fox: Snowshoe hare (an important prey species for lynx and predatory birds) and red fox mobility have been shown to be affected by snowmobile use (Schmid, 1983). Rongstad (1980) reported that cottontail rabbit home range size increased significantly when snowmobiles were present. Also, Numann and Merriam (1972) found snowshoe hares reducing their use of habitat near snowmobile trails.

Ptarmigan: There is evidence of changes in distribution and habitat use from snowmobile use on these species (Braun, 1971). Local subsistence users have observed similar effects on ptarmigan populations adjacent to the Park from the increasing levels of recreational snowmobile use in that area. (Denali Subsistence Committee, Meeting Notes April 26, 1996, and June 28, 1993).

Small Mammals: Small mammals inhabiting the subnivean environment are adversely affected by snowmobile use. Jarvinen and Schmid (1971) noted increased small mammal mortality beneath compacted snow. They concluded:

> Mortality of subnivean mammals in the area packed by snowmobiles was probably due to a combination of factors that increased winter stress to the point where survival was improbable. Mechanical compaction of snowfields will (1) destroy subnivean air spaces, (2) reduce snow depth, and (3) increase density, thermal conductivity, thermal diffusivity and shear strength of snow. These effects would in turn be inhibitory to mammal movement beneath the snow and at the same time subject subnivean organisms to greater temperature stress. There is also the possibility that air beneath packed snow may become toxic because of abnormal carbon dioxide accumulation.

Members of the public observed that the numerous snowmobile trails frequently seen across open meadows create subsurface "fences" or barriers in the snow that could affect subnivean animals on a larger scale than just a single trail (Kathy Ernst, Talkeetna Public Meeting, November 24, 1998).

Just as in other areas where snowmobile use has been studied, there is a close connection in the old park between predators and this small mammal prey base. If changes in the prey base were to occur, it could also alter predator populations.

Some studies indicate that in certain situations an individual skier can cause a greater wildlife response than a single snowmobile due to the lack of warning noise provided by the skier (Aune, 1981; Cassirer et al., 1992; Eckstein et al., 1979; Freddy et al., 1986). However, some of these studies were conducted on trail systems or in areas where animals were more familiar with snowmobiles and other motorized equipment than with people on foot or skis. Observations in other locations where all types of use were equally unfamiliar to animals or not restricted to trails, such as the Denali situation, demonstrate equal or greater responses to snowmobiles (Aune, 1981). Information on relative impacts also must be considered in the context of the frequency of encounters and the distance at which the animal is likely to be first disturbed. The much larger total area traversed by a snowmobile per unit of time increases the relative effects of snowmobile use in an area when compared with nonmotorized users (Brader, 1974).

Compacted trails also change distribution patterns of animals by providing energy efficient travelways that alter winter survival rates, predation rates, distribution patterns, availability of carrion for use by other species, and levels of human conflict (Meager et al., 1994). Compaction of snow in forage areas can also have other negative effects on wildlife foraging. It increases energy expenditure by ungulates such as caribou that must dig for vegetation in extremely stressful winter months (Fancy and White, 1995).

Research at Denali also indicates that snow depth and winter travel conditions are important factors in winter survival for ungulates and the predators that depend upon them (Adams and Dale, 1998). Public testimony and staff observations indicate that many animals such as moose, caribou, wolves, and other canids all use compacted trails when they are made available to reduce travel-related energy expenditures.

Impacts to Denali Wildlife Distribution and Behavior
Snowmobiles have only recently been able to access high elevation areas. Anticipated levels of snowmobile use represent a greater potential to change wildlife distribution than the current low-level use by non-motorized recreationists.

This alternative would result in the addition of many miles of snowmobile trails and increased snowmobile activity levels throughout all types of habitats. This area of previously protected habitat is particularly vulnerable to increased disturbance given its close proximity to the George Parks Highway. This new pattern of use would be a major change in the level and extent of human activity in this historically undisturbed winter environment, and would leave little opportunity for wildlife avoidance and refuge. It also would represent a significant change from the long-standing patterns of non-intrusive human interaction with wildlife. Consequently, many species likely would be affected by the presence of extensive trail systems and increased encounter rates resulting from anticipated widespread new levels of snowmobile use in the old park.

Encounters and effects on wolves, moose, Dall sheep, bears, wolverine, hares, red fox, ptarmigan, and small mammals would be expected throughout the entire old park area where snowmobiling would occur. Impacts to moose, hares, red fox would likely be more pronounced along river drainages used as travel corridors by snowmobilers because these animals tend to congregate in these areas. Effects would include stress, displacement, temporary abandonment of preferred habitat. Anticipated cross-country snowmobiling across open terrain above tree line would interact with animals such as wolves or wolverines that range widely across such areas. Hill climbing or "high marking" would place snowmobile use in alpine areas near sheep and ptarmigan. Impacts on lynx would be limited due to their use of tall shrub and forested habitat which covers only about one third of the old park area and may be less desirable for snowmobiling. Populations of all the species mentioned are currently at natural and healthy levels. Caribou numbers are at low levels, but the population is still considered to be in good physical condition during most winters.

The most immediate and direct effects would be at the level of changes in the habits of individual animals. These impacts would be distributed over a large area and many individuals due to the likelihood of a widespread pattern of crosscountry use. Population-level effects are possible. This is especially true during severe winters when wildlife is already experiencing a high level of natural stress or limitations on movements.

Any incremental disruptions of natural processes would compromise the long-standing value of this area as a comparative site for scientific studies and as a premier wildlife viewing experience for hundreds of thousands of visitors. Snowmobile use introduces yet another variable into the already complex studies of predator and prey relationships.

Natural variation in the system, which makes certain winters or periods of winters more stressful than others, coupled with the complexity of the old park ecosystem make it difficult to respond quickly to limitations that could decrease the effect of snowmobile use on wildlife health and distribution patterns. These local factors increase the risk that a detrimental effect would occur before sufficient corrective actions could be taken.

Cumulative Effects

The summer disturbance to wildlife is currently confined to the narrow corridor of the park road. The disturbance from backcountry users is not expected to change in the future due to the permitting system in place at the park resulting in stable use levels over the last 20 years. The levels of disturbance to wildlife in and near the old park during summer, when forage is more available for most animals, do not contribute to the severity of impacts from disturbance during the winter when survival is difficult. This would not be expected to change in the future, given the legal limits on motorized and non-motorized activities in the park during the summer.

Some wolves, bears, moose, caribou, and other animals, which spend most of their time inside the park, have large home ranges and are trapped or hunted outside the park. Most of the prey base animals found in the old park, such as hares, squirrels, ptarmigan, and small rodents, would

not move outside the old park boundaries. Population effects in the old park have not been observed for the species that are hunted or trapped outside the park.

The wintertime disturbance to wildlife in and near Denali National Park is predominantly from snowmobile use. People on foot or using dog teams cannot effectively pursue animals across untracked snow because of the slowness of trail breaking, nor do they create the extensive trail networks that are typical in areas regularly used by snowmobiles. High performance snowmobiles can cross almost any snow-covered terrain faster than wildlife and cover many miles in a day in many types of terrain and snow conditions. Under this alternative, which would allow unrestricted snowmobile use, the most significant new disturbance to wildlife in the old park would be from snowmobile use.

The cumulative effects of increased unrestricted snowmobile use in addition to non-motorized access into wild places could result in almost no undisturbed winter habitat for some wildlife species.

Cultural Resources
Winter access to the old park via snowmobiles likely would result in greater numbers of people using the old park, which could increase the risk of vandalism to 13 cabins on the National Register of Historic Places, others eligible for nomination, and other structures that have incomplete documentation. Archeological sites could be exposed to increased disturbance through snowmobile use. Many of these sites are found on exposed ridge that are more likely to blow free of snow and to be exposed to mechanical damage from snowmobile tracks.

Cumulative Effects
Access to the cultural resources of the old park, including summer access by backpackers, has resulted in minimal disturbance to these resources. Future disturbance to the old park's cultural resources (i.e., historic cabins) likely would be due to increased snowmobile use in the old park. The ease of access into the old park by snowmobiles would contribute to the potential for impacts to cultural resources.

Recreation, Visitor Use, and Wilderness Values
Impacts to wilderness values, recreation and visitor use are summarized in Table 3-4.

Table 3-4 Summary of Recreation, Visitor Use and Wilderness Values Impact Causes and Effects

Impact Cause	Effect on Recreation, Visitor Use, and Wilderness Values
Snowmobile use in remote areas	• Natural quiet, solitude, and undisturbed vistas would be diminished. • One of the only areas in Alaska where winter recreation use has been managed for non-motorized activities would be lost. • Snow compaction with subsequent vegetation changes would make some winter trails visible in the summer.

Table 3-4 Summary of Recreation, Visitor Use and Wilderness Values Impact Causes and Effects (cont.)

Impact Cause	Effect on Recreation, Visitor Use, and Wilderness Values
Snowmobile use in recreation areas used by non-motorized recreationists	• Widespread user conflicts would arise between snowmobile users and other recreationists, such as cross-country skiers, skijors, and dog mushers.
Motorized use in designated wilderness	• Wilderness values would be significantly reduced.

General Impact to Recreation, Visitor Use and Wilderness Values
A study in Canada found that non-motorized users, such as cross-country skiers, were negatively impacted by the presence of snowmobiles, whereas snowmobilers tended to be more indifferent to non-motorized users (Jackson and Wong, 1982). This is consistent with public comment received at Denali that indicates that conflicts cannot be resolved unless there is an area where snowmobile use is completely excluded. Relying on multiple use areas as a management tool is not an effective solution because this does not adequately protect the resource values, such as natural quiet and solitude, that are a critical component of many visitors' abilities to enjoy the area. The study also found that cross-country skiers prefer self-propelled, low-impact activities that reflect their desire for solitude, tranquillity, and a relatively undisturbed natural environment. Snowmobile users preferred machine-oriented activities, which provided an outlet for adventurousness and sociability.

In visitor use surveys in Yellowstone and Grand Teton National Parks (Littlejohn, 1996 & 1996a), the noise, pollution, and impacts to wildlife from snowmobile use were reported by many respondents as being the least enjoyable part of the national park experience.

A study in the Sawtooth National Recreation Area (USFS, 1998) found that snowmobile engine noise would likely interrupt the feeling of solitude. Along snowmobile travel routes, noise is most intense as snowmobiles approach and pass; sound should decrease within approximately one mile on either side of the pass (USFS, 1998). People could hear snowmobiles up to two miles away, with the noise easier to hear along ridges in that forested area. Sounds would travel farther above treeline and during colder weather, such as would be the case for most of the use in the old park. One report tells of skiers in the old park hearing a bulldozer 30 miles away outside the park during late winter (NPS, 1977 unpublished). Park staff observations also indicate snowmobile noise can be heard at least five miles away under winter conditions.

Denali Specific Recreation, Visitor Use and Wilderness Values Impacts
The lack of a definition of "traditional activities" within the context of Section 1110(a) of ANILCA would make it difficult, if not impossible, to separate out those uses of snowmobiles which are not for traditional activities. All use of snowmobiles, within the limits of safe operation (36 CFR 2.18), likely would be presumed to be legal. Snowmobile use within the old park would adversely affect the park management goals of preserving the non-motorized, off-road experience and retaining the historical level of resource protection. Opportunities for non-motorized wilderness recreation in Denali National Park and Preserve, would be curtailed or

eliminated if rising snowmobile use levels and expansion of use into the old park are not controlled. These opportunities are dependent on wilderness values, such as solitude, natural sound, surroundings where the imprint of man's work is substantially unnoticed, as well as on a setting where there is an opportunity for a primitive type of recreation. Few areas with these qualities are readily available or adjacent to the road system of Alaska.

User conflicts exist between snowmobile recreationists and such non-motorized recreationists as cross-country skiers, skijors, and dog mushers (public comment and written correspondence, 1998). These conflicts are created by the detrimental effects snowmobiles have on the resource values essential for the continued enjoyment of the area by non-motorized users, principally loss of solitude and ability to hear the sounds of nature due to the presence, noise, and exhaust generated by snowmobiles. This alternative would not provide adequate protection for those values. The number of people experiencing conflict of use in Denali at present is low because snowmobile use has never occurred in large numbers in the area. Although public comment indicated that some former non-motorized users of the south side of the Alaska Range were not returning because of the increased snowmobile use (public comment and written correspondence, 1998). These conflicts and abandonment would increase throughout the old park if snowmobile use were to expand into areas not presently experiencing this type of use. Visitor expectations of a visit to the old park within the mandates that apply to a designated wilderness area would be severely diminished by the use of snowmobiles in the area.

Many of Denali's visitors come to the park with high expectations of being in a non-polluted area. Public testimony leading up to the current temporary closure specifically mentioned that the sight and smell of snowmobile exhaust limited the ability to enjoy park resource values. (Denali public comments, 1998). Any diminishment of air quality or water quality, even if measurements are below the standard level of pollution, would likely be perceived as extreme to those visitors.

Snowmobile use in the winter can negatively affect visitor aesthetics in the summer months. Changes that relate to snow compaction can combine to make some winter trails visible in the summer. The visible evidence left in the summer from vegetation and soil changes created by winter use trails would mar wilderness landscape vistas for visitors to Denali.

Cumulative Effects

Snowmobile use likely would continue to expand into other remote areas of Alaska due to population and technology growth. This would result in increasing loss of opportunities for quiet recreation in other areas, and the value of areas available for these pursuits, including the old park, would increase.

Motorized and non-motorized recreation during winter could adversely affect recreation, visitor use, and wilderness values in the old park. Because of the limits on the use of vehicles in the old park in the summer, and the limited use of airplanes in the old park in the winter, almost all of the potential future winter impacts to wilderness resources/values from vehicles in the backcountry in the old park would be from snowmobile use. Conflicts are created by the detrimental effects snowmobiles have on the resource values that are essential for enjoyment of

the area by non-motorized users. Snowmobile use would be the single most important impact to values such as solitude and natural quiet in the old park during the winter.

Subsistence
Increased snowmobile traffic to the old park, originating mostly in Broad Pass, would diminish subsistence opportunities for small game and trapping in the park additions, by causing displacement of game and tangling or destruction of trap lines. These types of impacts already have been observed in the area adjacent to the old park (Denali Subsistence Commission Meeting Minutes, August 9, 1996). The extent of the impacts would depend on the extent of the increased traffic (see Appendix A).

Park Management
Short- and long-term studies would need to be initiated to evaluate the impacts to park resources from increasing snowmobile use. Topics covered by such studies would include those concerning snowmobile impacts to air and water quality, vegetation, wildlife, subsistence use, wilderness resources, and conflicts with other winter recreationists. There is also a lack of important information on ecosystem level effects. This lack of information further increases the risk of detrimental impacts on resource values. Snowmobile impact studies have generally been conducted on a very small spatial scale and for only short time periods. This review of scientific data found no studies that evaluate the long-term impact of widespread, cross-country travel and multiple trail travel that commonly occurs in Alaska. Even large impact evaluations such as the one from a Montana evaluation (Montana FWP, 1993) and a large review commissioned by snowmobile clubs in Canada (OFSC, 1994) have focused primarily on designated trail systems. These assessments assume mitigation of impacts is possible because the impacts of trails and activity related to the trail can be controlled by routing and because these impacts also will have only limited spatial implications. However, there is no evidence to support this assumption of mitigation in situations where extensive cross-country travel can create disturbances throughout virtually all habitat areas. This lack of long-term ecosystem based studies is a major concern because of Denali's value as a natural system and a benchmark for long-term studies of international importance. To accomplish these studies either internally or through contract, increased park funding would be required.

A significant public information and education effort would be required to inform snowmobile users about safe travel practices and NPS regulations regarding snowmobile use and wildlife protection. To accomplish this effort would require increased park funding.

Enforcement of the regulations (36 CFR 2.18) to promote safe operation of snowmobiles in an NPS unit would require staffing above existing levels.

The lack of a definition of "traditional activities" within the context of Section 1110(a) of ANILCA would make it difficult, if not impossible, to separate out those uses of snowmobiles which are not for traditional activities. All use of snowmobiles, within the limits of safe operation (36 CFR 2.18), would be presumed to be legal. This use within the old park would

adversely affect the park management goals of preserving the non-motorized off-road experience and retaining the historical level of resource protection.

Cumulative Effects
The majority of wintertime management activity in the future would be focused on snowmobile management and snowmobiler education. The ranger staff at Denali presently patrols routes known to be used by dog mushers, skiers, and other non-motorized users. The anticipated use by snowmobilers would require additional patrols, and the majority of these patrols would be in the old park. Patrols would take place over larger areas because of the mobility afforded by snowmobiles, and the patrols would often have to be made on snowmobiles, further impacting the old park's wilderness values. Additional public outreach would be required from the park staff, in cooperation with snowmobile user groups.

Alternative 2: Partial Closure of the Old Park to Snowmobile Use

The area left open to snowmobile use under this alternative (Figure 4) has experienced virtually all of the past snowmobile use in the old park in recent years.

The impacts of this alternative are similar to the No Action Alternative for the approximately 180,000 acres of the old park proposed to be open to snowmobile use. General impacts are described in more detail for the No Action Alternative. The impacts specific to the old park are presented below.

Air and Water Quality
Localized, short-term concentrations of carbon monoxide and other air pollutants would occur in areas where snowmobiles were used. Snowmobile use would diminish the air quality in the 180,000 acre area. This diminishment to air quality likely would be below the federal standards for pollution. However, those standards do not consider that most backcountry areas of Denali have had little exposure to pollution. Impacts to air and water would be greatest under this alternative because any future use would be concentrated in this portion of the old park.

Unburned hydrocarbons would accumulate on the snow surface and eventually wash into streams and lakes, causing localized degradation of the high water quality of the old park. This diminishment to water quality appears to be below the federal standards for pollution. This cannot be established with certainty until further research is conducted. Also, those standards do not consider that most backcountry areas of Denali have had little exposure to pollution. Those standards do not take into account that many of Denali's visitors come to the park with high expectations of being in a non-polluted area. Any diminishment of water quality, even if measurements are below the standard level of pollution, becomes extreme to those visitors.

Even minor impacts to water and air quality from non-point source pollution would have impacts on the current importance of the old park as a significant site for long term monitoring. For

example, a long term water quality monitoring site was just recently placed in the Dunkle Hills area that is intended to be a experimental control site for the Susitna River Basin.

Cumulative Effects
Pollution from snowmobile traffic is in addition to the pollution contributed by busses, administrative traffic, and transport of industrial pollutants from Eurasia. In winter, snowmobiles likely would be the largest contributor to air quality impact in the park. This is especially true in the 180,000-acre area, which is currently less affected than the north side of the Alaska Range by these other sources of pollution. No other water pollution sources besides snowmobiles have been identified for the old park. The ability to use Denali as a long-term reference site for pollution studies could be compromised by the addition of pollutants from snowmobiling in the 180,000 acres of the old park that would be open to snowmobile use.

Vegetation, Soils, and Wetlands
Given the extensive area under consideration in this alternative, it is difficult to determine the amount of snow cover that is needed to prevent damage to vegetation and soils. Staff observations of snow pack conditions in this area in 1999 indicate that adequate snow cover to protect vegetation does not occur uniformly over the area. This is due to variation in terrain, snow depth, and snow pack characteristics such as crusts, snow density, or layers within the snowpack. Therefore, if any level of use is allowed in an area, damage to vegetation is likely at some locations within the 180,000-acre area. Park staff have observed damage to vegetation from the low levels of use in the area during the past few years.

Having enough snow to barely cover vegetation may not be adequate to protect vegetation. Staff observations of the snow conditions at Denali indicate that snowmobile tracks may sink down well into snowpack depending on the characteristics of the snowpack. Consequently, vegetation that may appear to be protected is actually susceptible to abrasion.

Impacts likely would be more severe in this 180,000-acre area than at the other locations referenced in the literature. Field observations in this area show that the snowpack lasts longer and is more compacted and dense in snowmobile trails. Trail formation would create artificial changes in soil temperatures and moisture content and vegetation species composition along re-used routes. Where the snow depth is shallower, such as in wind-scoured snow free zones, it is likely that widespread damage to exposed soil, plants and lichens would occur.

Impacts to shrub communities likely would be less in this alternative due to greater snow depth in the area and the fact that three quarters of the old park is at or above shrubline. It cannot be determined with out further research that the likely impacts to the alpine vegetation in this area would be any different than in other portions of the old park.

Use across open areas such as meadows, lakes, or open slopes, is not typically confined to single narrow corridors. Staff observations indicate that snowmobile use often occurs in the form of multiple parallel trails, in some cases as much as 100 meters wide and extending for over 2

miles. The expansiveness of these trail corridors multiplies the potential impacts of snowmobile use on vegetation and soils.

Impacts from snowmobile use to the sensitive vegetation and permafrost soils of the subarctic found in the 180,000 acre area of the old park would increase the creation of permanent trails, soil erosion, damage or loss of vegetation, and the delay or permanent prevention of recovery once the impact to soils and vegetation has occurred.

Cumulative Effects
The vegetation, soils, and wetlands of the old park are subject to air and water pollution from motorized vehicles within the park. Vegetation impacts from off-road hiking is at equilibrium due to limits which have stabilized use for the past twenty years. Negligible impacts would occur in the 180,000-acre area due to these things. Most damage to vegetation, soils, and wetlands would be from snowmobile use. No mechanized vehicles in the backcountry of the old park other than snowmobiles come in direct contact with the vegetation and soils. Snowmobile use in 180,000 acres of the old park would represent a widespread new source of impacts to vegetation from human use. If trails through vegetation, such as willows, were created through winter snowmobile use, those trails could be selected for use by summer hikers, creating more use and damage along trail corridors.

Wildlife Values and Habitat
Harassment of wildlife, both purposeful and unintended, would be unavoidable under this alternative. The large area that would be open to travel would make the prevention of intentional harassment through patrols essentially impossible. The cross-country nature of snowmobile travel and the rates of speed that likely would occur would make unintended harassment events inevitable.

Stress Impacts on Denali Wildlife Values and Habitat
Under this alternative there would be many additional miles of snowmobile trails and increased snowmobile activity levels throughout all types of habitats. This area of previously protected habitat is particularly vulnerable to increased disturbance, given the easy access afforded by its close proximity to the George Parks Highway. This new pattern and anticipated increasing level of use would represent a significant change from the long-standing patterns of non-intrusive human interaction with wildlife, and would adversely affect many animals over the 180,000 acre area. Consequently, the stress created by any alterations in winter habitat use or energy expenditures would occur at a level of more than just a few individuals adjacent to a single trail.

Any increase in stress through added energy expenditure or loss of preferred habitat is a concern in the difficult times of winter. Generally, animals such as caribou and moose are in good condition during the winter, but this may vary significantly depending on conditions such as snow depth or crusts. During difficult winters when snowfall is deep, stress to wildlife that are already weak could be more pronounced due to disturbance from snowmobiles. Snow conditions that are bad for wildlife may be good for travel by snowmobile. Snowmobile use is likely to occur at higher levels and reach into more areas when there is good snow cover. Effects on

individual animals would occur. The occurrence of any population level effects would likely depend upon the severity of the winter and the level and spatial extent of snowmobile use. Any effects would be most likely to occur during mid-to-late winter when wildlife is most likely to be in a nutritionally-stressed condition. For example, bears, which are present and den in this 180,000-acre area of the old park, emerge from their dens in spring when snow cover often is still adequate for snowmobiling.

Many raptors, including gyrfalcons, golden eagles, northern goshawks, northern hawk owls, great horned owls and boreal owls, begin their nesting activities in early March in Denali when snow cover often is adequate for snowmobiling. If additional stress caused by human disturbance occurred during this critical portion of the nesting cycle, it would disturb nesting raptors and could cause nest abandonment. Nesting areas for the forest dwelling species is limited in this 180,000-acre area so the impact would be reduced accordingly.

If changes in birth rate and survival of young and mortality of older animals occurred, it could, in turn, cause changes in predator/prey relationships. This would compromise the value of this 180,000-acre area of the old park as a site for comparative studies. Also, any changes related to increase stress would be difficult to distinguish from the effects of natural stress. The introduction of yet another variable could further complicate the research that is being conducted in this area because it would be difficult to determine what changes are related to natural process or human activities. Currently, human activity and the resultant impacts in the this area is negligible. This alternative would change that situation and possibly alter the ability to use this portion of the old park as a control site for important scientific studies.

Impacts to Denali Wildlife Distribution and Behavior
Snowmobiles have only recently been able to access high elevation areas. Anticipated levels of snowmobile use represent a greater potential to change wildlife distribution than the current low-level use by non-motorized recreationists.

This alternative would result in the addition of many miles of snowmobile trails and increased snowmobile activity levels throughout all types of habitats in the area of the old park left open to snowmobile use. This area of previously protected habitat is particularly vulnerable to increased disturbance given its close proximity to the George Parks Highway. This new pattern of use would be a major change in the level and extent of human activity in this historically undisturbed winter environment, and would leave little opportunity for wildlife avoidance and refuge. It also would represent a significant change from the long-standing patterns of non-intrusive human interaction with wildlife. Consequently, it is likely that many would be effected by the presence of extensive trail systems and increased encounter rates resulting from anticipated widespread new levels of snowmobile use in the portion of the old park left open to snowmobile use.

Encounters and effects on wolves, bears, wolverine, hares, red fox, ptarmigan, and small mammals would be expected to occur throughout the entire area. Impacts to moose, hares, red fox are likely to be more pronounced along river drainages that will be used as travel corridors by snowmobilers. Extensive cross country travel across open terrain above tree line would

interact with animals such as wolves or wolverines that range widely across the area. Hill climbing or "high marking" would place snowmobile use in alpine areas near ptarmigan and Dall sheep.

Impacts on lynx would be less under this alternative than in Alternative 1 due to the lack of extensive habitat in this 180,000 acre area. Caribou and Dall sheep also do not have a major presence in this area during winter months. Dall sheep, for example, are restricted to only the Windy Creek drainage at this time of year and the Denali caribou herd winters primarily on the north side of the Alaska Range.

The most immediate and direct effects would be at the level of changes in the habits of individual animals in this portion of the old park. These impacts would be distributed over a large area and may individuals due to the likelihood of a widespread pattern of crosscountry use. Population level effects are possible and this impact cannot be ruled out until there is further research. This concern is especially true during severe winters when wildlife is already experiencing a high level of natural stress or limitations on movements.

Incremental disruptions of natural processes, as described above, would compromise the long-standing value of this area as a comparative site for scientific studies and the wildlife viewing experience for hundreds of thousands of visitors. Snowmobile use introduces yet another variable into the already complex studies of predator and prey relationships.

Cumulative Effects

The wintertime disturbance on wildlife in and near Denali National Park and Preserve is predominately from snowmobile use. People on foot or using dog teams cannot effectively pursue animals across untracked snow because of the slowness of trail breaking nor do they create the extensive trail networks that are typical in areas regularly used by snowmobiles. High performance snowmobiles can cross almost any snow-covered terrain faster than wildlife and cover many miles in a day in many types of terrain and snow conditions.

Some wolves, bears, moose, caribou, and other animals, which spend most of their time inside the park, have large home ranges and are trapped or hunted outside the park. Most of the prey base animals found in the old park, such as hares, squirrels, ptarmigan, and small rodents, would not move outside the old park boundaries. Population effects in the old park have not been observed for the species that are hunted or trapped outside the park.

The levels of disturbance to wildlife in and near the old park during summer, when forage is more available for most animals, do not contribute to the severity of impacts from disturbance during the winter when survival is difficult. This would not be expected to change in the future, given the legal limits on motorized and non-motorized activities in the park and preserve.

The cumulative effects of increased motorized and non-motorized access into wild places could result in almost no undisturbed winter habitat for some wildlife species.

Cultural Resources

Access to cultural resources, including summer access by backpackers, has resulted in minimal disturbance to the park's cultural resources. Most future disturbance to the cultural resources in the 180,00-acrea area likely would be from snowmobiles. Winter access to the 180,000 acres of the old park via snowmobiles could increase the risk of vandalism to 2 cabins on the National Register of Historic Places and to other structures that have incomplete documentation. Some archeological sites found on ridges would be exposed to increased disturbance through snowmobile use. These areas are more likely to be exposed due to windblown conditions and could be damaged by abrasion from snowmobile tracks or skis.

Cumulative Effects

Other access to these cultural resources, including summer access by backpackers, has resulted in minimal disturbance to the park's cultural resources. No cumulative effects to the cultural resources of the old park have been identified.

Recreation, Visitor Use, and Wilderness Values

Opportunities for non-motorized wilderness recreation, which is dependent on wilderness values such as solitude and natural sound, would be curtailed or eliminated within the 180,000 acre area of Denali National Park and Preserve if rising snowmobile use levels and expansion of use into that area are not controlled. Few other areas with all these qualities are available on the south side of the Alaska Range.

Many of Denali's visitors come to the park with high expectations of being in a non-polluted area. Public testimony leading up to the current temporary closure specifically mentioned that the sight and smell of snowmobile exhaust limited the ability to enjoy park resource values. (Denali public comments, 1998). Any diminishment of air quality or water quality, even if measurements are below the standard level of pollution, would be perceived as extreme to those visitors.

User conflicts exist between snowmobile recreationists and such non-motorized recreationists as cross-country skiers, skijors, and dog mushers (Public comment and written correspondence, 1998). These conflicts are created by the detrimental effects snowmobiles have on the resource values that are essential for enjoyment of the area by non motorized users, principally due to loss of solitude and primitive and unconfined recreation from the presence, noise, and exhaust generated by snowmobiles. This alternative would not provide adequate protection for those values.

The number of people experiencing conflict of use in this portion of Denali at present is low, although public comment indicated that some former non-motorized users of the south side of the range were not returning because of the increased snowmobile use (Public comment and written correspondence, 1998). These conflicts would increase throughout the area if snowmobile use were to expand into times of winter and parts of this area not presently experiencing this type of use. Visitor expectations of a wilderness visit to this area of the old park would be severely diminished by the use of snowmobiles in the area.

Snowmobile use in the winter can negatively affect visitor aesthetics in the summer months. Changes that relate to snow compaction can combine to make some winter trails visible in the summer. The visible evidence left in the summer from vegetation and soil changes created by winter use trails would mar wilderness landscape vistas for late spring visitors to Denali.

The 180,000-acre area that would remain open under this alternative would provide an additional opportunity for snowmobilers to recreate in mountain terrain near a major highway. Loss of the opportunity to operate a snowmobile within approximately 1.8 million acres of the old portion of the park would have a negative impact on the group of recreationists who desire that experience. However, since almost all of Alaska adjacent to major road corridor is open to snowmobile use, this loss of a recreational opportunity is not considered significant relative to the loss of opportunity that would be experienced my nonmotorized users under this alternative.

Cumulative Effects
Summer activities or activities outside the park likely would not affect recreation in the 180,000-acre area of the old park during winter. Snowmobile use likely would continue to expand into other remote areas of Alaska due to population and technology growth. This would result in increasing loss of opportunities for quiet recreation in other areas, and the value of areas available for these pursuits, including the old park, would increase.

Snowmobile use would be the major cause of impact to park values, such as solitude and natural quiet, in the 180,000-acre area of the old park.

Subsistence Use
Increased snowmobile traffic to the old park, originating mostly in Broad Pass, would diminish subsistence opportunities for small game and trapping in the park additions, by causing displacement of game and tangling or destruction of trap lines. The extent of the impacts would depend on the extent of the increased traffic (see Appendix A).

Park Management
Short- and long-term studies would need to be initiated to evaluate the impacts to park resources from increasing snowmobile use. Topics covered by such studies would include those concerning snowmobile impacts to air and water quality, vegetation, wildlife, subsistence use, wilderness resources, and conflicts with other winter recreationists. To accomplish these studies either internally or through contract, increased park funding would be required.

A public information and education effort would be required to inform snowmobile users about safe travel practices and NPS regulations regarding snowmobile use and wildlife protection. To accomplish this effort would require increased park funding. Enforcement of the regulations (36 CFR 2.18) to promote safe operation of snowmobiles in an NPS unit would require staffing above existing levels. An increase in expenditures for the enforcement of the snowmobile closure in the majority of the old park would be anticipated. This would primarily consist of aircraft overflights and patrols using snowmobiles.

The lack of a definition of "traditional activities" within the context of Section 1110(a) of ANILCA would make it difficult, if not impossible, to separate out those uses of snowmobiles which are not for traditional activities. All use of snowmobiles, within the limits of safe operation (36 CFR 2.18), likely would be presumed to be legal. This use within the old park would adversely affect the park management goals of preserving the non-motorized off-road experience and retaining the historical level of resource protection.

Cumulative Effects
Wintertime management activity in the future would be focused on snowmobile management and snowmobiler education. The ranger staff at Denali presently patrols routes known to be used by dog mushers, skiers, and other non-motorized users. The anticipated use by snowmobilers would require additional patrols, and the majority of these patrols would be in the 180,000-acrea area of the old park. Patrols would take place over larger areas because of the mobility afforded by snowmobiles, and the patrols would often have to be made on snowmobiles, further impacting the wilderness values of the 180,000-acre area of the old park. Additional public outreach would be required from the park staff, in cooperation with snowmobile user groups.

Alternative 3: Temporary Closures of the Old Park to Snowmobile Use
The impacts of this alternative would be the same as those discussed for Alternative 4; however, with respect to effects on park management, additional staff time and effort would be required to revisit and renew the temporary closure each year.

Alternative 4: Permanent Closure of the Old Park to Snowmobile Use (Preferred Alternative)

Air and Water Quality
The use of old park as a national and international benchmark site for long-term monitoring would not be compromised because snowmobile use would not occur in the old park. Visitors would continue to experience air and water quality values that have not been diminished by the addition of a new source of pollution that does not currently exist in the area.

Cumulative Effects
Pollutants contributed by busses, administrative traffic, and transport of industrial pollutants from Eurasia would be the largest contributor to adverse air quality in the old park. No cumulative effects would be anticipated for water quality.

Vegetation, Soils, and Wetlands
Park visitors would not encounter additional signs of human activity beyond the levels that result from current non-motorized backcountry uses such as dog sledding. Signs of vegetation damage would not impair wilderness vistas. There would be no increase in the alteration of wildlife habitat.

Cumulative Effects
The vegetation, soils, and wetlands of the old park are subject to air and water pollution from motorized vehicles within the park. The impacts to vegetation from the summer use of vehicles in the park are limited to the road corridor and are largely unchanged in magnitude since the road was built 70 years ago. Vegetation growing on the park road fill slopes or backslopes tends to grow faster due to increased soil warmth and road runoff, although this impact is restricted to the road corridor. Vegetation impacts from off-road hiking is at equilibrium due to limits which have stabilized use for the past 20 years.

Wildlife Values and Habitat
This alternative would insure protection of internationally significant wildlife values and habitat. This alternative would prevent the incremental disruptions of natural processes that would ultimately compromise the long-standing value of the old park as a comparative site for scientific studies and the wildlife viewing experience for hundreds of thousands of visitors. It would prevent the introduction of yet another variable into the already complex studies of predator and prey relationships.

Cumulative Effects
Cumulative effects to wildlife and wildlife habitat would be from visitor and vehicle use along the park road in summer, from day-hiking and backpacker use in summer, and from non-motorized use by dog mushers and skiers in winter. The magnitude of these uses is currently is stable and limited, and the uses also are monitored and regulated so that the future effects from these uses are expected to be minimal, as past experience with these uses has indicated.

Cultural Resources
There would be no impact to cultural resources under this alternative.

Cumulative Effects
Access to the cultural resources of the old park, including summer access by backpackers in summer and access by non-motorized visitors in winter, has resulted in minimal disturbance to these resources. There is no reason to expect this would remain the case, since these uses are stable and limited and would be expected to continue to be stable and limited.

Recreation, Visitor Use, and Wilderness Values
This alternative does not separate out those uses of snowmobiles that are not for traditional activities. Therefore, this alternative would neither diminish nor alter access now enjoyed by snowmobile users on the remaining two-thirds of park and preserve land, an area of approximately four million acres. It would result in the loss of opportunity to operate a snowmobile in the old park and would be perceived as a negative consequence of the closure by those who desire that experience. However, since two-thirds of Denali National Park and Preserve and the vast majority of Alaska adjacent to road corridors is open to snowmobile use, this loss is not considered significant.

At the same time, this alternative would provide a benefit to those who desire an experience in the old park wherein mechanized sounds are virtually absent, consistent with the Wilderness Act. The old park would continue to provide a unique resource to those members of the public who seek solitude, natural quiet, and a non-motorized winter park experience because it is relatively accessible, compared to the rest of Alaska. It would remain one of the few areas currently available with these qualities that is readily available or adjacent to the road system of Alaska. The low density, non-motorized winter recreation that has developed in this area through the last 82 years of National Park Service management would continue.

Cumulative Effects
The NPS has a permit system for the old park to ensure a high quality experience for visitors, whether in a concentrated situation, such as viewing wildlife and scenery from a bus along the park road, or in dispersed situations, such as hiking in the wilderness off the road. Establishing limits has retained a high-quality visitor experience. This alternative would preserve the high-quality wilderness values of the old park and the visitor uses that rely on these values.

Subsistence Use
Subsistence is not permitted in the old park. There would be no significant impact to subsistence use under this alternative because there is currently only limited and recent snowmobile use within one edge of the old park. Therefore, a permanent closure would not redirect any significant level of snowmobile use toward adjacent lands where subsistence use is permitted. There is more likely to be a net benefit to subsistence users because increasing levels of snowmobile traffic enroute to the old park would not occur. This would ultimately reduce impacts on adjacent lands were subsistence activities are permitted. Further analysis is presented in Appendix A.

Park Management
Enforcement of the closure of snowmobile use within the old park could require staffing above existing levels, but not to the levels required by alternatives one and two. Enforcement would consist primarily of aircraft overflights along with a continuation of ranger patrols by dog sled in the old park and snowmobile patrols in the new park additions. By reserving the old park for non-motorized visitor use, this alternative would contribute to the park's goal of ensuring a spectrum of visitor opportunities within Denali National Park and Preserve.

Cumulative Effects
The majority of wintertime management activity in the future probably would be on snowmobile management in the new park additions and snowmobiler education, for which additional park funding and staffing would be needed. The anticipated use by snowmobilers in the new park additions would require additional patrols, and the majority of the patrols would be in the new park additions.

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