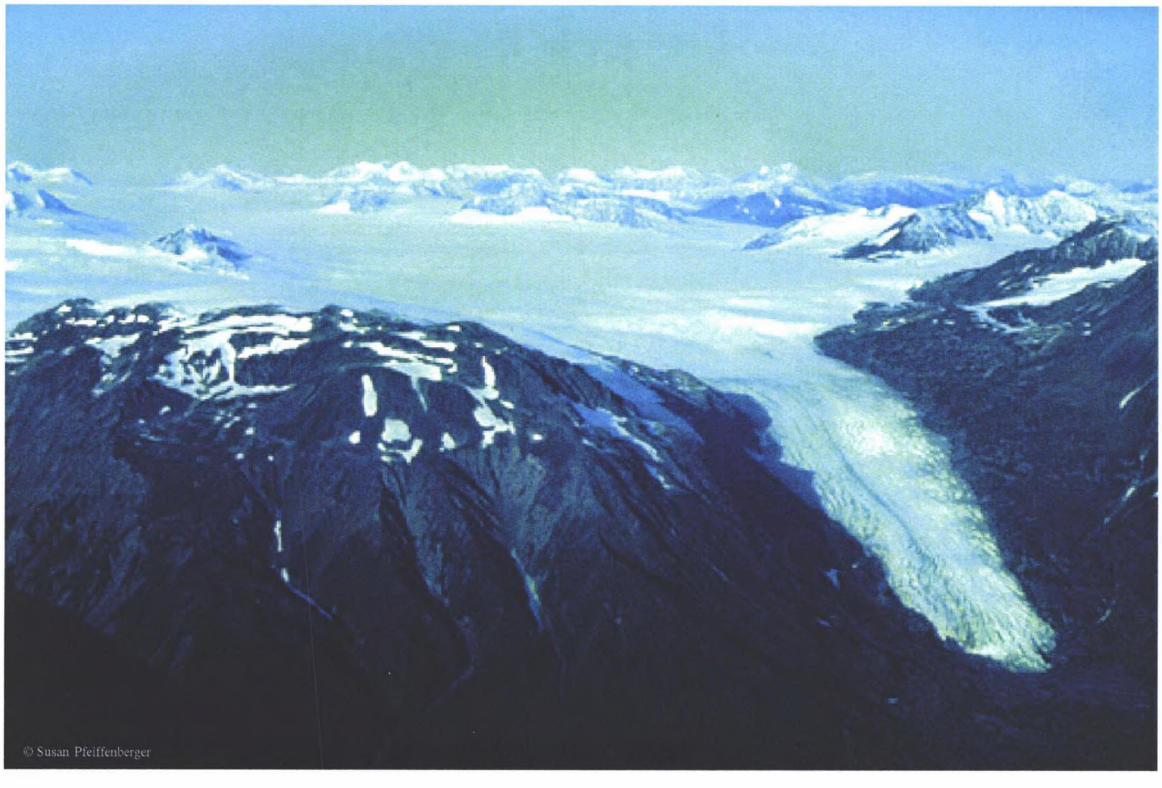
Kenai Fjords National Park

Exit Glacier Area Plan

Environmental Assessment and General Management Plan Amendment



May 2004

186/138304

United States Department of the Interior

NATIONAL PARK SERVICE
Kenai Fjords National Park
P O Box 1727
Seward, Alaska 99664

IN REPLY REFER TO.

L7617 (AKSO-RER)

April 12, 2004

Dear Public Reviewer,

Enclosed for your information and review is the environmental assessment (EA) for the Exit Glacier Area Plan in Kenai Fjords National Park. The EA was completed in accordance with the National Environmental Policy Act of 1969, and the regulations of the Council on Environmental Quality (40CFR 1508.9).

The environmental assessment also is available for review at the following website: www.nps.gov/kefj/home.htm and click on Park Issues.

Public comments on the environmental assessment will be accepted from May 3 to June 1, 2004. Written comments on the environmental assessment may be addressed to:

Kenai Fjords National Park
Attn: EG Plan
P.O. Box 1727
Seward, Alaska 99664
Email: kefj_eg_plan@nps.gov

Thank you for your interest in Kenai Fjords National Park.

Anne Castellina
Superintendent

Exit Glacier Area Plan

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Kenai Fjords National Park
National Park Service

U.S. Department of the Interior
Seward, AK

May 2004

SUMMARY

The National Park Service (NPS) developed this *Exit Glacier Area Plan/ Environmental Assessment and General Management Plan Amendment* to provide guidance on the management of the Exit Glacier area of Kenai Fjords National Park over the next 20 years. The approved plan will provide a framework for proactive decision making on such issues as natural and cultural resources, visitor use, and park development, which will allow park managers to effectively address future problems and opportunities. The plan also will institute a carrying capacity framework to measure and monitor resource conditions and visitor uses and experiences and implement management actions to protect visitor satisfaction.

The *Exit Glacier Area Plan* responds to the 1996 Frontcountry Development Concept Plan (DCP) which directed the park to complete a carrying capacity study prior to taking additional management actions at Exit Glacier. This plan fulfills that directive by identifying the overall desired resource conditions and visitor experiences for Exit Glacier. Increases in visitor use at Exit Glacier further support the need for a carrying capacity study.

Alternatives

The planning team developed four alternatives for managing visitor uses and resources in the Exit Glacier study area. Each alternative presents a different management approach for directing visitor use. The alternatives were based on the park's purpose and significance, park mission, other legal mandates and policies, park issues, public views, and information on visitor use patterns and park resources.

The **no-action alternative** provides a baseline for evaluating the changes and impacts of the three action alternatives. Under this alternative, park managers would continue to manage the park as it has in the past, relying on existing plans and policies. No new construction or major changes would occur, except for already approved developments. Existing park facilities would be operated and maintained as they have in the past. No visitor carrying capacity or other new visitor management initiatives would be implemented.

The **preferred alternative** is the plan recommended by the National Park Service and is the environmentally preferred alternative. Under this alternative, park managers would make changes to proactively address impacts resulting from increased levels of visitor use. The Exit Glacier area would be zoned to ensure that resources were protected and that opportunities were provided for a range of visitor experiences. The focus of this alternative would be to enhance the opportunities to view Exit Glacier, which is the main attraction of the area, and to provide for additional non-motorized recreational opportunities.

A visitor carrying capacity framework for the area would be established to preserve and protect natural and cultural resources and the visitor experience. The framework would

be based on the management zones prescribed by the preferred alternative. Resource and visitor experience indicators and standards would be developed in a subsequent planning process to ensure that resources were protected and that opportunities were provided for visitor enjoyment. If conditions were determined to be deteriorating, appropriate management actions would be taken to ensure that resources and visitors' opportunities for positive recreational experiences would not be degraded or lost.

In summer, major actions would include constructing a bike path on the north side of the entrance road, constructing two new trails (the Paradise Valley Trail and the Unnamed Peak Trail), additional educational signs and exhibits, improvements to the Overlook Loop Trail, and the construction of a gathering pavilion.

In winter, major actions would include closing the Visitor Facilities and Pedestrian zones to motorized vehicles other than on the road and parking lot (although motorized use would continue to be allowed in other zones), grooming the bike path and the trail to the glacier for non-motorized winter recreation, using a snow coach to bring school groups and other visitors to the Exit Glacier area, and providing ranger-led winter activities out of the Nature Center.

Alternative A would focus on improving interpretation, education, and non-motorized recreation, but would rely more on increased staffing and program development than on physical development to do so. The goal of this concept is to transform Exit Glacier from a "photo-op" of the glacier to an education experience. Like the preferred alternative, park managers would apply management zones to proactively manage visitor use and would establish a carrying capacity framework.

In summer, major actions would include providing curriculum based education programs for students, expanded ranger-led programs and teacher workshops, construction of a wetland viewing platform, educational signs and exhibits, and converting social trails along Exit Creek into an official trail.

In winter, major actions would include reducing motorized vehicle use to the road and in the parking lot, offering additional overnight accommodations in the form of temporary structures such as yurts, providing ranger-led winter activities out of the Nature Center, marking or grooming trails for non-motorized winter recreation.

Alternative B promotes increasing the infrastructure of the Exit Glacier area to accommodate a greater number of visitors and recreational activities year-round. Visitor demand and economic feasibility would determine if the major actions would be implemented. Like the preferred alternative, park managers would apply management zones to proactively manage visitor use and would establish a carrying capacity framework.

In summer, major actions would include constructing a bike path on the north side of the entrance road, constructing four new trails (the Paradise Valley Trail, the Exit Creek Trail, the Forest Loop Trail, and the Goat Ridge Trail) and new trailhead parking,

constructing an RV campground and expanding the existing tent campground, constructing a hostel-style lodge, and installing telephone and electric services.

In winter, major actions would include bringing visitors to the area via snow coach, offering overnight accommodations at the hostel and in the form of temporary structures such as yurts, scheduling ranger-led activities at the Nature Center, designating the bike path and the Forest Loop Trail for non-motorized winter recreation, and allowing motorized vehicle use in designated areas including the road and parking lot, in the outwash plain to within 50 yards of the glacier terminus, and in the Exit Creek Trail corridor and the Paradise Valley Trail corridor.

Environmental Consequences

Each alternative was evaluated to determine effects on natural resources, cultural resources, visitor experience, the socioeconomic environment, park operations, and safety. Both adverse and beneficial impacts were identified. A summary of impacts associated with each alternative is provided in Table 5. The most substantial impacts are summarized below. If a resource category is not discussed, it is because it would not result in major or moderate impacts.

Relatively few moderate adverse impacts would be associated with the alternatives, and none would have major impacts. This is because the National Park Service is required to avoid, minimize, and mitigate potential project impacts to the greatest extent possible during the planning and implementation processes so that substantial adverse impacts do not occur to park resources and visitor experiences.

Under the **no-action alternative**, minor adverse impacts on natural resources would occur in some sites throughout the Exit Glacier area due to human use. There would be moderate impacts on floodplain resources or function, as alterations to floodplains would continue in order to prevent damage to infrastructure. Moderate adverse impacts on air quality would occur as snowmachine and woodstove use would continue, and increased vehicle emissions would be expected to increase correspondingly with visitation. Moderate impacts on vegetation would occur from continued off-trail foot traffic. Left unmanaged, growth in snowmachine use could likely lead to moderate adverse impacts to wildlife in the Exit Glacier area.

The **preferred alternative** would result in minor adverse impacts on natural resources in some sites throughout the Exit Glacier area from human use and the construction of new facilities. There would be moderate impacts on floodplain resources or function as changes to protect infrastructure would continue and are expected to be long-term. Moderate impacts on vegetation would occur from construction of new trails and bike path. Moderate impacts to wildlife from new trails and actions designed to promote increased winter visitation are those most likely to impact wildlife by spatially and temporally altering human intrusions on wildlife. There would also be a moderate impact on the visitor experience in the winter due to limitations on where snowmachine activity would be allowed and due to the implementation of a new winter interpretive program

that would attract more visitors to the area. By NPS preferring motorized vehicle use in winter on the road and in the parking lot, some visitors might not be able to access the park where they wanted to, or in the manner they desired. No major adverse natural resource or social impacts would be expected.

Alternative A would have similar minor adverse impacts as the preferred alternative on natural resources throughout the Exit Glacier area from human use and the construction of new facilities. There would be moderate impacts on floodplain resources or function as changes to protect infrastructure would continue and are expected to be long-term. Moderate impacts to wildlife from new trails and increased winter visitation are those most likely to impact wildlife by spatially and temporally altering human intrusions on wildlife. Moderate impacts would also occur to the visitor experience in winter. The key factors involved are limiting where snowmachine activity is allowed, the implementation of a new winter interpretive program, and the potential addition of a concessionaire-operated yurt system. By reducing motorized vehicle use in winter to the road and in the parking lot, some visitors might not be able to access the park where they wanted to or in the manner they desired. New programs and activities in the shoulder and winter seasons would bring in more visitors during periods when the area normally experiences low visitation. No major adverse natural resource or social impacts would be expected.

Alternative B would result in more impacts than the other alternatives. There would be moderate impacts on several resources. Impacts to floodplain resources or function would be moderate as changes to protect infrastructure would continue and are expected to be long-term. Moderate impacts to vegetation would occur as areas of vegetation would be permanently removed, there would be potential for spread of exotic plants via road and trail vectors, and vegetation trampling may lead to changes in habitat types. Moderate impacts to air quality would occur as vehicles and their associated emissions in the study area would increase. Although some of the impacts to the soundscape would be transient (seasonal) or limited to construction of discrete projects, adding overnight facilities year-round would create moderate impacts to natural quiet in the long-term. Impacts to visitor safety would be moderate as multi-use trails in winter and several miles of new hiking trails pose higher potential for injuries to occur. Moderate impacts to soils would be associated with the construction of new routes, trails, infrastructure, and the normal impact from trampling that typically occurs along margins of trails. There would also be moderate impacts on the visitor experience in both summer and winter. The key factors involved are large increases in overnight visitor use as a result of the addition of a small lodge, RV campground, expansion of the tent campground, and a winter yurt operation. Also, there would be several miles of additional hiking trails that would markedly increase the length of stay and open up new areas for visitor access. In general, the distribution of visitor activities would change significantly as a result of longer visits and additional facilities. Moderate impacts on wildlife would occur as a result of new trails, the lodge and RV campground, and actions designed to promote increased winter visitation by spatially and temporally altering human intrusions on wildlife. Species most likely to be impacted by the proposed actions include moose, brown bear, wolves, wolverine, lynx, and nesting songbirds.

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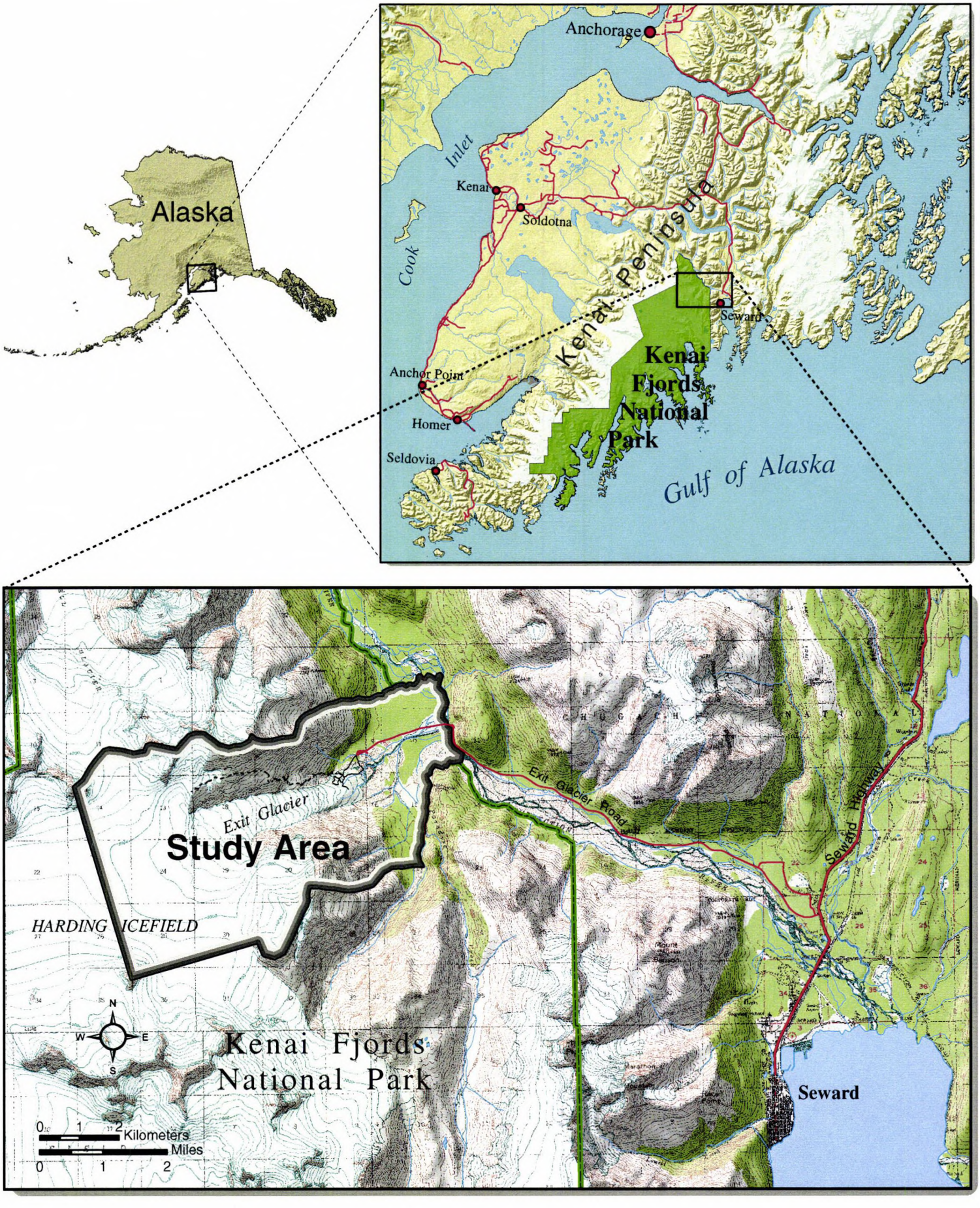
Purpose and Need

Exit Glacier Project Study Area and Vicinity



PURPOSE OF ACTION

Exit Glacier provides visitors with a rare opportunity to easily approach a glacier on foot. Visitors can drive within one-half mile of the glacier terminus and walk a relatively easy path to the towering face of ice. Access via foot travel to the Harding Icefield is also provided in this area on the scenic and rugged Harding Icefield Trail that leads visitors through sensitive alpine habitat.

The purpose of the *Exit Glacier Area Plan* is to clearly define a direction for resource preservation and visitor use in the Exit Glacier area of Kenai Fjords National Park so that we can preserve the special experience at this unique locale, add additional visitor opportunities such as education and hiking, and manage user conflict. This plan will provide a foundation for proactive decision making and will describe desired natural and cultural resource conditions and visitor experiences that are to be achieved and maintained in the Exit Glacier area over the next 15 to 20 years.

The park, including the Exit Glacier area, has been operating under a General Management Plan (GMP) that was prepared in 1984 and a Frontcountry Development Concept Plan (DCP) that was prepared in 1996. Once approved, this plan will amend the 1984 GMP for Kenai Fjords National Park for the Exit Glacier area and will replace the 1996 Frontcountry DCP.

The National Park Service has prepared this Environmental Assessment to evaluate the potential environmental impacts of the proposed plan alternatives and to inform and seek input from the public, regulatory agencies, and other interested parties. Implementing the plan may require promulgation of special regulations and public advisories in consultation with other federal and state agencies and the public. This Environmental Assessment has been prepared according to the National Environmental Policy Act of 1969 and regulations of the Council of Environmental Quality (40 CFR Part 1500).

NEED FOR ACTION

The 1984 GMP established broad goals for management of the Exit Glacier area. Specific area developments for Exit Glacier were approved in the1996 Frontcountry DCP, and most have been constructed (road improvements, parking lot expansion, campground upgrades, and new sanitary and power facilities). Although the DCP called for moderate development in the Exit Glacier area to accommodate a growing number of visitors, it directed the park to complete a carrying capacity study prior to taking additional management actions. This plan would fulfill that directive by identifying the overall desired resource conditions and visitor experiences for Exit Glacier. The monitoring of indicators to determine whether standards are met will commence once this plan is approved and implemented.

Increases in visitor use at Exit Glacier further support the need for a carrying capacity study. Visitation to Exit Glacier increased from 10,000 visitors in 1982 to a high of 180,000 visitors in 1997 (NPS 2002a). Current visitation levels at Exit Glacier, 120,000

visitors in 2002 (NPS 2002a), are close to what was predicted under the low growth scenario in the 1996 DCP. The rise in visitor numbers is likely the result of two factors: a campaign launched in the early 1990's to attract tourism, and road improvements to Exit Glacier that now allow easy access to the glacier for tour buses and cars.

Increased visitor use has created concerns about damage to resources and has generated conflicts among different user groups. Laws, regulations and agency management policies require the NPS to manage recreational and other uses to protect resources and to prevent conflicts among park users.

PLANNING BACKGROUND

The Exit Glacier Area Plan was originally initiated as an Environmental Impact Statement (EIS). The NPS determined, however, that an Environmental Assessment (EA) would suffice for the plan. Preliminary analysis of the alternatives showed that there was no potential for significant impacts to the park resources and values. Scoping conducted for the draft EIS indicated less controversy than anticipated when the project was initiated. Furthermore, changes to the proposal, specifically, dropping the proposed alternative transportation system (shuttle bus), reduced the scope of this planning effort. For these reasons the NPS determined that the proposal would not constitute a major federal action requiring an EIS.

Brief Description of the Study Area

Kenai Fjords National Park is in southcentral Alaska, approximately 75 air miles (120 km) south of Anchorage. The park is on the southeastern coast of the Kenai Peninsula and encompasses a coastal mountain and fjord system. The Harding Icefield, a 300-square mile icefield, overlies the entire central portion of the Kenai Mountains. It is almost a mile above the Gulf of Alaska with glaciers radiating out in all directions. To the southeast the glaciers descend to a fjord system. Exit Glacier, to the northeast, descends from the icefield and terminates in a wide river valley.

The Exit Glacier study area is 10,000 acres located in the northeast section of Kenai Fjords National Park, which is 607,805 acres. The main feature and visitor attraction of the Exit Glacier area is the glacier itself. The area is accessible by paved road from mile 3.5 of the Seward highway. The 8.5 mile Herman Leirer Road (also known as Exit Glacier Road), which traverses State of Alaska and U.S. Forest Service land from the highway to the bridge over the Resurrection River and is maintained between approximately May 1-November 1. The 1.5 mile section of road that is inside the park boundary is under NPS jurisdiction. The Resurrection River, which flanks the eastern boundary of the park and is managed by the State of Alaska, is not included as part of the Exit Glacier study area.

The Visitor Experience and Resource Protection Framework

The Visitor Experience and Resource Protection (VERP) framework (NPS 1997) is a planning and management framework that focuses on visitor use impacts on the visitor experience and on park resources. Kenai Fjords National Park is adopting VERP as a framework for planning future management of the Exit Glacier area. Other National

Parks have used VERP to address the issue of carrying capacity as part of their park-wide General Management Plans (NPS 2000a, NPS 2001a). Unlike previous VERP plans, Kenai Fjords is applying this framework to the most heavily visited area of the park that need immediate attention, rather than to the entire park.

Visitor carrying capacity is defined as the type and level of visitor use that can be accommodated while sustaining acceptable resource and social conditions (NPS 1997). Under this definition, carrying capacity is interpreted primarily as a prescription of resource and social conditions, and secondarily as a prescription for the appropriate numbers of people.

Nine elements are integral to the VERP framework, and all are necessary to implement a successful program. The VERP framework is intended to provide a system for documenting the logic and rationale for making decisions on carrying capacity issues. The nine elements of the framework are summarized here:

1. Assemble an interdisciplinary project team.
2. Develop a public involvement strategy.
3. Develop statements of park purpose, significance, and primary interpretive themes; identify planning constraints.
4. Analyze park resources and the existing visitor use.
5. Describe a potential range of visitor experiences and resource conditions (prescriptive zones).
6. Allocate the potential zones to specific locations in the park (prescriptive management zoning).
7. Select indicators and specify standards for each zone; develop a monitoring plan.
8. Monitor resource and social indicators.
9. Take management action if standards are deteriorating or have been violated.

This document initiates the steps toward completing a carrying capacity for Exit Glacier. Steps 1-6 have been completed and are covered in this document. Steps 7, 8 and 9 will be completed in subsequent planning efforts. Additional actions that would be required to fulfill steps 7-9 are: a) selection of measurable indicators that reflect the status of park resources and visitor experience and establishment of standards, which when maintained, ensure that acceptable conditions are perpetuated; b) development of monitoring protocols; and c) preparation of a long-term monitoring plan. These steps have been initiated and will require another year prior to launching long-term monitoring. Further environmental analysis and public input would be conducted as necessary prior to formally adopting any such indicators and standards and prior to taking any management action.

Direction for the Plan: Park Purposes and Significance

The direction for the alternatives and the management prescriptions considered in this *Exit Glacier Area Plan* is based on the description of the park's purpose, significance, and mission as well as other applicable policies and laws. The park *purposes* tell us why the park was set aside as a unit in the national park system. The *significance* of the park

addresses why the area is unique – why it is important to our natural and/or cultural heritage to warrant National Park designation and how this park differs from other parks. The purpose and significance statements for Kenai Fjords National Park also apply in their entirety to the Exit Glacier project area.

Kenai Fjords was designated as a National Monument in 1978. It became a National Park on December 2, 1980 when Congress passed the Alaska National Interest Lands Conservation Act (ANILCA), Public Law 96-487. An excerpt from this enabling legislation states that Kenai Fjords National Park shall be managed for the following purposes:

"To maintain unimpaired the scenic and environmental integrity of the Harding Icefield, its out-flowing glaciers, and coastal fjords and islands in their natural state; and to protect seals, sea lions, other marine mammals, marine and other birds and to maintain their hauling and breeding areas in their natural state, and free of human activity which is disruptive to their natural processes. In a manner consistent with the foregoing, the Secretary is authorized to develop access to the Harding Icefield and to allow use of mechanized equipment on the icefield for recreation."

The following purpose and significance statements, based on the above legislation, were crafted by a committee of park staff. The purposes of Kenai Fjords National Park are:

- To insure the preservation, interpretation and study of the interrelated Harding Icefield and Kenai Fjords rainforest system and its associated population of seabirds and marine mammals.
- To provide for visitor enjoyment and access to the coastal fjords, Exit Glacier, and Harding Icefield in a manner that maintains them unimpaired.

Kenai Fjords National Park has national significance for the following reasons:

- Kenai Fjords National Park preserves unimpaired an active icefield / fjord ecosystem containing an abundance of terrestrial and marine wildlife.
- Kenai Fjords National Park protects a dynamic landscape where visitors can experience up close glacial and biological change in a human timeframe.
- Kenai Fjords National Park contains rugged scenery created by a combination of the only subsiding coastal mountain range in the United States and the raw weather of the north Pacific.
- Relatively easy access to Kenai Fjords' varied resources makes them especially valuable for education, research, aesthetic, and recreational purposes.

Related Legal Mandates, Regulatory Requirements and Policies

Federal laws, as well as park planning documents and policies, affect the management of Kenai Fjords National Park. Federal mandates such as the National Environmental Policy Act, the Endangered Species Act, the Alaska National Interest Lands Conservation Act, the National Historic Preservation Act, and Executive Orders 11988 (Floodplain Management) and 11990 (Wetlands Protection) affect what can and cannot be done at the

park. Many NPS policies and goals identified in Management Policies 2001 (NPS 2000b) and the Strategic Plan (NPS 2000c) also determine many of the actions taken by park staff in natural and cultural resource management, development of park facilities, and visitor use management. These laws and policies would continue to guide management under all of alternatives described in this document. Several management constraints based on policy and regulation are important to point out:

- Part of the study area is considered suitable for wilderness designation; therefore, actions would not be taken that would affect wilderness character and preclude such designation (NPS 2000b).
- Temporary, seasonal, or emergency closures may be implemented in any zone pursuant to 36 CFR 1.5 when necessary for visitor safety, resource protection, and other purposes.
- All new buildings in the developed area would be accessible to people with disabilities, and existing structures would be modified to meet accessibility standards.
- Commercial visitor services and facilities would be limited to those that are necessary and appropriate for public use and enjoyment of Exit Glacier (NPS 2000b).
- The collection of fees would continue at least until 2006. This is based on congressional legislation and regional mandates.

Planning History for Exit Glacier

The 1980 House and Senate committee reports that accompanied the enabling legislation for the park directed the NPS to prepare a plan for the Exit Glacier area. The Exit Glacier Development Concept Plan, completed in 1982, outlined development of a parking area, visitor contact facility, ranger residence, accessible trail, Harding Icefield trail, walk-in campground, and public use cabin. All of these facilities were constructed.

Rapid growth in visitation to Exit Glacier created the need to reexamine visitor use and facilities. In 1996, a new Development Concept Plan was completed which predicted future levels of park visitation and proposed a moderate level of development at Exit Glacier. The 1996 DCP called for the following new developments: expansion of the parking lot and campground, installation of a new cooking shelter, construction of new toilets, construction of a new Nature Center to replace the old visitor contact station, construction of a gathering pavilion, and trails improvements. All of these actions have been completed with the exception of the gathering pavilion and trail improvements to a social trail along the river from the campground to the parking area.

The 1984 General Management Plan was prepared to serve as a guide for the management of resources, visitor use and development, land management, and administration at Kenai Fjords National Park. The GMP refers to the 1982 DCP as adequately addressing the requirements of the Exit Glacier area for the life of the GMP (10-15 years). Specific facilities mentioned are the campground, a public use cabin, and a trail system. Two management zones were identified for the Exit Glacier area: the park development zone, containing recreational and administrative developments, and the natural zone, with emphasis on the conservation of natural resources and processes. The GMP states that the zoning designation will remain valid until revised or superseded.

Furthermore, if conditions that affect the park changed substantially during the life of the plan, the GMP would be amended or a new plan prepared, as occurred with the 1996 DCP and with the current *Exit Glacier Area Plan.*

Other related planning documents for the park include an Environmental Impact Statement for Park Wilderness Recommendation (NPS 1988), a Park Trail Plan (NPS 1991), a Resource Management Plan (NPS 1999a), and a Long-Range Interpretive Plan (NPS 2001c).

The purpose of the 1988 EIS for Park Wilderness Recommendation was to recommend lands in Kenai Fjords National Park for wilderness designation in compliance with section 1317 of the Alaska National Interest Lands Conservation Act. None of the alternatives presented in the EIS recommend wilderness designation for a 1280 acre area near the terminus of Exit Glacier. That area was found unsuitable for designation because of existing and proposed NPS developments there. No Record of Decision was ever signed for this EIS and no wilderness proposal was ever forwarded from the Assistant Secretary's office to the Secretary of Interior.

The 1991 Park Trail Plan defines the standards and provides direction for trail management at Kenai Fjords National Park. The majority of park trails are located in the Exit Glacier area. The trail types outlined in the plan, all of which currently exist at Exit Glacier, are major trails, minor trails, wilderness trails, walks, and other special use trails. The trails plan also outlines the level of maintenance for each trail, ranging from Level 1 trails that are maintained for high use with heavy traffic to Level 5 trails that are maintained for primitive use with low traffic.

The 1999 Resource Management Plan (RMP) describes how Kenai Fjords National Park should implement resource management objectives and outlines additional studies needed to establish baseline information and to monitor impacts to natural and cultural resources. Programmatic objectives for resource management are outlined in the RMP as:

- Conduct long-term ecological monitoring to assess park resource conditions, monitor regional and global changes and detect impacts resulting from activities in the area.
- Protect significant cultural resources with methods that are compatible with the natural characteristics of the area.
- Encourage an ecosystem management approach and provide for outstanding visitor experiences within a natural setting while maintaining, restoring, or enhancing park resources and preserving natural processes.
- Develop visitor facilities that fit into the natural and cultural landscape and that do not significantly impair park resources. Provide opportunities for resource-based activities, and encourage development in areas least vulnerable to resource degradation.
- Design and develop visitor and administrative support facilities that are environmentally and economically sustainable.
- Encourage and participate in efforts to acquire and analyze information to support the best possible management strategies for resource protection and visitor enjoyment.

The RMP describes the vision of future conditions for the visitor experience at Exit Glacier as "...a moderately developed area with amenities for the casual visitor. Visitors will be aware that they are on the edge of a unique natural area still being shaped by the awesome forces of nature...." This statement is meant to be refined through the current VERP planning process.

The 2001 Long-Range Interpretive Plan identifies park themes, describes visitor experience goals, and recommends a wide array of interpretive services. The goal of the plan is the development of a cost-effective, tightly focused, high quality park interpretive program that effectively addresses all audiences and achieves management goals. The plan recommends several specific actions to improve interpretation at Exit Glacier including a traveler's information local radio station, a new ranger station, wayside exhibits, safety signs, bulletin boards, and viewing platforms. These actions will be implemented if they are compatible with the alternative selected for this VERP plan.

PRIMARY PLANNING ISSUES AND CONCERNS

A number of key issues and concerns about the Exit Glacier area were identified based on discussions with park staff, interested agencies and organizations, and the general public (Chapter 5, Consultation and Coordination, provides details on public involvement and scoping). Many of the issues revolve around the increasing number of visitors and changing visitor activities, and the resulting impacts on resources and the visitor experience in the Exit Glacier area. This plan will provide a framework or strategy for addressing these issues.

Increasing Visitor Use

Visitation to Exit Glacier has increased dramatically over the past two decades (see details in the Affected Environment chapter), resulting in increasing resource impacts and potential crowding. While most of the area's resources are in good condition, in some locations visitors are inadvertently damaging natural resources by creating social trails, resulting in trampled vegetation and soil erosion. Although many visitors rate their experiences at Exit Glacier as high, there is concern that this rating could decrease as visitation increases and visitors begin to feel crowded. Visitors differ in their opinions regarding the appropriate balance between developing infrastructure (which would support higher visitation) and carrying capacity limits (which would protect natural resources and the visitor experience).

Winter Recreation

Currently, winter visitors at Exit Glacier cross-country ski, dogsled, snowshoe, winter camp, and snowmachine. During public scoping, several people suggested eliminating or restricting snowmachining to reduce noise, visual intrusions, disturbance of wildlife, and resource damage. They also pointed out that the recreational experience for non-motorized users is degraded by frozen snowmachine tracks, noise, and exhaust. Other people, however, noted that snowmachining is a family activity that facilitates public access to the area and, therefore, opposed any restrictions on this activity. They pointed out that the riding at Exit Glacier is great and novice riders can experience the park in

winter without hazards. Additional winter use issues include whether to add more recreational facilities (e.g., ski trails, public use cabins) and whether to implement a shuttle system (e.g., with a snow coach) to bring more people to the area. Also, the question of plowing Exit Glacier Road in the winter to allow for private vehicle access came up as an issue of debate.

Levels and Types of Access

During the summer, visitors travel along a paved road to access Exit Glacier by private vehicle, tour bus, and, occasionally bicycle. During the winter this road is left unplowed and visitors must use snowmachines or muscle-power (primarily skis and dogsleds) to access the area. There are many access options to consider, all of which are supported by at least some members of the public. Options include leaving access as-is, improving access by adding trails all the way to the glacier accessible to people with disabilities, and reducing access by removing the pavement and toll booth and stopping vehicles at the park border.

Levels and Types of Development

The facilities that exist in the Exit Glacier area include structures, roads, and trails that were built based on previous planning documents such as the 1984 GMP and the 1996 DCP. This VERP planning process will help the NPS determine which facilities will remain and whether additional development should occur in the study area. Comments we received during public scoping include concern about over-development and commercialization of the area and support for maintaining the area as natural and quiet as possible. A few people wanted to see the area returned to the way it was before the vehicle bridge was built and the road was paved. Others applauded the paving of the road for easier access. Some people wanted to see more camping facilities and trails, viewing Exit Glacier as a frontcountry area that needs to be managed for increasing visitor use.

TOPICS FOR ENVIRONMENTAL ANALYSIS (IMPACT TOPICS)

To focus the environmental consequences chapter of this plan, the planning team selected specific impact topics for full analysis and eliminated others from evaluation. A brief rationale for the selection of the topics is given below. Impact topics considered but not analyzed in detail in this document also are identified and discussed.

Effects on Soils

Foot traffic may compact newly exposed soil, which in turn could change its properties including its resistance to erosion and its ability to support plant and animal life.

Off-trail foot traffic in alpine areas can have impacts on the fragile soils during periods when the soils are saturated with water. Soil structure can be damaged by compaction or churning; disturbed soils can be more easily eroded.

The construction of new trails could have very localized effects on soils. Local impacts to soils could result from hikers cutting switchbacks and forming social trails or parallel

trails. On steep slopes this can lead to erosion which results in damage to the trail bed and increased free sediment being carried downslope onto vegetation and into streams.

Effects on Water Quality
Trails could bring more visitors into contact with streams, increasing the possibility of contaminants, e.g., garbage and human waste/coliform bacteria entering streams or groundwater.

Additional lodging structures such as a hotel, chalet or yurts could place additional demands on the existing septic system and increase the possibility of coliform bacteria and nitrates contaminating the groundwater.

Increased snowmachine or other off-road vehicle use could increase hydrocarbon emissions that may collect on snow surfaces and enter streams or groundwater.

Effects on Floodplains
Proposed and existing infrastructure is almost entirely located within a floodplain. Building and trail construction can alter the natural hydrology of the area, adversely affecting other areas (e.g., flooding and silting).

Effects on Wetlands
Construction-related activities proposed in wetlands can cause disturbance and perturbations that may include but are not limited to filling of low-lying areas with soils or aggregates, draining wet areas, or otherwise disrupting wetland hydrology and ecology.

Effects on Air Quality and Visibility
Woodsmoke, emissions from vehicles, generators, or other internal combustion engines may pose a threat to local air quality.

Effects on Soundscape
New trails and facilities in the Exit Glacier study area may increase human activity and noise, disturbing the natural quiet during construction, routine maintenance, and use.

New activities in winter may increase visitor use, accompanied by noise intrusions which could elevate noise levels during traditionally low use periods. Maintenance of these trails in the winter, such as plowing or grooming, would create noise.

Current activities, such as motorized use, skiing, hiking, etc., would adversely affect the natural soundscape.

Effects on Vegetation
Vegetation in areas where visitors concentrate could continue to be impacted. New plants colonizing the terminal moraine in the outwash plain are susceptible to damage from trampling, as are alpine plants due to their slow recovery rates.

Construction of new trails, a bike path, or new facilities, such as a lodge or RV campground, could require clearing of vegetation in lowland forest, alder, wetland, and alpine habitats. Long-term maintenance could require trimming of vegetation. Development or increased visitation could impact the pale poppy (*Papaver alboroseum*), a state-listed species of special concern with several populations in the Exit Glacier area. Additionally, exotic plants may find new avenues for invasion of undisturbed areas with the addition of new trails and facilities. Any fill brought in for new construction could result in the introduction of new exotic vegetation seeds.

In winter, snowmachines traveling off road could damage vegetation, especially in low snow conditions.

Hydrocarbon emissions from motorized vehicles, generators, construction equipment, or other local sources could impact vegetation in the Exit Glacier area. Nonvascular plants, such as lichens, are especially sensitive to airborne pollutants.

Effects on Wildlife

Increased visitation and development of a lodge, RV campground, or expanding the existing tent camping area could decrease available wildlife habitat, displace wildlife, allow increased opportunities for wildlife to obtain human foods, and increase the possibility for defense of life and property (DLP) bear killings. Additionally, wildlife could be disturbed and displaced by the noise and activity surrounding construction sites. The addition of new trails could increase the disturbance and displacement of wildlife and impact wildlife travel corridors. New trails may also fragment habitat and facilitate the encroachment of "edge species".

Increased winter use promoted by staffing the Nature Center year round, providing additional overnight accommodations or operation of a snow coach could disturb, displace, or alter the behavior of wildlife.

Wildlife may be adversely affected by snowmachine use in any part of the study area. Adverse affects may include altering moose and mountain goat behavior, displacement of moose and goats from feeding or bedding areas, and inhibiting microtene (e.g., shrews and voles) movements through snow compaction. Activities such as skiing or dog mushing could also disturb and displace wildlife.

Effects on the Visitor Experience

Visitation

Total annual visitation could be affected by increased winter use and increased amenities, such as hiking trails and overnight accommodations.

Visitor Profile

The extent of motorized access into the study area could cause a change in the demographic profile of the average visitor. New or expanded trails may also cause a demographic shift.

Visitor Access
Visitor access issues focus on trail access within the study area. New trails could allow more visitors to access areas that currently receive very little use.

Visitor Activities
The visitor activities that are most likely to be affected are associated with hiking trails, a new bicycle/pedestrian path, and overnight stays. Also, motorized winter activities could be adversely affected if motorized use was restricted to the road and parking lot.

Crowding
The number of visitors present at one time (i.e., the level of crowding) could have an effect on the visitor experience.

Effects on Socioeconomic Environment
Private operation of a small food / beverage concession or a lodge may provide new business opportunities and related economic benefits. Additionally, development of a bike path could provide increased business opportunities (e.g., bike rentals).

Increased winter use for overnight stays, education programs, and non-motorized recreation on groomed trails may provide economic benefits to local businesses in winter months.

Development of an RV campground could compete with private and city run campgrounds in surrounding areas.

Improving trails to accommodate large groups may increase visitation, especially large tour groups, with subsequent economic benefits.

Increased hiking opportunities may increase the average length of stay of some users, and thus increase time and money spent in the local community.

Economic benefits could be derived from expenditures required to conduct ecological restoration in areas of infrastructure removal.

Effects on Safety
The mixing of snowmachiners, cross-country skiers, snowshoers, skijorers, and mushers in the same general area could result in user conflicts with injuries to individuals and/or damage to personal property. Injuries associated with summer activities, such as hiking or bicycling, could also occur with increased miles of trails.

Increasing the number of trails may increase direct interactions with wildlife (primarily moose and bear). These increased interactions could result in injuries to both individuals and/or wildlife.

The addition of glacier access trails would bring more visitors in close proximity to the glacier, with potential risk from falling ice.

Access to the new proposed Paradise Valley Trail (where no bridge is provided) would require hikers to wade across Exit Creek. Such a river crossing would pose a potential safety hazard.

The addition of new trails may increase the possibility of water contamination due to improper human waste disposal along drainage areas in higher elevations. Also, additional demands on the existing septic system due to increased overnight use may increase the possibility of coliform bacteria and nitrates contaminating the groundwater. Such contamination has safety implications for visitors drinking the water.

TOPICS DISMISSED FROM FURTHER ENVIRONMENTAL ANALYSIS

Several potential impact topics were dismissed because they would not be affected, or the potential for impacts under all the alternatives would be negligible. These topics are mentioned below, with an explanation of why they were not considered in detail.

Geologic Resources

None of the actions proposed in any of the management alternatives would impact the geological resources of the Exit Glacier area including natural processes such as the advance and retreat of Exit Glacier and shifting of stream channels.

Cultural Resources

An archaeological survey of the Resurrection River Valley, including the study area, was conducted in 1983 (Reynolds 1983). No cultural sites within the study area were identified, other than the remnants of a trapper's cabin, used as recently as the 1960's. A recent observation (Tetreau 2003) indicates that this particular site near the confluence of Exit and Paradise creeks has been extensively impacted by flood events, and the current integrity of the site is unknown. For this reason and since no other cultural resources are known to exist in the study area, the effects of the proposed action on cultural resources was dismissed from further analysis. Construction or clearing of new trails, or other proposed actions causing ground disturbance may reveal currently unidentified cultural resources. Should unknown resources be uncovered, work in the discovery area would be stopped and KEFJ would consult in accordance to 36 CFR 800.11.

Night Sky

Throughout periods of highest visitor use, artificial lighting is seldom necessary due to long summer daylight hours. Lighting in winter is limited to within structures, such as at the Nature Center when visitors are present. Lighting of any kind changes the visual landscape, most of which are insignificant at this time (such as the lights of snowmachines, skiers, mushers, etc.). The current electrical utilities in the study area (namely a generator and fuel cell) are not adequate to increase light output sufficient to impact night skies. Additionally, any current or planned light output can be mitigated through shading.

Aircraft Overflights

Although the noise from aircraft overflights could affect desired soundscape conditions in the Exit Glacier area, aircraft overflights will not be addressed in this plan. Exit Glacier serves as a route for airplanes traveling from the east side to the west side of the Kenai Peninsula during poor weather conditions. Additionally, the Federal Aviation Administration (FAA) regulates the minimum altitude aircraft can fly. At present, there are occasional noise intrusions from fixed wing aircraft (Wright and Hetrick 2002). Flight tour operators have been asked to voluntarily stay away from Exit Glacier and fly over other glaciers not routinely visited. NPS will continue to work with the FAA, USFS, and pilots to minimize visual and auditory intrusions where possible.

Subsistence Activities

The effects of the proposed action on subsistence uses and needs was dismissed from further analysis because (1) Kenai Fjords National Park (including the project area) is closed to subsistence uses, and (2) the proposed action would not affect regional subsistence resources or activities outside the park. There would be no potential for significant subsistence restrictions. An ANILCA Section 810(a) summary evaluation and analysis is contained in Appendix B.

Socially or Economically Disadvantaged Populations

Executive Order 12898 "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations" requires federal agencies to incorporate environmental justice into their missions by identifying and addressing high and adverse human health or environmental effects in their programs and policies on minorities and low-income populations and communities. None of the actions in any of the alternatives would result in adverse impacts on any minority or low-income population or community.

Threatened and Endangered Species

None of the plant or animal species occurring in the Exit Glacier area are federally listed as endangered, threatened, special concern, or candidate species. Several state listed species that occur in the project area are discussed under the Vegetation and Wildlife sections of this document.

Designated Wilderness

None of the actions proposed in any of the management alternatives would impact areas suitable for wilderness designation in the Exit Glacier area. No lands were designated as wilderness in Kenai Fjords National Park under the enabling legislation (ANILCA, sec. 701). The 1984 GMP included a wilderness suitability study, which determined that nearly 97% of the park's lands were suitable for wilderness designation, excluding the developed area at Exit Glacier (see Planning History above) (NPS 1988). No wilderness recommendation has been approved to date, and Kenai Fjords National Park is managing lands as suitable rather than designated wilderness (NPS 2000b). The Exit Glacier Area Plan will not address the wilderness designation because of the complexity of the process and the fact that wilderness designation requires congressional action.

Alternatives, Including the Preferred Alternative

INTRODUCTION

This chapter presents four alternatives, or approaches, for managing the Exit Glacier area of Kenai Fjords National Park: the no-action (i.e., status quo) alternative and three action alternatives, one of which is the NPS preferred alternative. The alternatives and the assessment of their potential environmental consequences form the core of this document. Alternatives in this plan describe different general visions for the future of the Exit Glacier area. They are intended to enable managers, visitors, neighbors, and the public to consider different approaches to managing resources and visitor use.

This section describes the planning process used by the planning team. It also describes the assumptions made, management zones developed, and the range of alternatives generated. The no-action alternative describes existing management in the park; the preferred alternative is the National Park Service's proposed plan; and two other action alternatives focusing on providing a more social, convenience-oriented experience than currently exists and on providing more educational opportunities. In describing the alternatives, if management actions are not discussed, then future management would be similar to existing management as described in the no-action alternative. After the alternatives are described, common mitigating measures that would be taken to reduce the intensity of impacts are described. At the end of the chapter are tables that summarize the key differences between alternatives (Table 4) and the key differences in the possible impacts that may result by implementing each alternative (Table 5). The impact tables are based on the analyses in Chapter 4 – Environmental Consequences.

Formulation of the Alternatives

In formulating the alternatives, the planning team considered the park's purposes and significance, and legal mandates and policies. The team also solicited input from the public, government agencies, and other organizations about desired future conditions for the Exit Glacier area. Team members gathered information about existing visitor use and natural and cultural resources and conducted surveys and analyses to help understand current conditions.

Using the above information, the planning team developed five new prescriptive management zones for guiding the use, development, preservation, and understanding of the Exit Glacier area and its resources. Each zone identifies how different areas of Exit Glacier would be managed to achieve a combination of desired resource and social conditions, as well as types and levels of visitor use, facilities and development, and management activities. The park would take different actions in the different zones based on the desired conditions. These zones form the basis of the range of alternatives proposed and are described below. These new zones do not apply to the no-action alternative (the no-action alternative would continue to be zoned as described in the 1984 GMP).

In May 2002, preliminary alternatives were presented in a workbook for public review. Based on comments from the public and park staff, the planning team identified a

preferred alternative by combining management zones and actions from the four preliminary action alternatives. Two of the preliminary alternatives, C and D, were eliminated from further consideration (see explanation below under *Alternative Actions Considered but not Analyzed Further*). The remaining preliminary alternatives were either changed slightly or not at all and are included in this document as part of the range of strategies considered.

Each alternative was built around an underlying concept, which was used to guide different configurations of management zones. In addition, each alternative includes a summer management scenario and a winter management scenario. Winter is defined as the time of year when the road into the park is closed to car traffic for the season (approximately November to May); summer comprises the rest of the year when the road is open. If changes in management actions are not discussed under the description of each alternative, then future management would be similar to existing management as described in the no-action alternative. The actions described are those that are most likely to take place in the next 20 years given zone definitions, what already exists in the area, and the area's environmental constraints.

It is important to keep in mind that implementation of any alternative is dependent on funding. While additional funds can be requested, the plan does not guarantee that the money will be forthcoming. The plan will establish a vision for the future that will guide year to year management of Exit Glacier, but full implementation could be many years in the future. As necessary, NPS may require additional feasibility studies, more detailed planning, and appropriate environmental documentation and public involvement prior to actually building many of the developments proposed in the action alternatives.

Management Zones

Under the preferred alternative (and the other action alternatives), the Exit Glacier area would be divided into different zones. The zones are intended to protect park resources and provide a range of positive recreational experiences. The zone descriptions give visitors an understanding of the types of activities and experiences they can expect to find in each zone. Zones also tell park managers where development can and cannot occur and the intensity of management that is appropriate. Each zone is discrete and cannot overlap with another zone. This approach considers and analyzes a diversity of appropriate experiences and underlying resource conditions, and helps structure future carrying capacity analyses and monitoring standards. Note that the no-action alternative would not follow this new zone management strategy, but would remain as zoned in the 1984 GMP. Key differences between the zones are outlined in Table 1.

The National Park Service is committed to ensuring reasonable access for visitors for all appropriate recreational activities in the park. The National Park Service will encourage access to the Exit Glacier area by means of facilities (e.g. trails and marked routes), and will allow independent, cross-country travel although limitations may be imposed as necessary to achieve the desired future conditions for each management zone and protect visitor safety. If and when it becomes necessary to limit independent, cross-country

travel, the National Park Service will use the least restrictive mechanism or "tool" necessary to accomplish the goal.

The following are the tools that may be used to manage access when necessary, arranged in rough order from the least restrictive to the most restrictive. However, the park Superintendent is free to pick whichever tool is required as long as the "least restrictive" criterion is heeded. There is no implication that the tools must be tried in the listed order and a failure elicited before trying the next one.

1) Education
The National Park Service would provide printed material, public presentations, targeted presentations to user groups, and Internet-based programs with the goal of actively involving visitors in helping the park achieve the desired future conditions for all management areas.

2) Increased enforcement of existing regulations
The National Park Service would prioritize enforcement of existing regulations to assist in achieving desired future conditions for management areas. For example, enforcement of the snowmachine speed limit or the sound level limits on motorized equipment could assist in achieving desired conditions for sound quality.

3) Voluntary restrictions
The National Park Service would ask visitors to voluntarily restrict their use. Examples of such measures could include use of low-impact equipment, avoidance of certain areas of the, or avoidance of areas during particular seasons or times of day.

4) Technology requirements or other requirements governing means of access
The National Park Service would place requirements on the means of access, such as requiring four-stroke engines for snowmachines, in order to achieve desired conditions.

5) Manage commercial activity
The National Park Service would adjust concession contracts and other commercial use permits to govern use levels or direct authorized commercial activity to locations, seasons, or times of day as necessary to achieve desired future conditions.

6) Limit numbers of visitors
The National Park Service would establish quotas for visitor numbers when the volume of use is high enough that other mechanisms are unlikely to achieve desired future conditions. Visitors would be required to register and carry a permit, and the number of available permits would be limited.

7) Temporary closures
The National Park Service would temporarily close areas to visitor use or to certain modes of access to protect resource values and for other purposes. Access would be

restricted to particular times of day, days of the week, months, or other unit of time, or the duration of access could be limited.

8) Permanent closures
The National Park Service would permanently close areas to visitor use or to certain modes of access to protect resource values consistent with ANILCA 1110(a).

Visitor Facilities Zone

The Visitor Facilities Zone provides basic infrastructure necessary to accommodate visitors arriving to the Exit Glacier area. Visitors arriving by motorized vehicle would park and then transition to the walking mode, orient themselves at the Nature Center, and quickly immerse themselves in the natural world by moving out of this zone. The experience would be highly social with few opportunities for solitude. Infrastructure is meant to blend in with, not dominate the environment and yet provide basic services the visitor expects at a National Park entrance.

Natural Resource Conditions
Evidence of human use is common. Although this evidence may persist long-term, in general the landscape retains a high degree of natural features and is not dominated by man-made structures. Impacts from development and infrastructure are allowed (e.g., construction and maintenance of roads, trails, parking lot, and buildings) but must adhere to laws and policies to ensure minimal resource damage. Intrusions to the natural soundscape can be expected more often and may be of higher intensity than in any other zone. Noises often come from both inside and outside the zone, including noise from vehicles, people talking and shouting, and aircraft. Natural processes (e.g., flooding, fire) are likely to be interrupted to protect infrastructure and resources.

Social Conditions
Encounters with other visitors and with park staff can be frequent during daylight hours, but may significantly decrease at night. There is very low potential to find solitude. Large groups of 12 or more people may be frequently encountered. This zone provides a low level of challenge and adventure, and a short time commitment is needed to experience this zone.

Visitor Use
Both motorized and mechanized uses (includes but is not limited to bicycles, roller skates/in-line skates, skate boards, and similar devices) are allowed in this zone (e.g., cars and snowmachines on the road and in the parking lot, bicycles on the road and bike path). Camping is allowed in designated campgrounds and may include walk-in, RV, and car camping. No ice climbing or glacial travel is allowed. Pets are allowed on a leash on the road and parking lot. In winter, dogs are allowed on a skijor harness or dogsled harness.

Facilities and Development
Roads, parking lots, and trails are paved or otherwise hardened. Roads are no wider than two lanes. Trails in this zone may be paved, hardened and compacted, cleared of

obstacles, and have a smooth surface. Trail types can include major trails, minor trails, and walks (as specified in the 1991 Trail Plan for Exit Glacier) and may be accessible to people with disabilities. Structures are allowed for such purposes as resource management (e.g., fences, exclosures, plot markers), administration (e.g., staff housing, weather stations), safety (e.g., handrails, signs, emergency shelters), comfort (e.g., public use cabins, restrooms, benches) and education (e.g., signs, interpretive kiosks, ranger station). Structures can be large, highly visible, and suitable for habitation.

Management Activities

There is a very high level of road and trail maintenance. Regulatory and interpretive signs are very common. Many education and interpretation activities occur on-site, such as ranger led programs, staff providing information, wayside exhibits, and signs. Management actions give moderate priority for resource protection, high priority for visitor needs and safety issues, and low priority for a positive visitor experience in a natural setting.

Pedestrian Zone

The Pedestrian Zone accommodates numerous visitors, many of who wish to experience the towering glacial ice of Exit Glacier up close. Social opportunities are plentiful, visitor comforts and structures are available but fewer and less concentrated than in the Visitor Facilities Zone, and the opportunity for visitor education through signs and personal contacts are abundant. Viewing of wildlife from this zone is an important activity.

Natural Resource Conditions

Evidence of human use in this zone is common. Although such evidence may persist long-term, it does not dominate the landscape. Impacts from development and infrastructure are allowed but to a lesser extent than in the Visitor Facilities Zone (e.g., trail construction and maintenance, installation of interpretive exhibits, regulatory signs, and safety barricades). Noise intrusions on the natural soundscape can be expected often from sources outside this zone (e.g., human voices, vehicles, aircraft) and can be expected less often overall than in the Visitor Facilities Zone. Natural processes (e.g., flooding, fire) may be interrupted on a limited basis to protect resources and infrastructure.

Social Conditions

Encounters with other visitors and park staff during daylight hours can occur often but are significantly reduced at night. Opportunities for solitude are low. Large groups of 12 or more people may be encountered frequently. Opportunities for challenge and adventure are low. The time commitment necessary to experience this zone is moderate.

Visitor Use

Motorized and mechanized vehicles are not allowed in this zone except for administrative purposes such as response to an emergency, for safety issues, or to conduct necessary maintenance. Camping is not allowed in this zone. Possible activities include walking,

nature observation, skiing, and education. No ice climbing or glacial travel is allowed. Pets are not allowed, except in winter on a skijor harness or dogsled harness.

Facilities and Development
No roads or parking lots are present in this zone, except jeep trails that may be maintained for emergency access. Trails in this zone may be hardened and compacted, cleared of obstacles, and have a smooth surface. Trails types may include major and minor trails and may be accessible to people with disabilities, as specified in the 1991 Trail Plan for Exit Glacier. Highly visible, moderately sized structures may be present in this zone to serve the same purposes as in the Visitor Facilities Zone, but may not be used for visitor or staff habitation.

Management Activities
Maintenance activities, such as trail work, occur at a high level. Signs directing visitors or providing interpretive messages are common in this zone. On-site interpretation and education are present and may include signs, wayside exhibits, staff presence, and formal programs. Management actions give a moderate priority for resource protection, high priority for visitor needs and safety issues, and moderate priority for a positive visitor experience in a natural setting.

Hiker Zone

The Hiker Zone allows visitors to access more remote locations of the study area along well maintained trails. This zone is meant to provide a mostly natural experience with moderate social possibilities, increasing opportunities for solitude, and fewer visitor comforts. Many visitors with varying outdoor skills would be able to hike into the Alaskan backcountry. While danger and hazards still exist, day hikers can access this zone with only a moderate amount of preparation and education about the area. Preservation of the natural system is a high priority, but impacts from trail development and associated use are common.

Natural Resource Conditions
Evidence of human use is occasional and may persist long-term. Although the presence of humans and impacts are not as high as in the Pedestrian and Visitor Facilities Zones, the higher levels of use in those zones can be seen from this zone. Impacts from development and infrastructure are occasionally allowed (e.g., trail construction and maintenance, installation of signs, survey markers, and safety barricades). There are periodic, low intensity noise intrusions coming from outside of the zone (e.g., vehicle and aircraft noise) but noise intrusions originating within the zone, such as human voices, are uncommon. Disturbance of natural processes is uncommon and on a small scale (e.g., ditching along trails to direct runoff).

Social Conditions
Encounters with other visitors and park staff are occasional during daylight hours, but are rare at night. The potential for finding solitude is moderate. Occasionally groups of 12

or more individuals may be encountered. A moderate time commitment is required for this zone and the level of challenge and adventure is moderate as well.

Visitor Use
Typical visitor activities in this zone are non-motorized and non-mechanized. Hiking, nature observation, and skiing are examples of typical visitor activities. Motorized use is not allowed in summer; in winter, it is allowed for traditional activities as long as zone conditions are otherwise met. Camping is not allowed. Ice climbing and glacial travel are allowed with some restrictions, including use of appropriate access routes and seasonal limitations (i.e., no climbing allowed in the summer when glacial ice is unstable). Pets are not allowed, except in winter on a skijor harness or dogsled harness.

Facilities and Development
There are no roads or parking lots in this zone. Trail surfaces are natural, may be uneven, and may contain obstructions such as fallen trees and rocks. Trails types may include minor trails and wilderness-type trails, as specified in the 1991 Trail Plan for Exit Glacier. Structures may exist for resource management, interpretive, administrative or safety purposes (see definitions under Visitor Facilities Zone). There are no structures for visitor comfort, such as benches. Any structures in this zone are small, moderately visible and not habitable.

Management Activities
The level of trail maintenance is moderate. Interpretive and regulatory signs are uncommon. Education conducted on-site includes ranger led walks and programs and temporary signs. Off-site publications (such as the park brochure and newsletter) and education are important tools to inform visitors about this zone. Management actions give a high priority for resource protection and a high priority for a positive visitor experience in a natural setting. Visitors would need to rely to a moderate degree on their own skills for safety and other needs.

Backcountry Semi-Primitive Zone

The Backcountry Semi-Primitive zone provides better opportunities for visitors to experience wildlands and solitude than the other zones described above. As this zone is less difficult to access than the Backcountry Primitive Zone, more visitors are allowed the opportunity to experience a mostly undisturbed glacial ecosystem. Because more visitors are accommodated, the opportunity to experience solitude and the intrinsic natural values may be slightly diminished. Natural resources are afforded the same level of protection as the Backcountry Primitive Zone and there is a high probability of viewing wildlife in a mostly undisturbed state.

Natural Resource Conditions
Evidence of human use is uncommon and persists only for the short-term. However, high levels of human presence and impacts are usually evident in the distance outside the zone. Impacts from development and infrastructure are minor and seldom allowed (e.g., may allow installation of a small weather station, research equipment, and trail markers).

Natural sounds predominate, and noise intrusions are rare, of low intensity, and mainly from outside the zone, such as vehicles and aircraft. Natural ecological processes are rarely interrupted and only in extreme cases (e.g., for protection of rare species).

Social Conditions
Visitors seldom encounter other visitors or park staff during daylight hours or at night. The potential for finding solitude is high, but not as high as in the Backcountry Primitive Zone. Groups of 12 or more individuals may be seldomly encountered. The opportunity for challenge and adventure is high, as is the needed level of outdoor skills. A long time commitment is needed to access and experience this zone.

Visitor Use
Typical visitor activities in this zone are non-motorized and non-mechanized. Examples of typical visitor activities in this zone include hiking, skiing, nature observation, and mountaineering. Motorized use is not allowed in summer; in winter, it is allowed for traditional activities as long as zone conditions are otherwise met. Camping is allowed at a minimum distance of 1/8 mile from any trail and out of sight of the trail. Ice climbing and glacial travel are allowed anywhere in the zone except on the face of the glacier during summer months. Pets are not allowed, except in winter on a skijor harness or dogsled harness.

Facilities and Development
No roads are present and there is little or no constructed tread on trails. Trail markers, such as blazes or cairns, are used as needed on wilderness trails. Structure purposes are only for administrative use, resource management, and safety (see definitions under Visitor Facilities Zone). Structure size is small and has very low visibility. Structures are not to be used for habitation.

Management Activities
Route markers may be occasionally maintained. Regulatory signs are rarely installed, except for extreme resource protection and safety situations. Off-site publications and education are the most common methods used to disseminate information; however, occasional interpretation by park staff may occur on-site (e.g., ranger led walks), and no interpretive signs are allowed. Management actions give a high priority for resource protection and a high priority for a positive visitor experience in a natural setting. Visitors would need to rely to a high degree on their own skills for safety and other needs.

Backcountry Primitive Zone

The Backcountry Primitive Zone provides the opportunity for visitors to experience the Exit Glacier area in its most undisturbed state. The intangible values some backcountry users associate with minimally impacted areas can be experienced in this zone. Examples include solitude, challenge, the enormity/wonder of the natural world, etc. Ecosystem functions and the complex web of life are mostly undisturbed, providing an excellent

research control area for comparison purposes and opportunities to view Alaskan wildlife in a natural setting.

Natural Resource Conditions

Natural resources within this zone are generally in pristine condition and rarely show evidence of human use, although the presence of humans and their impacts may be evident in the distance. Within the zone, human impacts are transient and rarely seen, although minor permanent impacts may occur for administrative purposes on a very restricted basis (e.g., survey markers, weather stations, research equipment). Impacts to natural resources from installation of structures are very rarely allowed. Natural sounds predominate and noise intrusions are rare, of low intensity, and mainly from outside the zone, such as vehicles and aircraft. Disturbance of natural processes is rarely allowed and only under extreme circumstances (i.e., for protection of rare species).

Social Conditions

Visitors to this zone rarely encounter other groups of people or park staff either in the daylight or at night. The opportunity for solitude is very high. Groups of 12 or more individuals may be rarely encountered. High degrees of challenge and adventure can be found, and a long time commitment is required for visitors to access and experience this zone.

Visitor Use

Typical visitor activities in this zone are non-motorized and non-mechanized. Examples of typical visitor activities in this zone include hiking, skiing, photography, wildlife observation and mountaineering. Motorized use is not allowed in summer; in winter, it is allowed for traditional activities as long as zone conditions are otherwise met. Dispersed, minimum-impact camping is allowed. Technical ice and rock climbing activities and glacial travel are allowed except on the face of the glacier during summer months. Pets are not allowed, except in winter on a skijor harness or dogsled harness.

Facilities and Development

This zone does not contain any type of constructed road, trail or route markers. Structures may be present only for administrative and resource management purposes (e.g., plot markers or research equipment). If structures are present they are very small, have very low visibility, and are not habitable.

Management Activities

The evidence of management activities in this zone is absent or very low. Management actions are strictly for resource protection and if necessary for visitor safety. On-site structures for information or education, such as signs, are not allowed. On-site interpretation and education by park staff is minimal and the presence of ranger-led groups is rare. Off-site interpretation and education are very important for visitors to this zone. Management actions give a very high priority for resource protection and a very high priority for a positive visitor experience in a natural setting. Visitors would need to rely to a very high degree on their own skills for safety and other needs.

Table 1. Summary of key differences among management zones.

	Visitor Facilities	Pedestrian	Hiker	Backcountry Semi-Primitive	Backcountry Primitive
Resource Conditions					
Evidence of Human Use	Common, apparent year-round, long-term but does not dominate landscape	Common, apparent year-round, long-term but does not dominate landscape	Occasional, long-term; high levels of human use are evident nearby	Uncommon, short-term; human use usually evident in the distance	Rare, impacts are transient; human use may be evident in the distance
Impacts from Development and Infrastructure	Allowed	Allowed	Occasionally allowed	Seldom allowed	Rarely allowed
Intrusions on Natural Soundscape	Can be expected often inside and outside the zone	Can be expected often from outside, but of lower intensity and less often from inside the zone	Periodic, low intensity intrusions from outside the zone; uncommon from inside the zone	Natural sounds predominate; intrusions are rare, of low intensity and mainly from outside the zone	Natural sounds predominate; intrusions are rare, of low intensity and mainly from outside the zone
Natural Processes	May be disturbed to protect infrastructure and resources	May be disturbed on a limited basis to protect infrastructure and resources	Disturbance is uncommon and of small scale	Disturbance is rare and only in extreme cases	Disturbance is rare and only in extreme cases
Social Conditions					
Encounters with Other Visitors and Staff	Frequent during daylight hours; significantly decreased at night	Often during daylight hours; significantly decreased at night	Occasional during daylight hours; rare at night	Seldom during daylight hours and at night	Rare during daylight hours and at night
Potential for Solitude	Very low	Low	Moderate	High	Very High
Group Size (a large group is 12 or more)	Frequently encounter large groups	Frequently encounter large groups	Occasionally encounter large groups	Seldomly encounter large groups	Rarely encounter large groups
Challenge and Adventure	Low	Low	Moderate	High	High
Time Commitment	Short	Moderate	Moderate	Long	Long
Visitor Use					
Motorized Use	Yes, only on paved surfaces	No in summer and winter	No in summer; allowed in winter for traditional activities as long as zone conditions are otherwise met	No in summer; allowed in winter for traditional activities as long as zone conditions are otherwise met	No in summer; allowed in winter for traditional activities as long as zone conditions are otherwise met
Mechanized Use	Yes	No	No	No	No
Camping	Yes in designated campgrounds	No	No	Yes, with restrictions	Yes, dispersed
Ice Climbing and Glacial Travel	No	No	Yes, with restrictions	Yes	Yes

	Visitor Facilities	Pedestrian	Hiker	Backcountry Semi-Primitive	Backcountry Primitive
Pets	Yes, on leash on road and parking lot	No (except in winter on a skijor or dogsled harness)	No (except in winter on a skijor or dogsled harness)	No (except in winter on a skijor or dogsled harness)	No (except in winter on a skijor or dogsled harness)
Development					
Trails	Paved or hardened, free of obstacles, smooth surface	Hardened or compacted, free of obstacles, smooth surface	Natural surface, obstructions may be present, surface may be rough	No constructed trails, but routes may be marked	None
Roads and Parking Lots	Paved	Jeep trail, for administrative use only	None	None	None
Structure Purposes	Resource management, administration, safety, comfort, education	Resource management, administration, safety, comfort, education	Resource management, administration, safety, education	Resource management, administration, safety	Resource management, administration
Structure Size	Large	Medium	Small	Small	Very small
Structure Visibility	High	High	Moderate	Very low	Very low
Structure Habitability	Habitable	Not for habitation	Not for habitation	Not for habitation	Not for habitation
Management Activities					
Trail Maintenance	Very high	High	Moderate	Markers occasionally maintained	None
Signs	Very common	Common	Uncommon	Rarely, for extreme resource protection and safety situations	None
Interpretation	On-site, may include exhibits, staff presence, formal programs, signs	On-site, may include exhibits, staff presence, formal programs, signs	On-site consists of staff presence, formal programs, and temporary signs; off-site education is important	Off-site is important; occasional on-site interpretation by park staff may occur	Off-site is very important; rare personal on-site
Mgmt. Actions for Resource Protection	Moderate priority	Moderate priority	High priority	High priority	Very high priority
Visitor Self-Reliance for Safety and Other Needs	Low	Low	Moderate	High	Very High
Mgmt. Actions for a Natural/Pristine Visitor Experience	Low priority	Moderate priority	High priority	High priority	Very high priority

NO-ACTION ALTERNATIVE

Concept

This alternative provides a baseline for evaluating the changes and impacts of the action alternatives. Under this alternative, the Park Service would continue to manage the Exit Glacier area at Kenai Fjords National Park as it has in the past, relying on existing plans. The park staff would continue to respond to issues on a case-by-case basis. All existing visitor facilities would remain in place, with Exit Glacier itself as the primary visitor attraction. No new construction, other than that identified in the 1996 Development Concept Plan, would be authorized, nor would there be any changes made in the way Exit Glacier area is managed.

Carrying Capacity and Visitor Use Management Strategies

Park managers would follow all of the policies and practices for managing visitor use that were identified in the "Planning Background" section of the Purpose and Need chapter. Natural resource impacts would be managed reactively as they are identified. Aside from existing visitor use management policies, park managers would likely place few additional limits on visitor use.

Visitor use in summer and winter, as described in the Affected Environment Chapter, would continue to be managed as it is now. In summer, visitors would continue to be allowed to touch the glacier where it is safe and to participate in all current recreational activities such as hiking, photography, camping, wildlife observation, etc. Use of snowmachines in winter would continue to be allowed throughout the Exit Glacier area, with access via Exit Glacier Road and the Resurrection River bridge. Activities such as skiing, snowshoeing, dog mushing, and skijoring would be allowed anywhere in the area.

Carrying capacity would not be addressed under this alternative. There would not be any monitoring of indicators and standards to trigger management actions for protection of natural resources and the visitor experience. For a full description of carrying capacity, indicators, and standards, see the "Carrying Capacity and Visitor Use Management Strategies" section under the preferred alternative. Instead, monitoring would occur, as it does currently, on an as needed basis, reactively rather than proactively.

Zone Allocation and Related Actions

Under the no-action alternative, the Exit Glacier area would remain zoned as described in the 1984 GMP. Portions of the area containing recreational and administrative developments are located in the *Park Development Zone*, where the provision and maintenance of park development to serve the needs of park visitors and management are emphasized. The boundary of this zone is limited to the actual facilities and the immediate surrounding area required for facility use and maintenance. The remainder of the project area is located in the *Natural Zone*, which emphasizes conservation of natural resources and processes and the accommodation of uses that do not adversely affect these resources and processes. Facilities in this zone, such as trails and primitive shelters, are dispersed.

The following facilities are located in the Park Development Zone of Exit Glacier and would continue to be maintained at current levels:

- an entrance road approximately 1.5 miles long from the Resurrection River bridge to the parking lot
- a parking lot that holds approximately 100 vehicles and a fee booth
- a campground with 12 walk-in tent sites, a cooking shelter, and a small parking lot
- new restrooms with flush toilets and six vault toilets at three locations
- a network of trails (a 0.6 mile long trail to the outwash plain (0.3 mi paved and 0.3 mi unpaved), a 0.7 mile long Nature Trail, the 0.7 mile long Overlook Loop Trail, and the 3.8 mile long Harding Icefield Trail)
- a small emergency shelter at the top of the Harding Icefield Trail
- three cabins used for employee housing in summer; one cabin is open for public use in winter
- a warming hut for winter use and a picnic area with two tables
- an exhibit kiosk and three information bulletin boards
- a recently completed 1500 sq. ft. Nature Center containing exhibit space, staff offices, and a book shop
- a generator and associated enclosure for the Nature Center
- a small building housing the area water system

The gathering pavilion, which was a facility identified in the 1996 DCP but has not yet been constructed, would be built as planned under this alternative when funds become available. The only facility identified in the 1996 DCP that would not be constructed is the river trail from the campground to the north end of the parking lot. The need for this trail has been revisited since the completion of the DCP and has been determined to no longer be necessary.

Visitor orientation and interpretation would continue at current levels. There would continue to be park rangers available to provide information from approximately 9 am to 6 pm during the summer months and winter caretakers in fall, winter, and spring months. Ranger led walks would continue to occur in summer on a daily basis, and with the new Nature Center, on a limited basis in winter. Additional staff would be stationed at the Nature Center to conduct year-round education activities.

Winter use of the Exit Glacier Road (Herman Leirer Road) would continue to be based on an informal agreement/partnership with other agencies which states that the road would not be plowed in the winter. Changes in winter public road use would require agreement with partners. Winter snowmachine use for traditional activities would continue throughout the Exit Glacier area provided the use does not damage vegetation or soils. Traditional activities have not been defined for Kenai Fjords National Park.

Based on current legislation, entrance fees at Exit Glacier would continue to be collected at least until 2006.

Costs and Implementation

Management actions described under the no-action alternative (i.e., those that have already undergone environmental and public review as part of the 1996 DCP), would continue to be implemented over the next 20 years as funding became available. Priorities for implementation would remain as identified in existing approved documents, such as the 1996 DCP (NPS 1996) and the park's Strategic Plan (NPS 2000c). Additional funds for implementing this alternative would be needed for construction of the gathering pavilion, for additional staffing needs as visitation increases, and to cover costs of inflation. The estimated costs, in year 2007 dollars, for construction of identified facilities and mitigation of resource impacts is $75,000 – 100,000 and $575,000 – 600,000 per year for additional staffing needs (Table 2).

Management of the study area at Exit Glacier requires the participation of six park teams. They include the Superintendent, Administration, Ranger Operations, Interpretation, Maintenance and Resources Management. Kenai Fjords National Park employs one permanent, full-time ranger and two permanent rangers that are employed part of the year. Depending on funding levels, up to three seasonal rangers are hired during the peak summer months to assist with work load. The Interpretation division is comprised of one permanent full-time employee, four permanent part-time employees, one seasonal employee and several volunteers during peak summer months. The Maintenance division is comprised of one permanent full-time employee and three permanent part-time employees. During the peak summer months up to four seasonal employees are hired. The Resources Management division consists of three permanent full-time, two term employees, and up to four seasonal employees. Because the park is currently operating with a deficit of staff, additional staffing needs for each division would be:

- Maintenance: two seasonals and convert two part-time employees to full time
- Resource Management: one permanent full time employee and two seasonals
- Ranger Operations: convert one part-time ranger to full time
- Interpretation: one permanent seasonal employee and two seasonals

PREFERRED ALTERNATIVE

Concept

The preferred alternative is the alternative the National Park Service proposes to implement for the Exit Glacier area of Kenai Fjords National Park over the next 20 years. The focus of this alternative would be to enhance the experience of viewing Exit Glacier, which is the main attraction of the area, and to provide for additional non-motorized recreational opportunities.

In this alternative, park managers would follow all of the desired conditions described for the management zones earlier in this chapter plus several additional management actions described below. The preferred alternative maps show how the different management zones would be applied to the Exit Glacier area in summer and winter.

Carrying Capacity and Visitor Use Management Strategies
To address carrying capacity, this plan describes desired resource conditions by management zone. The management zone prescriptions set qualitative carrying capacities for the Exit Glacier area by prescribing the appropriate range of resource conditions, social conditions, visitor uses, development and management. Carrying capacity is defined as the type and level of visitor use that can be accommodated while sustaining resource and social conditions that complement the purposes of the park and its management objectives.

Subsequent to this plan, for each zone, indicators of resource condition and visitor experiences would be developed that would reflect the overall condition of the zone and allow measurement of impacts on biological, physical, and cultural resources of the Exit Glacier area, as well as measurement of the impacts on visitor experiences. Standards for each indicator would be set that establish the maximum amount of deterioration of resource or experience quality that would be allowed before management action is taken. Indicators are defined as specific, measurable physical, ecological, or social variables that reflect the overall condition of a management zone. Resource indicators measure visitor impacts on the biological, physical, and cultural resources, while social indicators measure visitor impacts on the visitor experience. Standards are defined as the minimum acceptable condition for each indicator variable. It is not a condition managers would strive to achieve. Further environmental analysis and public input would be conducted as necessary prior to formally adopting any such indicators and standards and prior to taking any management action.

Monitoring programs that would measure the condition of resources and visitor experiences would be initiated. Effective monitoring of indicators provides feedback and documentation needed to implement meaningful management action. Monitoring would document if and when a management action is needed to keep conditions within the standards. The intent of the management actions would be to improve the situation and achieve the intended conditions within the zone. Management actions would range from low intrusiveness (such as education and signing) to highly restrictive (such as closures or use limits). Monitoring and proactive management actions would be ongoing tasks starting with the implementation of this plan.

Zone Allocation and Related Actions – Summer
In summer, the Backcountry Semi-Primitive and the Backcountry Primitive Zones would cover most of the Exit Glacier study area (48.9% and 39.3% respectively). The Hiker Zone would cover 9.3% of the area, the Pedestrian Zone 1% and the Visitor Facilities Zone 1.5%.

The *Visitor Facilities Zone* would encompass the existing road with a corridor wide enough to allow for pullouts and a bike path. It also would encompass the Nature Center, picnic area, campground, cabins, restrooms, and parking lot. Beyond the parking lot, the zone would follow the existing paved trail to the Harding Icefield Trail junction, a location where visitors can get a good view of the glacier. Key actions in this zone:

- A bike path would be located on the north side of the entrance road starting at the vehicle bridge over the Resurrection River and ending at the parking lot, approximately 1.5 miles long. The bike path could connect with a path that is being planned for construction by the State and USFS in the Exit Glacier Road corridor. The bike path would hug the shoulder of the road (separated by a safety barrier) where it traverses through the wetlands near the vehicle bridge. Past the wetlands in the lowland forest, the path would curve away from the road several meters to provide for a more scenic and quiet experience. A spur trail that crosses the road would be added near the campground to connect the campground to the bike path.
- A trailhead for the new Paradise Valley Trail would be located on the south side of the entrance road just inside the park boundary near the vehicle bridge. The only amenities at the trailhead would be a sign marking the start of the trail and a bulletin board with visitor safety information.
- New educational signs and exhibits would be installed near the Nature Center using themes from the Long-Range Interpretive Plan (NPS 2001c.) These themes include the ability to witness the continuing forces of glaciation, the fragile mountain ecosystem and the opportunity to learn how the Harding Icefield and its outflowing glaciers provide a window to past ice ages that helped shape our world.
- A gathering pavilion, as identified in the 1996 DCP, would be constructed near the Nature Center on the site of the old ranger station.
- One of the existing cabins (Cottonwood) would be remodeled and enlarged. An addition would be constructed behind the cabin, with a footprint increase of 30-40%. The cabin would continue to be used for housing two park employees in summer.
- A gray water disposal area would be installed at the campground. The disposal area would most likely consist of a hole in the ground lined with concrete and a metal screen to catch food scraps.

The *Pedestrian Zone* would be located in the outwash plain of the glacier terminus, encompassing the Nature Trail and the Overlook Loop Trail. This zone would be dynamic, as it would increase or decrease with glacial retreat or advancement, so as to always be located adjacent to the face of the glacier. Key actions in this zone:

- The Overlook Loop Trail would be improved as needed, in accordance with a type A trail in the Trail Plan for Exit Glacier (NPS 1991), to accommodate increasing visitation. Improvements could include widening the trail up to 48", providing steps in steep areas, and erecting barriers to prevent shortcuts and erosion between switchbacks.
- As the glacier retreats, the park would continue to provide safe, low impact access to the face of the glacier, for example, existing trails may be extended as needed.
- Additional educational signs and exhibits would be installed along the trail to the outwash plain, the Nature Trail, and the Overlook Trail explaining biological succession, wildlife in its natural setting, and a naturally-functioning ecosystem.
- A viewing platform (consisting of a hardened gravel pad) would be constructed on the edge of the outwash plain within view of the glacier and a spotting scope installed to provide an opportunity for physically challenged visitors to view the glacier. Some vegetation would be cleared to improve the vista.

The *Hiker Zone* would be applied as a 0.25 mile wide (0.125 mile on each side of a trail) corridor along hiking trails. Key actions in this zone:

- Construct a new trail through Paradise Valley that could in future connect to the trail system of Caines Head State Recreation Area. Connecting trails outside of the Exit Glacier study area could be designated through a future Backcountry Management Plan. This trail would be a type B minor trail, 18" to 24" wide, constructed of native materials with a natural appearance, and may have rocks or other low obstacles (NPS 1991). Hikers would be required to ford Exit Creek at the trailhead since there would be no bridge for crossing. This trail would be 2.5 miles long and located close to the eastern park boundary (see approximate location on map).
- The Unnamed Peak Trail, starting at approximately mile 1.25 on the Paradise Valley Trail, would be constructed leading to an alpine peak. This trail would be a type B trail as described for the Paradise Valley Trail and would be 2.25 miles long.

Terrain that is not suitable for trails or structures due to steepness, unstable rock, and avalanches would be included in the *Backcountry Semi-primitive zone*; this is the majority of the Exit Glacier area. The *Backcountry Primitive Zone* would be applied to include the entire Harding Icefield portion of the Exit Glacier area and part of the glacier along the summer snow melt line because these areas are not suitable for trails or marked routes due to shifting ice and snow. No actions are proposed for these two zones.

Zone Allocation and Related Actions – Winter

In winter, the Backcountry Primitive Zone would cover the majority of the Exit Glacier study area (87.8%). The next largest zone, Backcountry Semi-Primitive, would cover 9.7%. The Pedestrian Zone and the Visitor Facilities Zone would essentially remain the same as in summer at 1% and 1.5% respectively. In winter there would be no area zoned as Hiker.

The *Visitor Facilities Zone* would be allocated the same as in summer but would not include the paved trail from the parking lot to the glacier. There would be no motorized use beyond the parking lot. Key actions in this zone:

- Snowmachines and other motorized vehicles would be allowed only on the entrance road and in the parking lot in this zone. Signs and/or increased staffing would be in place to advise visitors of area closures.
- The bike path would be groomed and designated for non-motorized winter recreation, such as skiing, snowshoeing, and skijoring.
- One existing cabin would remain open to public use, as under current management, and another existing cabin could be made available if demand increases. The third exiting cabin would continue to be used by the winter caretakers. The vault toilets would continue to be available for use in winter.
- Activities would be scheduled for the general public and for organized groups at the Nature Center. Based on demand, activities could be scheduled as often as every day or only once a week, such as ranger-led snowshoeing to observe animal tracks, indoor programs about winter ecology, and winter ecology programs especially for students.

- A park owned and/or a concessionaire operated snow coach would be used to bring groups, such as school children and Elder Hostel, to the Exit Glacier area in winter to participate in educational programs at the Nature Center and to improve access to the Exit Glacier area for individuals and families to participate in winter recreation activities and educational programs. The use of modern over the snow vehicles implementing the latest technology such as the Mattrack system or another environmentally approved systems designed to lessen the noise created would allow use of a standard van or other such vehicle. An example of the latest access vehicles for over snow use is shown below on the left verses a more traditional snow coach, on the right, with a diesel engine and tank-like tracts that move over the snow. No decision has been made at this time about which type of snow coach would be used.

- Other than snowmachines and snow coaches, no other motorized vehicles would be allowed in this zone.

The *Pedestrian Zone* would be applied the same as in summer to include the entire outwash plain as well as the paved trail from the parking lot to the glacier. An exception to this zone description would allow motorized use for administrative purposes. Key actions in this zone:

- This entire zone would be closed to snowmachines and other motorized use except for trail grooming and emergency response. Snowmachines would no longer be allowed on the main trail to the glacier or on the outwash plain.
- Special arrangements for mobility impaired visitors could be made for motorized access to the glacier terminus.
- The paved trail to the glacier would be groomed for non-motorized recreation.

In winter the *Backcountry Semi-primitive Zone* boundary would follow the contours of the lowland forest and would include a small portion at the terminus of the glacier. The key action for this zone:

- The new Paradise Valley Trail would have continued snowmachine use for traditional activities, as well as non-motorized recreation, and would be considered an exception to the desired zone conditions.
- The number of snowmachiners in this zone under current conditions is not consistent with the desired conditions of the Backcountry Semi-Primitive Zone which states that visitors "seldom encounter other visitors and staff" and "intrusions on natural sounds

are rare, of low intensity, and mainly from outside." Therefore, the number of snowmachines would need to be reduced on Exit Creek and elsewhere in this zone, but not on the Paradise Valley Trail.
- The tools described on pages 16-17 would be used to decrease snowmachines in order to meet desired winter conditions in this zone.

Terrain that is not suitable for trails or structures due to steepness, unstable rock, and avalanches would be included in the Backcountry Primitive zone; this is the majority of the Exit Glacier area.

Costs and Implementation
The actions included in the preferred alternative would be implemented over the next 20 years, as funding became available. The initial cost estimate (year 2007 dollars) for constructing new facilities and other elements included in the preferred alternative is approximately $625,000 – 650,000 (Table 2). $800,000 – 825,000 per year would be needed for additional staffing needs:

- Maintenance: four seasonals and convert two part-time employees to full time
- Resource Management: two permanent full time employee and two seasonals
- Ranger Operations: convert one part-time ranger to full time
- Interpretation: one permanent seasonal employee and four seasonals

The figures are intended to give a general indication of costs, and should *not* be used for budgeting purposes. Actual costs to the National Park Service would vary depending on if and when actions were implemented, the size and location of facilities, and contributions by partners and volunteers. The cost figures are only intended to give a rough idea of the relative costs of this alternative compared to the other alternatives.

Because of the limited financial resources available, the park staff would need to pursue various means to fully implement the preferred alternative, such as seeking additional funding sources and developing cooperative agreements. The actual cost of implementing the preferred alternative would ultimately depend on funding by the National Park Service and Congress over the life of the plan.

ALTERNATIVE A

Concept
This alternative would focus on improving interpretation, education, and non-motorized recreation, but would rely more on increased staffing and program development than on physical development to do so. The goal of this concept is to transform Exit Glacier from a "photo-op" of the glacier to an education experience.

Carrying Capacity and Visitor Use Management Strategies
Carrying capacity and visitor use management strategies implemented under this alternative would be the same as described for the preferred alternative.

Zone Allocation and Related Actions – Summer
In summer, the Backcountry Primitive Zone would cover most of the Exit Glacier study area (92.5%). The Hiker Zone would cover 6.1% of the area, the Pedestrian Zone 0.9% and the Visitor Facilities Zone 0.5%. There would not be any area mapped as Backcountry Semi-Primitive

The *Visitor Facilities Zone* would be located around existing development including the road, the Nature Center, picnic area, campground, cabins, restrooms, and parking lot. Key actions in this zone:

- Curriculum based education programs for students would be provided during the early spring and late fall. Ranger led public programs would be offered during the summer season with expanded ranger led hikes along all trails. Day camp activities for children, teacher workshops, and training for teachers to give programs would be provided. The park would offer fixed station and roving interpretation along the hiking trails at Exit Glacier, develop a self-guided trail map and other resource related park information, and provide an opportunity for summer intern degree candidates and volunteers to develop research based programs, manuals and public information.
- A gathering pavilion, as identified in the 1996 DCP, would be constructed near the Nature Center on the site of the old ranger station.
- Install a wetland viewing platform to provide visitors with a new educational experience in a habitat not easily visited previously. The platform would be located on the south side of the entrance road near the vehicle bridge. The platform would be 10' x 10', accommodate up to 12 people, set approximately 20 feet away from the road, and accessed by a short boardwalk. Interpretive signs describing wetland ecology would be installed on the platform. Limited parking exists that would be within walking distance of the platform.

The *Pedestrian Zone* would be located in the outwash plain of the glacier terminus, encompassing the Nature Trail, the Overlook Loop Trail, and the start of the Harding Icefield Trail. This zone would be dynamic, as it would increase or decrease with glacial retreat or advancement, so as to always be located adjacent to the face of the glacier. Key actions in this zone:

- The 0.3 mile long section of trail on the southern end of the main trail from the parking lot to the glacier would be paved to improve access to the edge of the outwash plain.
- Additional educational signs and exhibits would be installed along the trail to the outwash plain, the Nature Trail, and the Overlook Loop Trail that includes information on interpretive themes such as plant succession, and preservation and protection of the resources. Additionally, wayside exhibits and informational signs would present safety information and guides for visitors to conduct self-guided tours of the area.

The *Hiker Zone* would be applied so that it follows the Harding Icefield Trail corridor and the Exit Creek corridor. The Harding Icefield Trail corridor would be 0.25 mile wide

(0.125 mile on each side of the trail) and the Exit Creek corridor would be 0.125 miles wide (0.06 mile on each side of the trail). Key actions in this zone:

- Existing social trails along the north side of Exit Creek would be extended and improved by removing vegetation to widen the trail (36" to 48") and clearing the surface of obstacles. This new Exit Creek Trail would be approximately 0.75 miles long, running from near the vehicle bridge, past the campground, and connecting to the eastern end of the Nature Trail.
- A spur trail would be added from the Harding Icefield Trail, in the location of an existing social trail, to allow access for ice climbing on the glacier. This new spur trail would be 0.25 mile long, 18" to 24" wide, and may have rocks or other low obstacles.
- A few small educational and interpretive signs would be installed along the Harding Icefield Trail and the Exit Creek Trail providing information on such topics as the Harding Icefield, habitat change with elevation increase, stream and floodplain processes, plant succession, and glaciation.

Terrain that is not suitable for trails or structures due to steepness, unstable rock, and avalanches would be included in the *Backcountry Primitive Zone*; this is the majority of the Exit Glacier area. No actions are proposed in this zone.

Zone Allocation and Related Actions – Winter

In winter, the Backcountry Primitive Zone would cover the majority of the Exit Glacier study area (82.9%). The next largest zone, Backcountry Semi-Primitive, would be added to cover 15.7% of the area. The Pedestrian Zone and the Visitor Facilities Zone would essentially remain the same as in summer at 0.9% and 0.5% respectively. In winter there would be no area zoned as Hiker.

Placement of the *Visitor Facilities Zone* would remain unchanged from the summer alternative. Key actions in this zone:

- Temporary overnight accommodations would be offered through a concessionaire, in addition to use of one of the existing public use cabins. A possibility for overnight accommodations would be to set up yurts in an already-disturbed area such as a section of the parking lot. Yurts could be erected at the start of winter and dismantled in the spring. The vault toilets would be available for use in winter.
- Activities would be scheduled for the public and for school groups at the Nature Center. Based on demand, activities could be scheduled as often as every day or just once a week, such as ranger-led snowshoeing to observe animal tracks, indoor programs about winter ecology, and winter ecology programs especially for students.
- A concessionaire operated snow coach would be used to transport individuals, families, and school groups to the Exit Glacier area. This would facilitate access and allow visitors to more easily visit the area to participate in winter recreation activities and in educational programs at the Nature Center (see *preferred alternative* for a description of snow coaches).

- Motorized vehicles would be allowed only on the entrance road and in the parking lot. Signs and/or increased staffing would be in place to advise visitors of area closures.
- Other than snowmachines and snow coaches, no motorized vehicles would be allowed in this zone.

The *Pedestrian Zone* would remain unchanged from summer. An exception to this zone description would allow motorized use for administrative purposes. Key actions in this zone:

- This entire zone would be closed to snowmachines and other motorized use other than trail grooming and emergency response. Snowmachines would no longer be allowed on the main trail to the glacier or on the outwash plain.
- The paved trail to the glacier would be groomed for non-motorized recreation.

The *Backcountry Semi-primitive Zone* would follow the contours of the lowland forest and include the wetland areas. Key actions in this zone:

- Ski routes would be marked, using signs or flagging, on the Exit Creek Trail and other routes to be determined if demand increases (e.g., in Paradise Valley). Routes would not be groomed; the first person out would set the track.
- The number of snowmachiners in this zone under current conditions is not consistent with the desired conditions of the Backcountry Semi-Primitive Zone which states that visitors "seldom encounter other visitors and staff" and "intrusions on natural sounds are rare, of low intensity, and mainly from outside." Therefore, the number of snowmachines would need to be reduced on Exit Creek and elsewhere in this zone.
- The tools described on pages 16-17 would be used to decrease snowmachines in order to meet desired winter conditions in this zone.

Terrain that is not suitable for trails or structures due to steepness, unstable rock, and avalanches would be included in the *Backcountry Primitive Zone*; this is the majority of the Exit Glacier area.

Costs and Implementation

Like the preferred alternative, the Park Service would implement actions under alternative A over the next 20 years as funding became available. The initial cost estimate (year 2007 dollars) for constructing new facilities and other elements included in the alternative A is approximately $175,000 – 200,000 and $650,000 – 675,000 per year for additional staffing needs (Table 2). Additional staffing needs for each division would be:

- Maintenance: two seasonals and convert two part-time employees to full time
- Resource Management: two permanent full time employee and two seasonals
- Ranger Operations: convert one part-time ranger to full time
- Interpretation: one permanent seasonal employee, one term employee and two seasonals

Again, cost figures are rough and only intended for comparison with the other alternatives.

ALTERNATIVE B

Concept

This alternative promotes increasing the infrastructure of the Exit Glacier area to accommodate a greater number of visitors and recreational activities year-round. Visitor demand and economic feasibility would determine if the major actions (e.g., RV campground, hostel, groomed trails in winter) would be implemented. Demand and feasibility would be determined through visitor surveys, dedicated economic feasibility studies, and issuance of concession prospectuses.

Carrying Capacity and Visitor Use Management Strategies

Carrying capacity and visitor use management strategies implemented under this alternative would be the same as described for the preferred alternative.

Zone Allocation and Related Actions – Summer

Most of the area would be mapped as Backcountry Primitive (71.6%), but a good portion would be zoned otherwise. The Backcountry Semi-Primitive Zone would comprise 13.4% of the study area, the Hiker Zone 11.1%, the Pedestrian Zone 1.6% and the Visitor Facilities Zone 2.3%.

The *Visitor Facilities Zone* would be applied around existing development including the road, parking lot, Nature Center, restrooms, cabins, picnic area, campground, Nature Trail, and the paved trail to the outwash plain. Key actions in this zone:

- A bike path would be located on the north side of the entrance road starting at the vehicle bridge over the Resurrection River and ending at the parking lot, approximately 1.5 miles long, as described in the *preferred alternative.*
- An RV campground would be added north of the entrance road, with access half way between the bridge and the parking lot. A one-way paved loop road (approximately one mile long) would provide 10 to 20 campsites located both inside and outside of the loop. Each campsite would consist only of a gravel pad for parking a camper or other vehicle. No dump station or hookups would be provided. Potable water could be obtained at the restrooms located at the edge of the parking lot. Camping would be on a first-come first-served basis. Several picnic tables and bear proof trash cans would be provided in a central location.
- The existing tent campground would be expanded by adding a new loop to the west between the road and the river. This new loop would accommodate nine to twelve additional walk-in tent sites similar to the existing sites. The campground parking lot would be expanded to allow for the additional required parking spaces. Two additional vault toilets and another cooking shelter would be installed at the far end of the new loop. Camping would continue to be on a first-come first served-basis.
- A gravel parking area would be built on the south side of the road at a new trailhead approximately 0.5 mile away from the vehicle bridge. Parking would be available for

10 to 15 vehicles for access to three new trails. A bulletin board with visitor information would be installed in the parking area.

- The 0.3 mile long section of trail on the southern end of the main trail from the parking lot to the glacier would be paved to improve access to the edge of the outwash plain.
- A gathering pavilion, as identified in the 1996 DCP, would be constructed near the Nature Center on the site of the old ranger station.
- A viewing platform (consisting of a hardened gravel pad) would be constructed on the edge of the outwash plain within view of the glacier, as described in the *preferred alternative*.
- A rustic 12-15 person hostel-type lodge would be constructed to be run year-round as a concession. The building would be approximately 2500 square feet, accessible from the parking lot and located just to the north. The hostel would provide three to five private rooms and also a dormitory style sleeping area. A cooking facility with running water and electricity would be available for guests to prepare their own meals. Two additional vault toilets would be installed adjacent to the lodge, or guests could use the restrooms near the parking lot. If this action were selected for implementation, an economic feasibility analysis would be completed as a first task.
- Communication capabilities, including telephone and electric service, would be improved. This would be accomplished either by installing a cell-phone tower in a location (to be determined) not visible to visitors or by installing a booth at the edge of the plaza that uses a satellite telephone. A generator, solar panels, and/or fuel cells could provide electricity to the hostel and Nature Center. Alternative energy sources would be given first priority.

The *Pedestrian Zone* would be applied to provide a transition between the Visitor Facilities Zone and the Hiking Zone in the area of the RV campground and the new Forest Loop Trail. This zone would also include the outwash plain and Overlook Loop Trail. This zone would be dynamic, as it would increase or decrease with glacial retreat or advancement, so as to always be located adjacent to the face of the glacier. A key action in this zone:

- The Overlook Loop Trail would be hardened (either paved or planked) and widened to a minimum of 48", in accordance to the Trail Plan for Exit Glacier (NPS 1991), for easier accessibility to the glacier and to accommodate larger numbers of visitors

The *Hiker Zone* would be allocated to provide a 0.25 mile wide (0.125 mile on each side of the trail) corridor along the Harding Icefield Trail. Hiker Zone corridors also would be allocated to encompass proposed trail corridors in Paradise Valley, Exit Creek, Goat Ridge, and Forest Loop. The Paradise Valley Trail corridor would be the same width as the Harding Icefield Trail corridor. The corridors around the other trails would be 0.125 mile wide (0.06 miles on each side of the trail). Approximate locations for these trails are shown on the map. Key actions in this zone:

- A new trail along the north side of Exit Creek would be constructed by extending and improving existing social trails, removing vegetation to widen the trail (36" to 48"),

and clearing the surface of obstacles. This new Exit Creek Trail would be approximately 0.75 miles long, running from the vehicle bridge, past the campground, and connecting to the eastern-most section of the Nature Trail. It could be accessed also from the new trailhead and parking area on the entrance road.

- The Forest Loop Trail would be constructed north of the road through the lowland forest and could be accessed at either the new trailhead or the parking lot. This new trail would be 2 miles long and have a similar surface to the Harding Icefield Trail (i.e., constructed of native materials with a natural appearance, may have rocks or other low obstacles).
- The Goat Ridge Trail would be constructed as a spur trail off the western section of the Forest Loop Trail to access the ridgeline running along the northern boundary of the study area. The trail to the ridgeline would be 1.25 miles long from the Forest Loop Trail (the section of the Forest Loop Trail from the parking lot to the start of this trail would be 0.5 mile long). The Goat Ridge Trail would have a similar surface to the Harding Icefield Trail.
- The Paradise Valley Trail (see trail description under the *preferred alternative*) would be accessed at the new trailhead (see trailhead description under the *preferred alternative*) on the entrance road and would be located close to the eastern park boundary. This 2.75 mile long trail could in future connect to the trail system of Caines Head State Recreation Area. Connecting trails outside of the Exit Glacier study area could be designated as part of a future Backcountry Management Plan. A footbridge would be installed past the trailhead to allow for crossing of Exit Creek. The bridge span would be constructed of treated timber girders placed over bents on either side of the stream and stream banks would be reinforced. This type of bridge is of similar construction to the existing footbridges that cross braided water channels in the outwash plain. The Paradise Valley Trail would have a similar surface to the Harding Icefield Trail.
- Two existing social trails used by ice climbers would be made into official spur trails for additional access to the glacier. Both trails would originate from the Harding Icefield Trail. The first trail would start at approximately mile 0.9 up on the Harding Icefield Trail and would be 0.25 miles long. The second trail would start at approximately mile 1.2 up the Harding Icefield Trail and would be 0.25 miles long, 18" to 24" wide, and may have rocks or other low obstacles.

Terrain that is not suitable for trails or structures due to steepness, unstable rock, and avalanches would be included in the *Backcountry Semi-primitive Zone*; this is the majority of the Exit Glacier area. The *Backcountry Primitive Zone* would be applied to include the entire Harding Icefield portion of the Exit Glacier area and part of the glacier along the summer snow melt line because these areas are not suitable for trails or marked routes due to shifting ice and snow. No actions are proposed for these two zones.

Zone Allocation and Related Actions – Winter

In winter, the Backcountry Primitive Zone would cover the majority of the Exit Glacier study area (83.3%). The Backcountry Semi-Primitive Zone would cover 7.9%. The Hiker Zone (except for the Harding Icefield Trail and Goat Ridge corridors) and the

Visitor Facilities Zone would essentially remain the same as in summer at 6.5% and 2.3% respectively. In winter there would be no area zoned as Pedestrian.

The *Visitor Facilities Zone* would be applied the same in winter as in summer. Key actions in this zone:

- Commercial transportation, such as a snow coach, would be encouraged to bring visitors from Seward to Exit Glacier (see *preferred alternative* for a description).
- One trail to the outwash plain and glacier would be groomed or cleared of snow for general access and access to people with disabilities.
- Overnight accommodations would be provided at the hostel, operated by the concessionaire as in summer, at two of the existing cabins that would be open to public use, at the tent campground, and at concessionaire operated yurts that could be set up on a temporary basis in the RV campground. The restroom facilities would remain open for use in winter.
- Snowmachines and snow coaches would be allowed in this zone, but would be restricted to the road and parking lot. Snowmachines would no longer be allowed on the main trail to the glacier.
- The bike path would continue to be used for non-motorized recreation, as in summer, and would be groomed.
- Activities would be scheduled for the public and for school groups at the Nature Center. Based on demand, there could be several activities scheduled each day, such as ranger-led snowshoeing to observe animal tracks, indoor programs about winter ecology, and winter ecology programs especially for school groups.

The *Hiker Zone* would encompass the outwash plain and the Forest Loop Trail, the Paradise Valley Trail, and the Exit Creek Trail corridors. Key actions in this zone:

- Snowmachine use for traditional activities would be allowed in the outwash plain to within 50 yards (46 meters) of the glacier terminus.
- The Exit Creek Trail corridor and the Paradise Valley Trail corridor would have continued snowmachine use for traditional activities, as well as non-motorized recreation.
- The Forest Loop Trail north of the road would be designated for non-motorized use only. This trail would be maintained as a groomed ski trail.

The area zoned as *Backcountry Semi-primitive* would encompass the lowland forest and the wetland areas. Key action in this zone:

- A short loop trail connecting the Paradise Valley Trail to the Nature Trail would be marked for non-motorized recreation under good snow conditions. Such trails would not be maintained, other than providing route markers, and would not be apparent in summer.
- The number of snowmachiners in this zone under current conditions is not consistent with the desired conditions of the Backcountry Semi-Primitive Zone which states that visitors "seldom encounter other visitors and staff" and "intrusions on natural sounds

are rare, of low intensity, and mainly from outside." Therefore, the number of snowmachines would need to be reduced on the social trail between Exit Creek and Paradise Valley and elsewhere in this zone.
- The tools described on pages 16-17 would be used to decrease snowmachines in order to meet desired winter conditions in this zone.

Most of the study area would be zoned as *Backcountry Primitive* since it would not be suitable for development or maintained routes in winter due to steep terrain and avalanche danger.

Costs and Implementation

Like the preferred alternative and alternative A, the Park Service would implement actions under alternative B over the next 20 years as funding became available. The initial cost estimate (year 2007 dollars) for constructing new facilities and other elements included in the alternative B is approximately $2,225,000 – 2,250,000 and $975,000 – 1,000,000 per year for additional staffing needs (Table 2). Additional staffing needs for each division would be:

- Maintenance: six seasonals and convert two part-time employees to full time
- Resource Management: two permanent full time employee and four seasonals
- Ranger Operations: convert two part-time rangers to permanent full time
- Interpretation: one permanent full-time employee, four permanent seasonals

Again, cost figures are rough and only intended for comparison with the other alternatives.

Table 2. Comparison of cost estimates among alternatives.

ALTERNATIVE	One-time Capital / Construction Costs	Annual Costs for Additional Staff (# of FTEs / cost)
No-Action	$75,000 – 100,000	8 FTEs / $575,000 – 600,000
Preferred	$625,00 – 650,000	11 FTEs / $800,000 – 825,000
A	$175,000 – 200,000	9 FTEs / $650,000 – 675,000
B	$2,225,000 – 2,250,000	14 FTEs / $975,000 – 1,000,000

MITIGATION MEASURES

Mitigation measures are specific actions that when implemented, minimize, avoid, or eliminate impacts on resources that would be affected by the actions of any alternative. The following mitigating measures would be applied to avoid or minimize potential impacts from construction activities and visitor use. Except where specifically noted, these measures would apply to all alternatives. Resources that are not listed would not have any applicable mitigation measures.

Soils

Construction impacts such as soil loss and erosion would be minimized by salvaging and reusing the native soils. Sprinkling construction areas with water would minimize soil loss from dust.

Trail and road construction would be planned and designed to minimize erosion and sedimentation. Alignment of trails, parking, and camping areas would avoid disturbing fragile wetland soils or intercepting and diverting seeps and stream channels. These areas would be accessed and traversed by boardwalks or bridges to prevent compaction, churning, or rilling of soils. Trails would be constructed in a manner to avoid or minimize steep treadways, reducing the potential for soil erosion due to formation of water rills, gullies, and outboard trail tread failure. The bike path would be wide enough to allow hikers and bicyclists to pass each other safely without leaving the path tread, which would minimize localized impacts to soils flanking the margins of the path. Hiking trails would also be designed to prevent development of social trails or other off trail uses.

Removal of vegetation would be minimized when possible, and areas disturbed during construction would be re-vegetated to preserve or enhance the restoration of natural soil properties. Denuded soils would be revegetated immediately after construction activities are completed.

Impacts to soils including compaction from visitor use would be mitigated by installing barriers to minimize off trail use through areas of sensitive or erodable soils. Where appropriate, natural rock trail borders would be installed to delineate trails and encourage users to remain on the trail/path tread, thus reducing soil impacts to adjacent off path areas. Soils would be monitored for compaction and erosion impacts and measures would be taken to prevent and repair further impacts.

Wetlands and Floodplains

Trails, including bicycle and hiking trails, would be routed to avoid wetlands wherever possible. Where not possible, or where visitor access to wetlands is desired, as in alternative A, structures such as a viewing platform and boardwalks would be designed with minimal piling placement to avoid impeding natural flow patterns. Inert structural materials such as plastics or untreated wood would be utilized. Boardwalks would also employ as little piling placement as possible and be slatted in such a manner to avoid creating excessive shade. Existing structures in wetlands, such as the road levee would be used to the fullest extent to support a bicycle path and to eliminate or minimize further fill placement. Siltation fencing would be used during construction activities to prevent sediments in disturbed areas from entering wetlands.

Alteration of floodplain structure or function would be avoided whenever possible in order to protect infrastructure, although some alteration, such as culvert placement and diverting runoff is unavoidable in all alternatives. In these instances, non-structural measures would be employed as much as possible to reduce hazards to property.

The exact location and design of a hostel as proposed in alternative B would require an onsite evaluation of local soil conditions. Preferred sites would possess well-drained soils. Locations requiring extensive fill would be avoided, as would proximity to steep slopes, landslides, rock outcrops and subsidence areas. Erosion- prone or fragile soils and areas with a history of flooding would also be avoided.

Air Quality and Visibility

In all alternatives, buses would not be allowed to idle in the parking areas in order to decrease emissions and odors.

Soundscape

For bike and hiking trail construction as proposed in the preferred alternative and alternatives A and B hand tools would be used in lieu of power tools as much as possible in order to lessen noise. Small diameter trees and shrubs would be cut or removed with handsaws or machetes. Efforts would be made to limit power tool use to times of low visitation, such as 0700-1100 and 1700-2100 hours, as daylight permits.

Visitors would be provided with information on the natural soundscape of the area as part of the overall natural experience via educational materials, school programs, signs, interpretive talks or other methods. Visitors would be educated on the importance of preserving soundscape as a natural resource.

An education plan would be developed to encourage the use of a snow coach and/or an alternative summer transportation system to aid in reducing vehicular related noise in the study area.

Generators in RV's would be muffled or not allowed, buses would not be allowed to idle, delivery trucks for fuel would arrive after peak visitor hours.

Vegetation

Work on campsites, trails, and other visitor facilities in the study area would be planned so as to reduce impacts on vegetation. Proposed locations for infrastructure such as signs, buildings, campsites, etc. would be surveyed for possible special status plant species. Areas disturbed during construction in any alternative would be revegetated with native plant species and restored to duplicate natural conditions. Trails would be designed and maintained to discourage social trail development. Efforts would be utilized to control exotic species in all alternatives. A dedicated program of invasive species control would be implemented to insure minimal negative impacts to native vegetation. The main components of the program would be to prevent spread of known exotic species populations and survey to detect new infestations, increase public awareness, manage existing exotic plant populations (e.g., techniques could include hand pulling plants), and monitor to determine population levels and effectiveness of control treatments.

Revegetation plans would be developed for areas impacted by major construction activities, and would continue to require the use of native species, as well as plant and topsoil salvage. Revegetation plans would specify such features as seed and plant sources, seed mixes, soil preparation, fertilizer, and mulching. Salvaged vegetation, rather than new planting or seeding, would be used to the extent possible. To maintain genetic integrity, all seeds used in restoration would be collected in the project area. Plant material would be propagated from seeds or plant stock collected in the project area. Use of nonnative species or genetic materials would be considered only where deemed necessary to prevent severe resource damage, and would be approved by the park's ecologist. Restoration activities would be instituted immediately after construction was completed. Monitoring would be carried out to ensure that revegetation was successful, plantings were maintained, and unsuccessful plant materials were replaced.

Wildlife

To the extent possible, construction activities would be timed to avoid sensitive periods, such as nesting season. New or rehabilitated facilities would be sited to avoid the following sensitive wildlife habitats:

- Wildlife travel corridors
- Foraging areas
- Denning sites
- Nesting or brood-rearing areas

Measures would be taken to reduce the potential for wildlife to get food from humans. Bear-proof garbage containers would be required in developed areas (including visitor centers, picnic areas, trails, interpretive waysides, and campgrounds). Visitors, park staff, and contractors would be required to secure all food and garbage in cabins, vehicles, or bear-proof containers. Visitors would continue to be educated about the need to refrain from feeding wildlife through the use of signs attached to picnic tables and posted on kiosks in campgrounds and picnic areas. Park staff would be instructed in the use of pepper spray and encouraged to carry it at all times while on duty.

Visitor use and park operational activities would be discouraged in sensitive wildlife habitats such as winter moose foraging areas. Selected wildlife populations may be monitored to detect adverse impacts.

Socioeconomic Environment

In alternatives A, B and the preferred, should the snow coach be implemented, mitigation measures would include undertaking careful planning and coordination with stakeholders to develop schedules and protocols that minimize impact to other user groups. Measures would also include developing and publicizing a reasonable limited schedule for snow coach service so that other users can plan their recreation around it, and pricing and scheduling these services in such a way as to maximize its use by as many different user groups as possible.

Limited use of snowmachines or other vehicles as a "courtesy shuttle" to allow access to the glacier by those unable to ski or snowshoe would also be considered as mitigation measures in alternatives A and the preferred. Impacts from this service would be mitigated by limiting the times and days that such a service would be offered.

Socioeconomic impacts from a hostel or similar accommodation as described in alternative B would be mitigated by working to develop a service that complements, rather than competes, with existing businesses. Amenities and/or prices appealing to a different market than that served by local bed and breakfasts, hotels, and motels would be offered.

Impacts from the creation of an RV campground would be mitigated by creating amenities and prices comparable to local private and municipal RV campgrounds to avoid unfair publicly subsidized competition.

Safety

Overall safety in the study area may be improved for all alternatives via education, including brochures, interpretive talks and displays. In addition to the bear safety brochures currently available, safe backcountry travel brochures stressing preparedness would be developed and distributed.

ALTERNATIVE ACTIONS CONSIDERED BUT NOT ANALYZED FURTHER

Several other actions and alternative concepts were considered by the planning team for managing the Exit Glacier area but were eliminated from further analysis. The following actions were not analyzed because they were found not to be viable or feasible under current conditions.

Return the area to the way it was before vehicle bridge was constructed
Preliminary alternative C proposed to return the area to the way it was 15 years ago. This alternative would have focused on ecosystem restoration and imposing fewer regulations on visitor use. The alternative proposed that access to vehicles would be blocked at the Resurrection River bridge with a gate but would have allowed access for foot traffic, wheelchairs, strollers, and the like to cross the Resurrection River. All existing infrastructure would have been removed, including the public bathroom facilities, the parking lot, and signs, other than the Nature Center which would function as a ranger station, using one nearby vault toilet. Disturbed areas where facilities would be removed would be revegetated or would undergo ecological restoration. This alternative has been dismissed as it does not meet the Purpose and Need for this plan as it does not preserve the experience of easily visiting Exit Glacier.

Non-motorized Hiker, Semi-Primitive and Primitve Zones
The preliminary alternatives workbook presented zones that were closed to all motorized vehicles. NPS has since decided to first attempt to meet zone conditions, while still

allowing some snowmachine use for traditional activities in winter, through less restrictive measures using the tools described on pages 16-17 to decrease snowmachine use.

Alternative Summer Transportation
A study conducted to determine the economic feasibility of an alternative transportation system (e.g., a shuttle bus) to bring visitors from Seward to Exit Glacier was conducted in 2002 (Giraud and Pinkerton 2003). The study determined that, depending on the options chosen, such as frequency of service and fees, a shuttle service provider could expect to see from 18,000 to 550,000 visitors per summer, based on opinions expressed by current visitors and projections. Annual revenues from such a service would range from $0 if the shuttle was free, to approximately $200,000 if a $5 fee was charged, to approximately $2,000,000 if a $15 fee was charged. Giraud and Pinkerton's (2003) assessment shows that the demand exists and that the operation would be economically feasible.

Although discussed in the preliminary alternatives originally presented to the public, NPS will not consider an alternative transportation system in this planning effort. Data show that the parking lot only reaches capacity on a few days each summer and that visitation trends are flat or even decreasing (NPS 2002a). Instead, the park will revisit the issue of alternative transportation in the future when the need becomes apparent according to carrying capacity thresholds. At that time, a transportation plan will be developed to determine whether the shuttle system would be operated on a voluntary or mandatory basis, what type of vehicle to use, where shuttle stops would be located, how often a shuttle would run, hours of operation, and other logistical issues.

Plow Exit Glacier Road
The concept of plowing all or part of the Exit Glacier Road (in partnership with the USFS and the State of Alaska) was considered by the planning team as a means of increasing access to the Exit Glacier area in winter. This concept was not proposed to the USFS or the State and was dropped from further evaluation in response to public input in both 1999 and 2002. Local residents indicated that they enjoy and rely on using the entire road for both motorized and non-motorized recreation in winter, whether they travel the whole distance to Exit Glacier or not.

Designated Snowmachine Trail To and Around the Outwash Plain
The planning team considered the concept of designating a marked and groomed snowmachine trail from the parking area to the outwash plain, following either the main summer pedestrian path or the bed of Exit Creek.

This trail would allow continued snowmachine access all the way to the glacial terminus, but would restrict riders from entering the wooded areas or slopes adjacent to the glacier, preserving wildlife escape habitat and areas for non-motorized recreation only.

This concept was determined to be infeasible for several reasons:

Visitor Safety and Preservation of Wildlife Habitat: The main pedestrian path to the glacier would be used for educational programs, likely consisting of groups of children or adults, for snowshoe walks or Nordic skiing in most of the alternatives. The summer pedestrian path is not wide enough to safely accommodate motorized vehicles such as snowmachines operating alongside such groups. Exit Creek provides an alternative, but operation of machines in that area would produce an unacceptable sound intrusion on these same groups and on winter stressed wildlife. Either route would result in conflicts between motorized and non-motorized users once they reach the outwash plain itself, as both user groups would seek the glacial terminus for its scenic and educational values.

Designated Snowmachine Trail Compliance: Since 1998, the park has experimented with a designated snowmachine trail to the outwash plain for visitors associated with the Seward Resort, a local US Army recreational facility. Both the park and the Army wanted to mitigate the impact of the Resort's snowmachine rental operation on the Exit Glacier area by selecting and grooming one specific trail to the glacier. Since 1999 the resort has provided at least one employee as a guide whenever a group is at Exit Glacier. One of the responsibilities of this employee is to inform users of the areas designated by the park for their snowmachine use. Despite everyone's best efforts, Seward Resort rental machines are commonly seen outside of these recommended riding areas. The park has noted that once one machine goes off trail and lays a new track, other users follow as it is difficult to readily differentiate between the "official" groomed trail and the non-designated track.

Maintaining and Policing a Designated Snowmachine Trail: Maintaining a designated trail would be difficult if not impossible without a system of trail markers that would be extremely labor intensive to maintain as well as being visually intrusive. Budget constraints would likewise make policing a designated trail impossible.

Snowmachine Trail between Paradise Valley and the Outwash Plain
The proposal to re-mark the trail that in the past connected the outwash plain to Paradise Valley across an alder/spruce grove was considered. This action was dismissed because the trail would be located in prime moose winter range and would decrease the amount of habitat available.

Alternate Times for Motorized and Non-motorized Activities in Winter
The concept of designating different times for motorized and non-motorized recreation was analyzed and considered previously at a public workshop in 1999. At that time it was rejected because of disagreement as to how to set up such a system. In addition, the weather and snow conditions in Seward are very variable and on beautiful days everyone wants to be out recreating. Based on the previous experience at trying to set up such a system, this concept was dismissed.

Construct a Lodge at the Top of the Harding Icefield Trail
An earlier version of alternative B proposed a rustic lodge located at the top of the Harding Icefield Tail to be operated on a year round basis. Due to economics, avalanche danger, sever weather, visitor access, and disposal of human waste and garbage, the

planning team determined that this was not a viable or responsible action to include in any alternative. Instead, a hostel-style lodge located in the developed area near the parking lot has been included in alternative B.

Electric Cart Trail to the Glacier
An earlier version of alternative B proposed a new paved trail to the outwash plain and glacier terminus to be constructed parallel to the existing paved trail. The purpose of this new trail was to be primarily for mechanized access to the glacier for electric carts used for access to people with disabilities, wheelchairs, and strollers and was to be paved all the way to the edge of the outwash plain to allow for the mechanized access. This action has been removed from alternative B since it would be almost identical to the existing trail and not deemed necessary.

One-way Trails
One-way trails were proposed during scoping to reduce feeling crowded when hiking at Exit Glacier. The park currently recommends that visitors hike one-way on the Overlook Loop Trail. This concept falls under general trail management, which is addressed in the Trails Plan for Exit Glacier (NPS 1991), thus was not incorporated as a new action into any of the alternatives.

Expand the Parking Lot
The concept of expanding the parking lot rather than implementing a shuttle system to transport visitors to the Exit Glacier area is not feasible due in part to limited availability of land. Expansion of the parking lot was considered in the 1996 DCP and has been implemented to the fullest extent practicable. Further parking lot expansion is limited by cumulative impacts that would degrade the surrounding wetlands. The existing lot capacity is only exceeded for a few days during peak times, and visitation is not expected to increase significantly.

Eliminate Entrance Fees
Kenai Fjords National Park is not authorized to determine whether or not to collect entrance fees. The decision to collect fees is based on congressional legislation and regional mandates. Based on current legislation, entrance fees at Exit Glacier would continue at least until 2006.

ENVIRONMENTALLY PREFERRED ALTERNATIVE

The Environmentally Preferred Alternative is defined as "the alternative that will promote the national environmental policy as expressed in §101 of the National Environmental Policy Act. Section 101(b) states that " ... it is the continuing responsibility of the Federal Government to...

(1) Fulfill the responsibilities of each generation as trustee of the environment for succeeding generations;

(2) Assure for all Americans safe, healthful, productive, and aesthetically and culturally pleasing surroundings;

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

(4) Preserve important historic, cultural, and natural aspects of our national heritage, and maintain, wherever possible, an environment which supports diversity, and variety of individual choice;

(5) Achieve a balance between population and resource use which will permit high standards of living and a wide sharing of life's amenities; and

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

The environmentally preferred alternative is the NPS preferred alternative for the *Exit Glacier Area Plan.* This alternative satisfies the national environmental goals. The alternative provides the best protection of natural resources while concurrently providing for a wide range of neutral and beneficial uses of the environment.

The alternative maintains an environment that supports a diversity and variety of individual choices and integrates resource protection with an appropriate range of visitor uses. The preferred alternative surpasses the other alternatives in realizing the full range of national environmental policy goals in Section 101.

REGULATORY IMPLEMENTATION

Under any selected alternative, changes to rules and regulations may be required to implement the plan and achieve desired future conditions. These changes may involve the elimination, relaxation, or other modification of existing regulations. Promulgation of new regulations may be required (see Table 3 for possible future regulations). Before new rules or regulations are promulgated, the park will explore other means to achieve the desired conditions, including education, improved signing, changes in staffing, and voluntary compliance.

Existing federal regulations, found in Title 36 of the Code of Federal Regulations (CFR), provide the Superintendent with authority to make designations or impose public use restrictions or conditions. These designations are reviewed at least annually and are contained in a document commonly referred to as the "Superintendent's Compendium" or simply "Compendium". The compendium is available at the park headquarters and from the park web page. The designations and restrictions are communicated to visitors in a variety of ways.

Pursuant to 36 CFR § 1.5(b), a closure, designation, use or activity restriction or condition, or the termination or relaxation of such, which is of a nature, magnitude, or

duration that will result in significant alteration in the public use pattern of the park, adversely affect the park's natural, aesthetic, scenic, or cultural values, require a long-term or significant modification in the resource management objectives of the park, or is of a highly controversial nature will be published as rulemaking in the Federal Register, with the required public notice and review.

Prior to closing an area on a temporary or permanent basis to the use of snowmachines for traditional activities pursuant to 43 CFR § 36.11(h), a finding that such use would be detrimental to the resource values of the area will be made. Any closure made will not be effective until after notice and hearing.

The park proposes to designate, through special regulation, the "Exit Glacier Developed Area" to include all areas zoned as "Visitor Facilities" or "Pedestrian" in the preferred alternative of this plan.

A "developed area" is defined in 36 CFR § 1.4 as "roads, parking areas, picnic areas, campgrounds, or other structures, facilities, or lands located within development and historic zones depicted on the park area land management and use map".

Special regulations specific to the Exit Glacier Developed Area would be proposed as needed to implement the management prescriptions of the final plan. Examples include regulations regarding snowmachine use, camping, fires, bicycles, parking, and similar activities which require more intensive management within the developed area than in the park as a whole.

Table 3. Possible future regulations required to implement proposed actions.

COMMON ACTIONS	EXISTING REGULATIONS	PLAN IMPLEMENTATION
Overnight Camping	Within the Exit Glacier Study area, camping is currently prohibited within ½ mile of any road or trail except in designated sites in the Exit Glacier campground from March 1st – November 1st. Camping outside of the campground is restricted to areas covered with snow or unvegetated rock. Camping in the campground is limited to no more than 14 nights in a 6 month period. No more than 6 persons and/or two tents may occupy a single campsite in the campground.	Regulation of camping in the Exit Glacier campground would essentially remain unchanged. The Pedestrian and Hiker zones may be closed to camping if the existing prohibition of camping within ½ mile of roads or trails does not achieve the desired conditions. Group size limits or similar conditions may be established in the Backcountry Semi-primitive and Primitive zones.
Overnight Occupancy of Recreational Vehicles	Overnight occupancy of vehicles is prohibited within the study area.	This prohibition would remain unchanged except to accommodate RV camping under alternative B.
Airplane Landings and Overflights	Operation of fixed wing aircraft is allowed in accordance with 43 CFR 36.11(f).	No changes in this activity are envisioned in this plan. The park management would continue to work cooperatively with aircraft operators to minimize visual and auditory intrusions where possible.
Snowmachines	Snowmachine use, subject to various restrictions [see 36 CFR 2.18(a), (b), (d), and (e); 43 CFR 36.11(a)(2)(c), and state law] is allowed for traditional activities.	Propose restrictions, closures, route designations, and other restrictions of snowmachine use.
Non-Motorized Winter Recreation	Non-motorized winter recreation is generally unrestricted at this time.	Propose restrictions if needed to mitigate user conflicts.
Bicycle and Other Mechanized Uses	Bicycle use is allowed on park roads and parking areas by 36 CFR 4.30. As non-motorized surface transportation, they are allowed for traditional activities by 43 CFR 36.11(e).	Propose restrictions if needed to limit bicycle use or designate routes.
Fires	Campfires, cooking, and warming fires are currently restricted to fire rings in the campground and picnic area.	Extend the current restriction to all zones.
Guided and Commercial Operations	No concessions contracts exist currently. All commercial operations are managed under Incidental Business Permits as required by 36 CFR 5.3	Permits are issued to qualified operators providing approved visitor services. The current restrictions on shuttle and taxi services may be eliminated. Permit conditions may be modified to achieve the desired conditions in some zones.
Research and Administrative Uses	Administrative activities, as defined at 36 CFR 1.4, are allowed in accordance with 36 CFR 1.2(d). Research is allowed in accordance with 36 CFR 2.5, 43 CFR 3.3.	Administrative and research activities would continue in accordance with management plans
Ice Climbing and Glacier Travel	Climbing on, in, and under Exit Glacier within ½ mile of the terminus from April 1 through November 1is prohibited.	No change is foreseen under any of the proposed alternatives.
Pets	Pets are allowed, on a leash not to exceed 6 feet or other under physical control, in the parking lot and entrance road but are prohibited beyond these areas . This restriction does not apply to service animals nor to harnessed dogs utilized as part of a mushing or skijoring team.	No change is foreseen under any of the proposed alternatives.

Table 4. Summary of key differences among management alternatives. All figures are approximate.

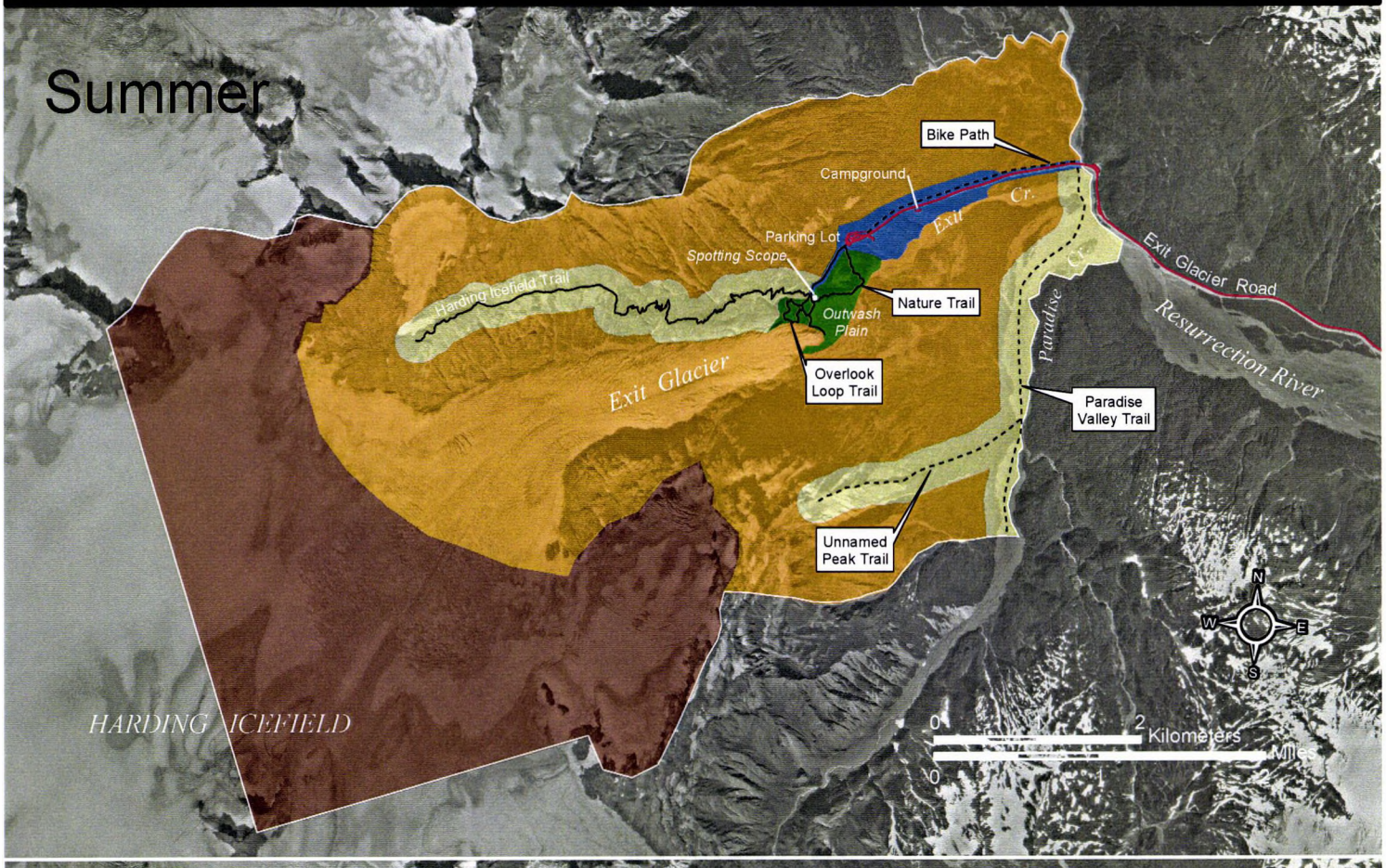
	No Action Alternative	Preferred Alternative	Alternative A	Alternative B
Miles of Hiking Trails	5.8	10.6	6.8	13.1
Miles of Groomed Non-Motorized Use Trails in Winter	0	2.1	0.6	4.1
Miles of Motorized Use Trails in Winter	5+	4+	1.5	5.5+
Number of Parking Spaces	100	100	100	110-120
Bike Path?	no	yes	no	yes
Number of Overnight Facilities/Guests (Summer)	12 walk-in tent sites	12 walk-in tent sites	12 walk-in tent sites	21-24 walk-in tent sites, 10-20 RV/car sites, and 12-15 person hostel
Number of Overnight Facilities/Guests (Winter)	1 cabin	1-2 cabins	1 cabin and 5-10 yurts	2 cabins, 5-10 yurts, and 12-15 person hostel
Use of a Snow coach?	no	yes	yes	yes
Visitor Facilities Zone (summer/winter)	---	1.5% / 1.5%	0.5% / 0.5%	2.3% / 2.3%
Pedestrian Zone (summer/winter)	---	1% / 1%	0.9% / 0.9%	1.6% / ---
Hiker Zone (summer/winter)	---	9.3% / ---	6.1% / 0	11.1% / 6.5%
Backcountry Semi-Primitive Zone (summer/winter)	---	48.9% / 9.7%	--- / 15.7%	13.4% / 7.9%
Backcountry Primitive Zone (summer/winter)	---	39.3% / 87.8%	92.5% / 82.9%	71.6% / 83.3%

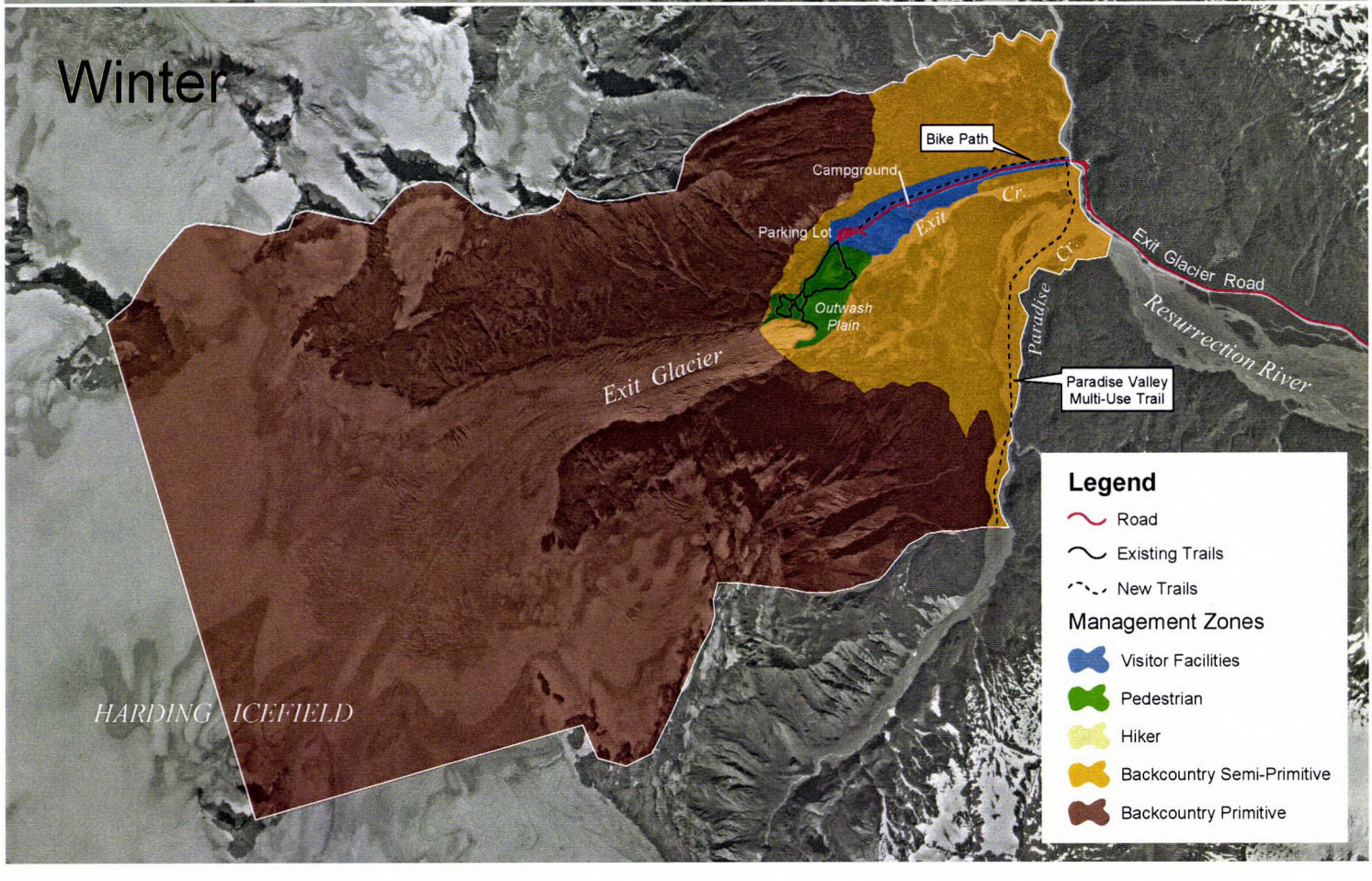
Table 5. Summary of the impacts of the alternatives.

	No-Action Alternative	Preferred Alternative	Alternative A	Alternative B
Soils	Impacts to soils would be negligible as they would be mainly associated with trampling along trail margins.	Construction of new routes and trails and trampling along trail margins would cause minor impacts to soils.	Impacts would be similar to the no-action alternative.	Construction of new facilities, routes, and trails and trampling along trail margins would cause moderate impacts to soils.
Water Quality	This alternative would have minor impacts to water quality from increases in fecal coliform levels, airborne exhaust particulates, and concentrated hydrocarbon pollution.	Impacts to water quality would be similar to the no-action alternative with the addition of new hiking trails bringing visitors in greater contact with surface waters.	Impacts to water quality would be similar to the no-action alternative with the addition of one new hiking trail bringing visitors in greater contact with surface waters.	Impacts to water quality would be similar to the no-action alternative with the addition of several new recreational opportunities bringing greater numbers of visitors to the area.
Floodplains	Moderate impacts to floodplains would occur due to actions that prevent flooding of infrastructure, such as diverting stream channels, placing culverts, or building berms.	Impacts to floodplains would be similar to the no-action alternative.	Impacts to floodplains would be similar to the no-action alternative.	Impacts to floodplains would be similar to the no-action alternative.
Wetlands	Under this alternative, impacts to wetlands would be negligible as no new activities are planned that would affect wetland function or area.	Minor impacts to wetlands would occur due to the construction of a bike path adjacent to wetlands.	Minor impacts to wetlands would occur due to the construction of a wetland viewing platform.	Impacts to wetlands would be similar to the preferred alternative.
Air Quality	Moderate impacts to air quality would occur from wood burning firepit/ fireplaces and emissions from continued winter snowmachine use.	Impacts to air quality would be minor as caused by wood burning firepit/ fireplaces. Motorized use in winter would be decreased resulting in a net decrease in emissions.	Impacts to air quality would be similar to the preferred alternative.	Moderate impacts to air quality would result primarily from increased vehicle use and their associated emissions in both summer and winter.
Soundscape	Minor impacts to soundscape may occur from possible increases in visitation, and associated noise such as vehicles, voices, the construction of a gathering pavilion, and snowmachine use in winter.	This alternative would have minor impacts on soundscape from construction activities, from new trails bringing more people into naturally quiet areas, and from an increase in winter visitors arriving by snow coach. Reducing motorized use in winter would decrease seasonal engine noise mainly to the road corridor.	Minor impacts to the soundscape would result from constructing a new gathering pavilion, a wetlands viewing platform, improving trails, installing additional signs, providing overnight accommodations, and maintaining the Nature Center open in winter. Reducing motorized use in winter would reduce cumulative seasonal engine noise mainly to the road corridor.	Moderate impacts to the soundscape would occur due to the addition of several means of overnight accommodations, construction activities, new trails bringing more people into naturally quiet areas, and an increase in winter visitors arriving by snow coach.
Vegetation	This alternative would have moderate impacts as vegetation would continue to be impacted by foot traffic and motorized use in winter; however, trail maintenance would continue, and exotic species would not be allowed to spread unchecked.	Moderate impacts on vegetation would occur from construction of new trails and bike path. Large amounts of visitors are not anticipated on proposed new trails, exotic species would not be allowed to spread unchecked, and there would be minimal off-road use of motorized vehicles in winter.	Construction of new trails and a wetland viewing platform would have minor impacts on vegetation. Exotic species would not be allowed to spread unchecked, and there would be minimal off-road use of motorized vehicles in winter.	Construction of three new hiking trails a bicycle path, an RV campground, an expanded tent campground, and a hostel-style lodge would have moderate impacts on vegetation. Overnight accommodations, increased visitation, and the potential for introduction of exotic plant species could also impact vegetation.

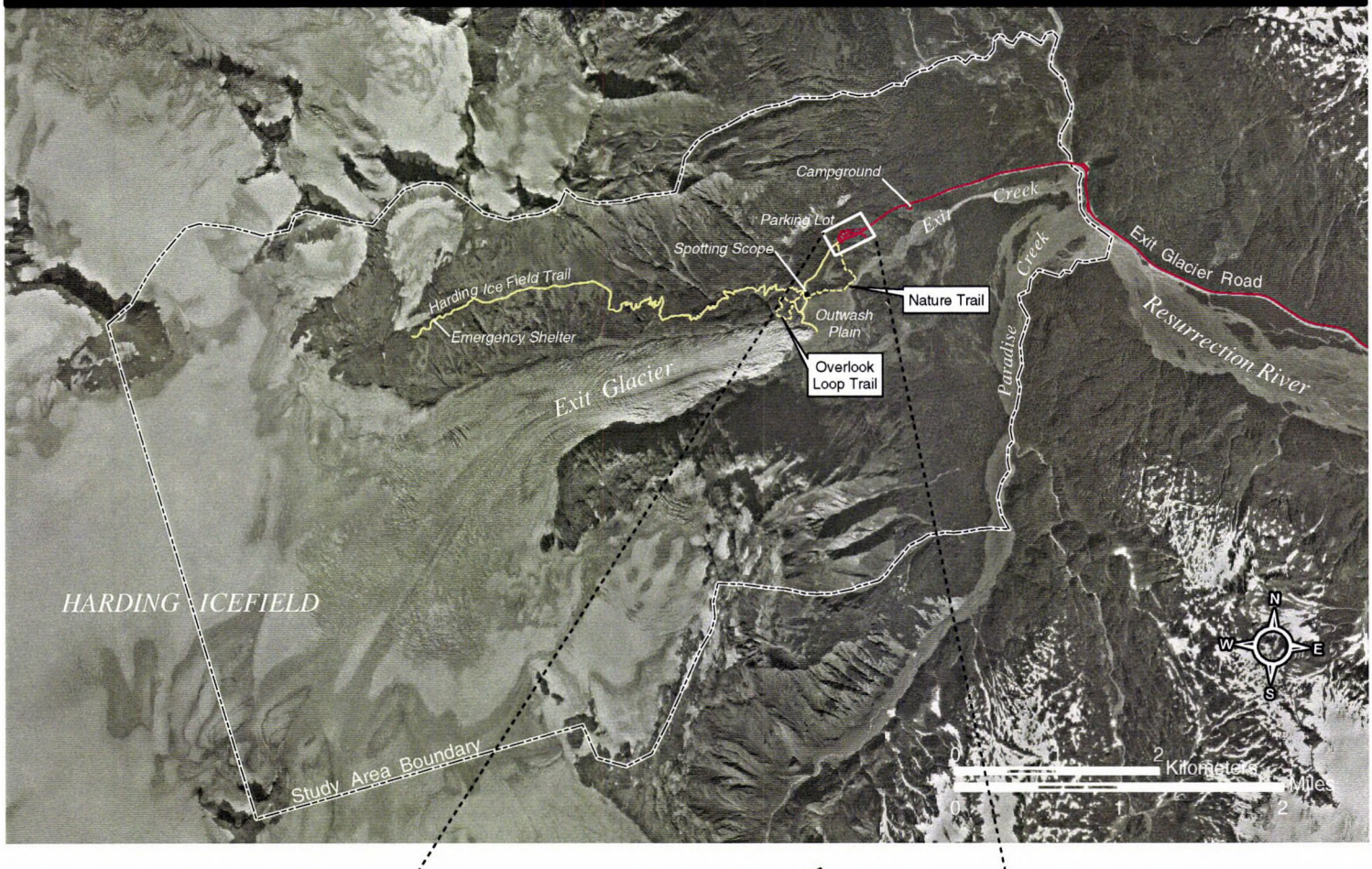
	No-Action Alternative	Preferred Alternative	Alternative A	Alternative B
Wildlife	Moderate impacts to wildlife would occur from continuing unrestricted use of off-road motorized vehicles in winter.	An expanded trail system and actions designed to promote increased winter visitation would have moderate impacts on wildlife. There would be positive impacts from the reduction of motorized vehicle use in winter.	Impacts to wildlife would be similar to the preferred alternative.	An expanded trail system, the addition of a lodge and RV campground, and actions designed to promote increased winter visitation would have moderate impacts on wildlife by spatially and temporally altering human intrusions.
Visitor Experience	Overall, impacts to the visitor experience would be negligible as the trend in visitation would remain flat and changes in infrastructure would be minimal.	Overall and during the summer season, impacts to the visitor experience would be minor due to new backcountry trails. In winter, limitations on where snowmachine activity is allowed and new education programs would result in moderate impacts.	Overall and during the summer season, impacts to the visitor experience would be minor due to expanded education programs. In winter, limiting where snowmachine activity is allowed, new education programs, and new overnight accommodations would result in moderate impacts.	Overall, impacts to the visitor experience would be moderate due to additional facilities for overnight accommodations (i.e., lodge, RV campground, expanded tent campground) and several miles of new trails.
Socioeconomic Environment	Any new park employment, expenditures or increases in visitation would have negligible impacts to the socioeconomic environment under this alternative.	Minor impacts to the socioeconomic environment would occur with the construction of new trails and changes in winter use patterns.	The increase in educational opportunities and changes in winter use patterns in this alternative would have minor impacts to the socioeconomic environment.	The minor impacts to the socioeconomic environment would be due to construction of new facilities, concessionaire opportunities, and an increase in education programs.
Safety	This alternative would have negligible impacts on safety as no new actions are planned that would increase the potential for injury.	Increased use of trails and stream crossing to access trails would have minor impacts on safety. Safety as related to user conflicts would improve as there would be less mixing of motorized and non-motorized activities in winter.	Impacts to safety would be negligible as the potential for user conflicts would decrease as there would be less mixing of motorized and non-motorized activities in winter.	Moderate impacts to safety would occur under this alternative with the addition of several miles of new hiking trails and multi-use trails in winter.

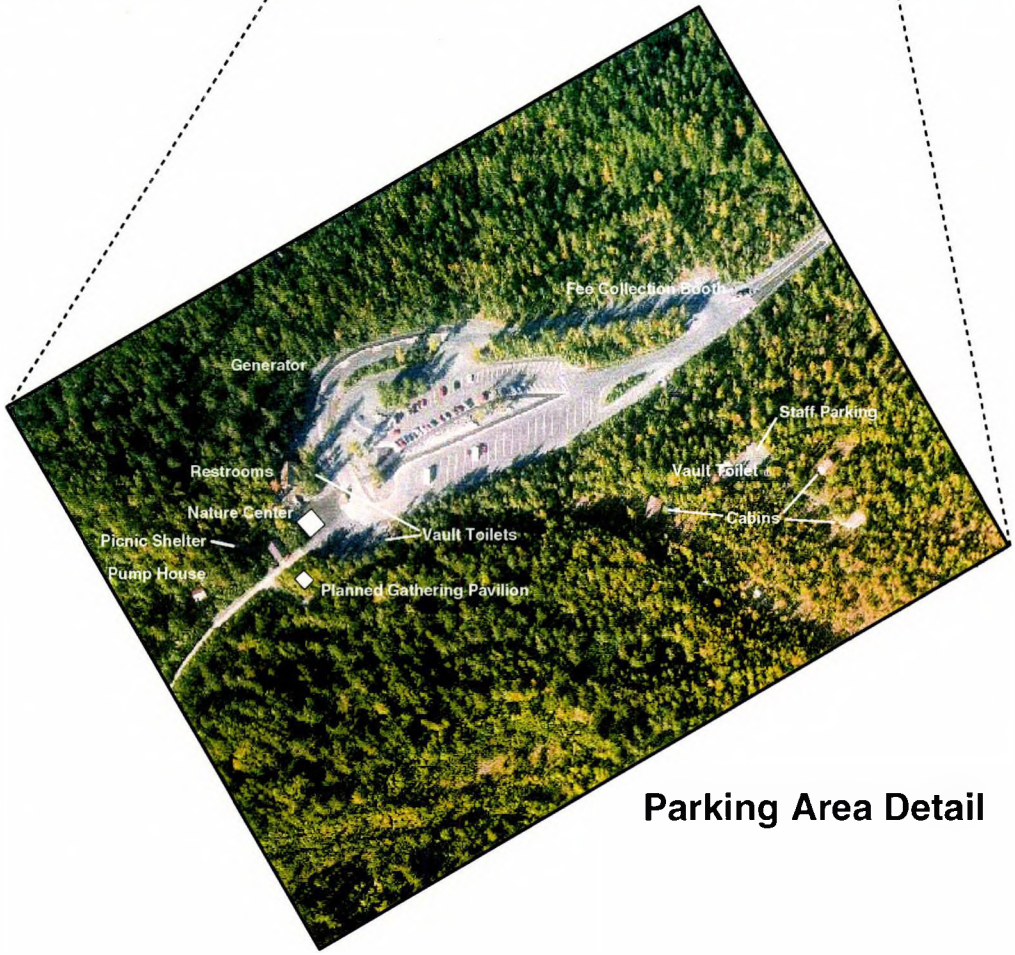
Preferred Alternative



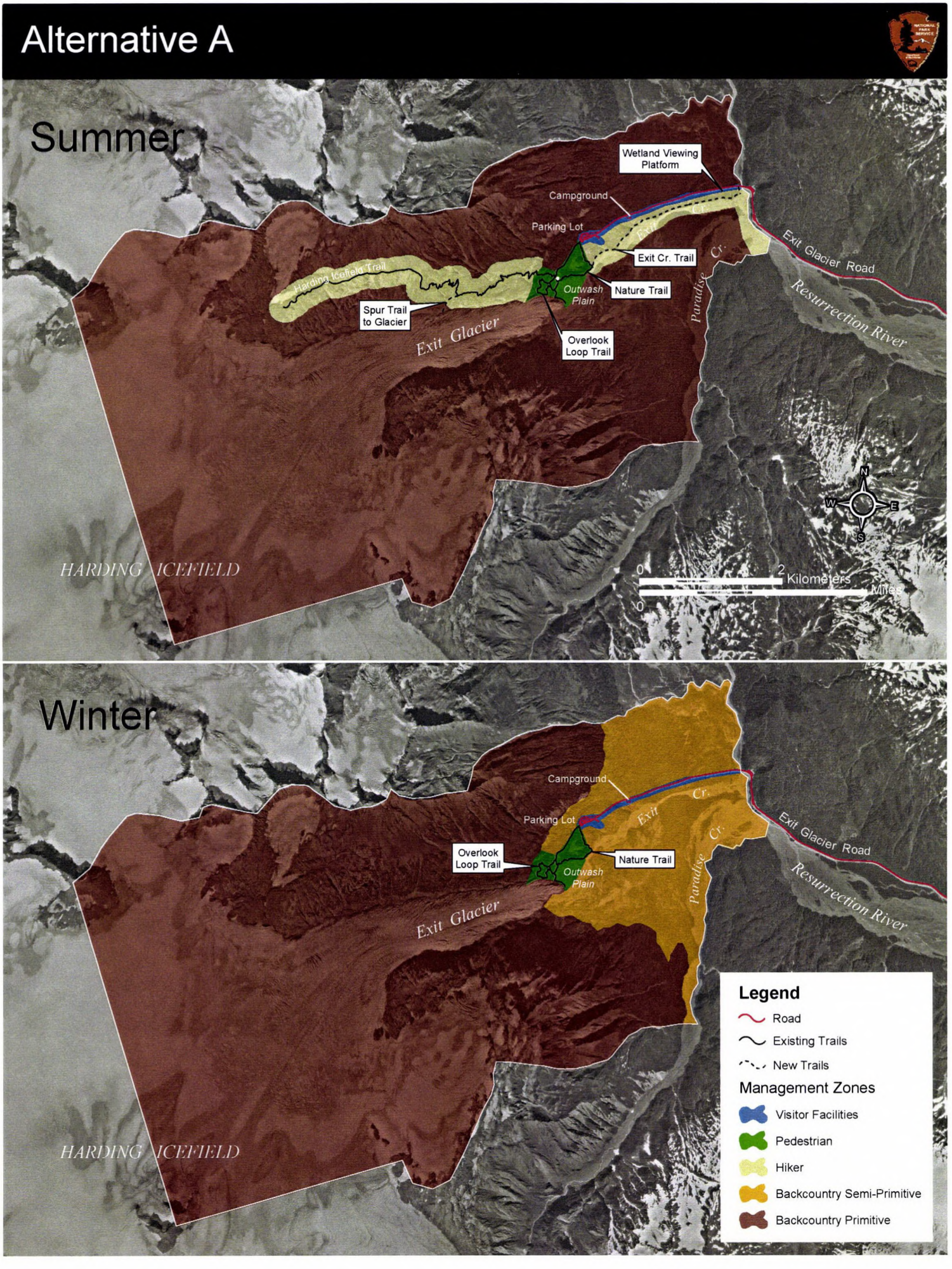


No-Action Alternative

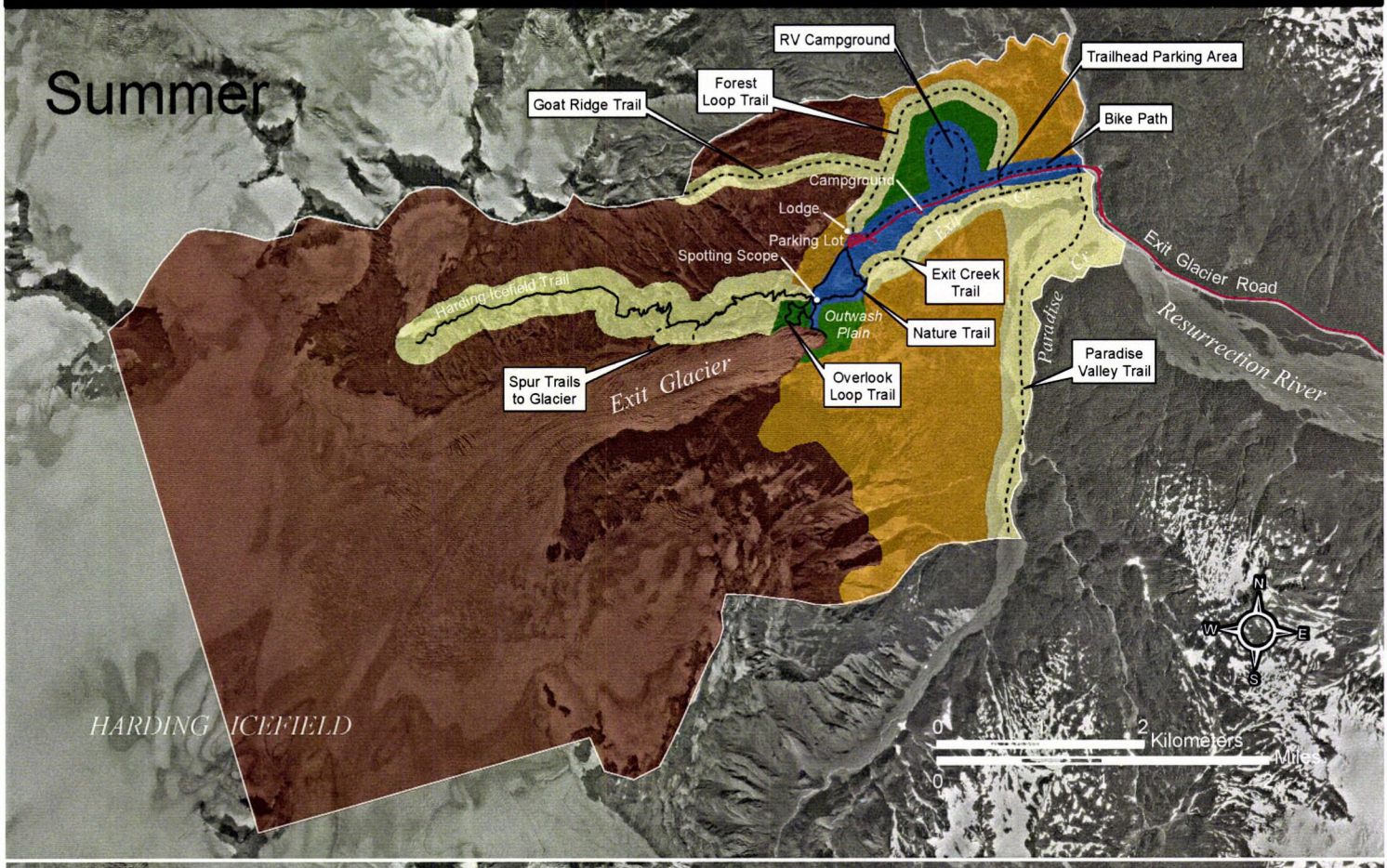


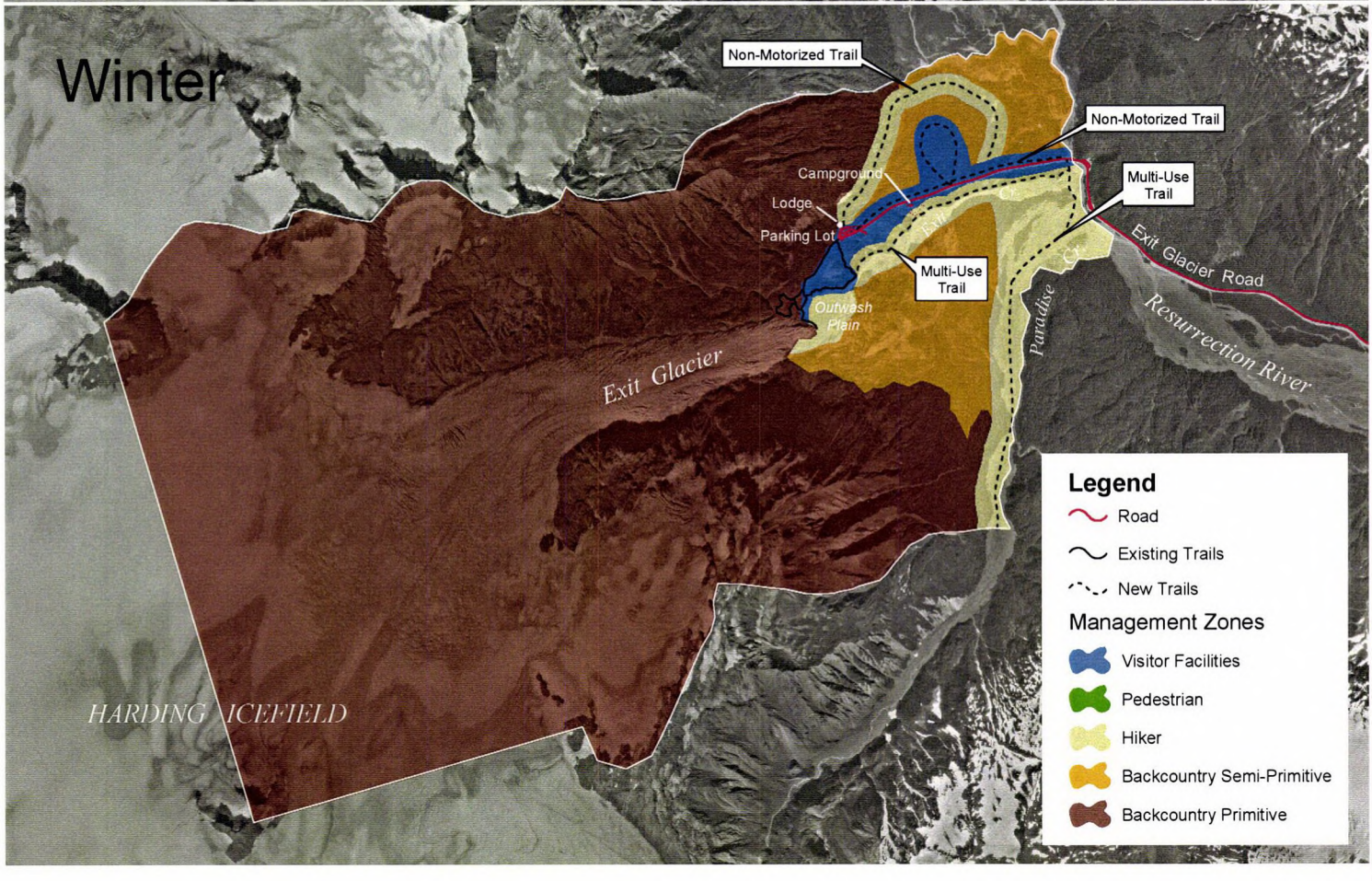


Parking Area Detail


Alternative A
Summer
Wetland Viewing Platform
Campground
Parking Lot
Exit Cr.
Exit Cr. Trail
Harding Icefield Trail
Outwash Plain
Nature Trail
Spur Trail to Glacier
Exit Glacier
Overlook Loop Trail
Paradise Cr.
Exit Glacier Road
Resurrection River
HARDING ICEFIELD
N
W
E
S
0
2
Kilometers
0
1
Miles
Winter
Campground
Exit Cr.
Parking Lot
Overlook Loop Trail
Nature Trail
Outwash Plain
Paradise Cr.
Exit Glacier Road
Resurrection River
Exit Glacier
HARDING ICEFIELD
Legend
Road
Existing Trails
New Trails
Management Zones
Visitor Facilities
Pedestrian
Hiker
Backcountry Semi-Primitive
Backcountry Primitive

Alternative B





Affected Environment

INTRODUCTION

This chapter describes the existing environment and the current condition of important resources and values of the Exit Glacier project area of Kenai Fjords National Park. These resources have the potential to be affected by the alternatives should they be implemented. Topics examined include soils, water quality, rivers and streams, floodplains, wetlands, air quality and visibility, soundscape, vegetation, wildlife, cultural resources, visitor experience, park operations, socioeconomic environment and safety.

PHYSICAL ENVIRONMENT

Soils

There has not been any detailed study or description of the soils in the Exit Glacier area, except for some chemical analysis related to plant succession by Helm (1995) and Cusick (2001). In general, the soils in the study area are young and poorly developed.

The valley floor is dominated by glacial moraines and alluvial gravels. The thickness of the organic layer on top of these gravelly soils is directly related to the amount of time since the last major disturbance – either from running water or from movement of the glacier. In general, the soils of the valley bottom are well-drained and not highly susceptible to compaction and erosion.

Along the margins of the glacier, especially around the terminus, are recently deposited soils in the form of moraines and other glacial deposits. These soils have a large proportion of fine-grained materials that make them susceptible to compaction. Although these areas may appear to be barren, they are the starting point for ecological succession as young plants colonize the area.

Above the valley floor the soils generally fall into three categories: lateral moraines, slopes of talus and broken rock, and fine-grained silts and clays. The old lateral moraines typically are a mixture of all sediment classes from silt to boulders and are well-drained. The steep slopes below the crumbling ridges of the area are covered with unstable talus and broken rock. In between these areas of recent and on-going deposition are the older native soils which are mostly silts and clays. These fine-grained soils are easily compacted and eroded, and are especially susceptible to sloughing and erosion when they are saturated with water.

The steep slopes and weakly developed soil veneers within the study area are prone to natural erosion stemming from debris flows and hydrologic processes. In areas where trails have been constructed, natural hillslope morphology and processes are altered which results in the potential for accelerated erosion. Social trails, although convenient for hikers, develop principally along steep trail segments where switchbacks have been installed to reduce trail steepness, increase the potential for soil erosion and downslope trail washout. Social trails are often parallel to the fall line and may collect, concentrate and transport water down slope to trail surfaces. These dispersed impacts occur primarily

along the Harding Icefield Trail corridor, between the Overlook Loop Trail and the glacier's edge, and on the outwash plain and recent terminal moraines.

Water Quality

Water quality baseline testing at Exit Glacier was conducted during the summer season of 2001 by US Geological Survey hydrologists in area streams considered at risk for impacts from human use. These streams were considered at risk due to their close proximity to the road and to high visitor use areas.

Two reaches of a freshwater stream adjacent to the Harding Icefield Trail were tested for coliform bacteria a total of six times each during the season. On one of the days tested, the stream reach crossed by the Harding Icefield Trail at mile 0.64 revealed small numbers (approximately 30) fecal coliforms per 100 ml of water. Although unacceptable for drinking, it was within normal limits for water contact recreational use such as swimming. The presence of fecal coliform bacteria in streams indicates that the water may have been contaminated with human or animal fecal material. Coliform presence can be used as an indicator for potential health risks associated with high visitor use. There are currently no toilet facilities available along the Harding Icefield Trail.

Prior to paving Exit Glacier road in July 2001, a tributary of Exit Creek adjacent to the road near the park entrance (mile 8.5 Exit Glacier Road) was tested. This reach was sampled in order to establish a baseline prior to the anticipated visitation increase the paved road would bring. The water as well as the stream bed sediments were analyzed for nutrients such as nitrogen and phosphorus, major organics including petroleum-based substances and insecticides, and heavy metals. Inorganic constituents including sodium, potassium and chlorides were also measured in order to characterize the stream. No contaminants or toxic compounds were found.

All stream reaches were also tested for dissolved oxygen levels, pH, temperature and conductivity. All parameters were within normal limits and were consistent with healthy stream systems.

Three drinking water wells, one serving the new Nature Center and public restrooms, one at the campground, and one serving the employee housing, have consistently tested negative for coliform bacteria and nitrates. The public water systems are tested for coliform bacteria twice monthly during the summer season. The well at the employee cabins is categorized as residential and tested once monthly. All three wells are tested annually for nitrates. A new septic system and drainfield were constructed in 2001 and is functioning efficiently.

Floodplains

The entire lowlands of the study area are located within a floodplain. An Army Corps of Engineers flood boundary and floodway map for the area has not been completed, although prior flooding in the area is well-documented (NPS 2002b).
All of the infrastructure at Exit Glacier including the Nature Center, employee housing, parking lot, restrooms and access road are located within this alluvial plain. There is

currently no floodplain management plan in effect for the study area. The floodplain functions naturally with the following exceptions that have altered floodplain structure:

- The built up, or diked, area that supports the road to the glacier.
- A stream diversion and small dike located behind the new Nature Center. A minor flood event occurred in October 2002, threatening the foundation of the Nature Center during construction, necessitating diversion of the stream and placement of the dike.
- The paved trail to the glacier. Streams were diverted and channeled to construct the trail; culverts are utilized to prevent the trail from flooding.

Exit Creek transports large quantities of sediment downstream, ranging from glacial flour to cobbles, depositing these materials along the way. This activity forms braided channels and actively eroding banks. These meandering channels and banks are unstable and constantly shifting, making prediction of flood patterns and damages difficult.

The floodplain is fed by three major stream systems, Exit Creek and the associated high-gradient runoff streams from the Harding Icefield, Paradise Creek, and the Resurrection River. Floods generated by any source are most likely to occur during periods of heavy fall rains (NPS 1986). Flooding of the Resurrection River near the study area has been characterized by relatively low-velocity sheet flow and silt deposition, while high gradient stream flooding may be high velocity and carry large amounts of woody debris and sediments from the steep valley sides. Extensive deposition of materials 10-15 feet deep were found at the base of the Harding Icefield Trail after the 1995 flood.

Wetlands

There are approximately 450 acres of wetlands in the western portions of the Exit Glacier study area. Additionally, small discrete wetland or bog areas are found throughout the study area. Many of the area wetlands were mapped using GIS technology during the 2002 field season (Sheldon and Wright 2002). Wetlands were mapped based on hydrology. Full-scale Army Corps of Engineers wetland delineation methods (Wetlands Training Institute 2001) were not employed. This data, in addition to a vegetation survey also conducted in 2002 (Bryden 2002c) and the National Wetland Inventory GIS theme, is the only wetland information currently available for the study area.

The wetlands are represented as palustrine marshes, bogs, inactive beaver ponds or riverine wetlands adjacent to rivers and streams. They are located primarily in lowland areas and vegetated with alder-willow scrub and sedges. The road to Exit Glacier bisects a wetland dammed by beavers in the late 1980's. Area wetlands are currently functioning naturally and unaltered, with the exception of the filled area supporting the road.

Wetlands are known to collect hydrocarbons emanating from vehicle exhaust as well as coolant, fuel or lubricant leaks and spills. Wetlands adjacent to roads within the study area although currently unimpaired, are most susceptible to these pollutants, whether generated by passenger cars, snowmobiles, road maintenance activities or trail construction.

Air Quality and Visibility

Kenai Fjords National Park is designated as a Class II air quality area (Class II areas allow for limited amounts of new emissions) under the Clean Air Act. No measurements of air quality or visibility have been made in or immediately adjacent to the Exit Glacier study area, or of wind and air movement. Air quality monitoring stations located elsewhere in Alaska do not accurately reflect conditions in the study area.

Visibility "impairment" under the Clean Air Act (CAA) is defined as "any humanly perceptible change in visibility." Furthermore, the draft Impairment Guidelines for the NPS state that air quality impairment determinations are not necessarily linked to exceeding the National Ambient Air Quality Standards (NAAQS). Park resource managers base the general description of the airshed in the study area on general observations over the past 15 years.

The air quality and visibility at Exit Glacier is generally thought to be very good, according to park personnel, due to a lack of local major emission sources and air flow through the area. In the summer, Exit Glacier valley is swept by down-glacier winds each afternoon as the cold air sinks down from the Harding Icefield, producing air-cleansing katabatic winds. This effect is most noticeable on warmer, sunny days and can be less pronounced or possibly absent on cold, cloudy days. In the winter, the air in the Exit Glacier valley is usually still with little apparent mixing, especially when contrasted with the strong winds that blow through the adjoining Resurrection River valley. For example, smoke from the woodstoves often lingers in the winter air and is typically noticeable throughout the day.

An exception to the generally good air quality in the study area is localized, temporary pollution from motor vehicles, wood stoves, and campfires. There is one cabin with a woodstove in the developed area near the parking lot, a fire pit at the campground cooking shelter, and a fireplace in the picnic area (also used for winter warming) that generate smoke. In the summer, motor vehicle traffic is limited to the road and parking lot where the smell of vehicle exhaust can be readily noticed on busy days. In the winter, snowmachines are currently allowed throughout the study area, but generally concentrated on the road, outwash plain, and Exit Creek. Snowmachine exhaust can be noticeable on busy days, and woodstove smoke is present daily throughout the winter. It is currently unknown to park personnel whether air pollution from external sources is present in the study area

Soundscape

Soundscape refers to the ambient acoustic environment in a given area. The soundscape in the Exit Glacier area is composed of both natural sounds and a variety of human-made sounds. The character of the soundscape may vary from day to night and from season to season. Noise is defined as unwanted or intrusive human induced sound.

Factors affecting natural sound levels include location with respect to noise source, topography and terrain, wind and vegetation. With the thick vegetation during summer months, much human made noise is muffled at Exit Glacier.

A recent pilot study of the soundscape during the summer season (June to August) at Exit Glacier (Wright and Hetrick 2002) documented noise and natural sounds for developing a baseline profile of the study area. Surveys were conducted by documenting all sounds heard in a 35-minute interval at several locations throughout the study area. At each listening station the surveyor (listener) concealed himself in a manner to avoid being approached by coworkers or visitors. The surveyor documented all sounds heard at 5-minute intervals for 5 *seconds*. Simultaneously, the surveyor documented every *human-generated* noise, its intensity, and the duration. The duration of instrusive sounds were recorded and the intensity of intrusive sounds were rated with a comparison scale ranging from faint and barely audible to overwhelmingly loud. Wright and Hetrick (2002) provide full details on methodology and findings.

The overall soundscape during summer in the study area is predominated by the natural sounds of wind and water. Human generated noise intrusions, including voices, whistling, and foot stomping, outnumbered the number of birds and other natural sounds detected during the surveys.

A soundscape survey documenting sounds in winter was recently completed. Although the data has not been fully analyzed, preliminary data indicate that the natural sounds of wind, rain and snow, and the occasional animal predominated. Human-generated sounds included voices, airplanes, and snowmachines.

BIOLOGICAL ENVIRONMENT

Vegetation

Vegetation Communities
Situated on the south-central coast of Alaska, the Kenai sub-region of the Coniferous Forest Biome is on the boundary of the southern boreal forests and coastal biogeoclimatic regions. The rugged relief of this area and its geographic position combine to produce a relatively unique mosaic of vegetated communities ranging from alpine meadows to coastal rainforests. The distribution of these vegetation communities across the landscape is determined primarily by elevation and glacial disturbance. Vegetation communities (adapted from Vierek et al. 1992) present in the Exit Glacier area include:

Seral Scrub: Open sparsely vegetated community. This is an early successional community found near the glacier terminus containing Sitka alder, fireweed, and a variety mosses and lichens colonizing the disturbed soils.

Closed Tall Scrub: This community, dominated by Sitka alder, occupies a small area on low floodplain terraces near the confluence of Exit Creek and the Resurrection River. Succesional dynamics of this community are controlled more by flood disturbance than glaciation.

Open Tall Scrub: Found on terraces adjacent to Exit Creek, these communities are dominated by either Sitka alder, black cottonwood, or Sitka willow. This community

represents an early post-glacial successional stage and is also subject to occasional flood disturbance by Exit Creek.

Closed Deciduous Forest: This community is dominated by black cottonwood and is found on upland terraces and moraine deposits in the Exit Glacier Valley. This is the most extensive vegetation community on the valley floor and represents an older successional stage than the open tall scrub community. Young Sitka spruce seedlings occuring in the understory indicate that, in time, this community will be become a closed mixed forest dominated by Sitka spruce and black cottonwood.

Closed Mixed Forest: This community is dominated by Sitka spruce and black cottonwood. Cottonwoods in this community are estimated to be approximately 200 years old (Helm 1995).

Closed Needleleaf Forest: This community represents the oldest successional stage present at Exit Glacier and occurs on slopes above the valley floor. The overstory is dominated by Sitka spruce and western hemlock.

Mesic Wet Meadow: A wetland is defined as an area inundated or saturated by ground or surface water for long enough during the year to support vegetation that prefers or tolerates saturated soils. Horsetail, sedges, and blue-joint reedgrass dominate this community.

Alpine: These vegetation community types in the park have not been surveyed and classified. A low mat of alpine vegetation extends from the upper reaches of tree line to the Harding Icefield. Arctic willow, dwarf arctic birch, and various grasses, sedges, and lichens occur in drier areas.

Existing impacts to vegetation occur primarily in the fragile alpine areas and in the seral and tall shrub communities. Impacts are generally caused by off trail use, resulting in trampling of plants, creation of social trails, and delay of natural plant succession. Most of these impacts occur in the outwash plain, along the Overlook Loop Trail, and along the Harding Icefield Trail. Off-road motorized use in winter results in breaking limbs of woody plants, compacting vegetation under snow, and damage to vegetation when snow cover is inadequate.

Threatened and Endangered Species
No known federally listed species occur in Kenai Fjords National Park. However, three plant species listed as rare within the state of Alaska by the Alaska Natural Heritage Program (AKNHP) have been documented in the study area. These are pale poppy (*Papaver alboroseum*), bog bluegrass (*Poa leptocoma*), and Bebb's sedge (*Carex bebbii*)(Bryden 2002a).

Pale poppy is a perennial that is found in several locations along the Harding Icefield Trail. AKNHP lists the pale poppy as rare or uncommon globally and rare or uncommon

in Alaska (Lipkin 1997). Development and increased recreational activity are the primary threats to populations of pale poppy in Alaska.

Two voucher specimens of bog bluegrass from the Exit Glacier area are housed at the US National Herbarium, Smithsonian Institution. These specimens were collected along the edges of drainages between the parking lot and the glacier outwash plain. Bog bluegrass is listed by AKNHP as demonstrably secure globally and imperiled in Alaska (Lipkin 1997).

Five voucher specimens of Bebb's sedge exist in the park herbarium collected and identified by Marilyn Barker of the Alaska Native Plant Society. The identification of the voucher specimens has yet to be confirmed. They were collected in August 1987 at 490 m (1600 ft) elevation in a wet area along the Harding Icefield Trail. AKNHP lists Bebb's sedge as demonstrably secure globally and critically impaired in Alaska (Lipkin 1997).

Exotic Vegetation

Nine species of exotic plants, plant species not native to this area, were identified within Kenai Fjords National Park along the Exit Glacier Road, campground, parking area and trails. Densmore et al. (2001) noted that pineapple weed *(Matricaria discoidea)*, common dandelion *(Taraxacum officinale)* and white clover *(Trifolium repens)* were found around the ranger station and parking lot and that common dandelion was scattered along the trails but not found on glacial moraines or the outwash plain. Densmore et al. (2001) also noted butter and eggs or toadflax *(Linaria vulgaris)* growing along Exit Glacier Road inside the park. Seeds for these plants were probably introduced in fill used for road or structure construction. It is also possible that seeds could have been carried into the park on motor vehicles or deposited in the feces of domestic animals.

Common dandelion was the only abundant exotic plant found along Exit Glacier road inside the park. During the summer of 2002, common dandelion, which was previously thought to occur only along the road and trail corridors of Exit Glacier, was documented to have spread beyond the road and trail corridors (Bryden 2002b). Common dandelion was found in areas of sparse vegetation both north and south of Exit Glacier road several kilometers from the road corridor.

Densmore et al. (2001) found eight additional species of exotic plants growing along the Exit Glacier road outside the park boundary. These included alfalfa *(Medicago sativa)*, yellow sweetclover *(Melilotus officinalis)*, red clover *(Trifolium pratense)*, oxeye daisy *(Leucanthemum vulgare)*, and annual hawksbeard *(Crepis tectorum)*. These plants were apparently introduced in a reseeding mix after that section of road was paved in 1999 (Bryden 2002 b). If left uncontrolled, it is likely that all of these species would eventually spread into the park.

Wildlife

Terrestrial Mammals

Twenty nine species of terrestrial mammals occur or are expected to occur within Kenai Fjords National Park (AKNHP 2000a). Habitats suitable for all or most of these species is present within the Exit Glacier study area and presumably these species occur there with varying frequency. Among these, mountain goat (*Oreamus americanus*), moose (*Alces alces*), black bear (*Ursus americanus*), brown bear (*Ursus arctos*), hoary marmot (*Marmota caligata*), snowshoe hare (*Lepus americanus*), porcupine (*Erithizon dorsatum*), ermine (*Mustela erminea*), red squirrel (*Tamiasciurus hudsonicus*), and red-backed vole (*Clethrionmys rutilus*) are the species most frequently encountered (AKNHP 2000a, NPS 2001g). Also present, but less frequently observed, are wolves (*Canis lupus*), coyotes (*Canis latrans*), lynx (*Felis lynx*), wolverine (*Gulo gulo*), marten (*Martes americana*), flying squirrel (*Glaucomys sabrinus*), beaver (*Castor candensis*), river otter (*Lutra canadensis*), little brown myotis bat (*Myotis lucifugus*), and mink (*Mustela vison*) (AKNHP 2000a, NPS 200g). The distribution and abundance of terrestrial mammal species in the Exit Glacier area is unknown. Most information regarding terrestrial species in this area has come from anecdotal reports by park staff and visitors and supported by a small number of surveys focused on bats and microtines (Wright 2001), mountain goats (Tetreau 1989), moose (Everitt 2001) and an ongoing survey of furbearer occurrence and distribution (Martin 2001).

Mountain goats occupy nearly all of the steep and rocky high country around Exit Glacier. Goats can be seen throughout the year from Exit Glacier trails and the parking lot and are occasionally encountered at close range along the Harding Icefield Trail. During summer, the goats spend most of their time above treeline in alpine habitats. In fall and winter, goats move to lower elevations at or below treeline in subalpine and forested habitats. Goats return to higher elevations in late May and early June to give birth. Goats occasionally cross the glacier and valley floor.

Moose are present in the Exit Glacier and Resurrection River area year-round, but are most visible during winter. In fall and winter moose congregate between Exit Creek and Paradise Creek to browse on the concentrations of willow in the early successional forests found there. This area provides high quality winter moose habitat which may be key to the presence of moose in the Exit Glacier area during winter.

Black bears are common in the Exit Glacier area. In early May bears are often observed above treeline on the north side of the Exit Glacier valley foraging on emerging vegetation. There are a number of reports of black bears preying on newborn moose and goats in spring and early summer. In summer and fall black bears feed on berries, primarily salmonberry (French 2003), and are encountered daily throughout the Exit Glacier area.

Brown bears are infrequent visitors to Exit Glacier, typically passing through the valley in the spring and late fall. Brown bears are rarely observed around Exit Glacier in summer or fall likely due to the lack of salmon runs in local streams.

Wolves are rarely observed in the Exit Glacier area, although tracks are commonly observed in winter snow. A total of nine wolf observations are recorded in the park's wildlife observation database (NPS 2002c). Given the low frequency of sightings and the small group sizes typically observed, it is unlikely that wolves den in or near the study area. The wolves observed are probably solitary or members of packs inhabiting the Resurrection River/Russian River valley to the north who pass through the area while hunting for moose, mountain goat, or small mammals.

Coyotes are more frequently encountered than wolves in the study area with numerous observations recorded in the park's wildlife observation database (NPS 2002c). Coyotes prey on ptarmigan, marmots, snowshoe hare, and other small mammals, and also feed on carrion from wolf or winter killed moose and goats. No den sights have been identified in the study area, though an observation made in 1998 of a family group near the Exit Glacier Ranger Station (NPS 2002c) suggests that coyotes may den in the area.

Lynx are extremely rare in the Exit Glacier area. Only three track observations have been recorded in the wildlife observation database between 1980 and 2002 (NPS 2002c). Local trappers report that lynx are rare in the entire Resurrection River drainage (Martin 2002). An intensive track and baited photo station survey targeting mid-sized carnivores, including lynx, was initiated in the study area in 2001. To date, this survey has only documented one lynx observation from a set of tracks found in October 2001 (Martin 2002). Suitable habitat and prey (snowshoe hare is the primary prey item) for lynx are present in the study area. However, the area may lack the concentrated populations of snowshoe hare necessary to support resident lynx.

Marten, wolverine, ermine, mink, and otter are all present in the study area. Marten and ermine are common in all habitats and likely den in the area (Martin 2002). Wolverines are less commonly encountered with track observations suggesting that they travel through the area searching for carrion and do not den in the area (Martin 2002). Mink and otter inhabit the river and creeks of the study area. It is unknown if mink or otter den in the study area.

Birds

Two hundred eighteen species of birds occur or are expected to occur within Kenai Fjords National Park (AKNHP 2000b). Of these, 143 species are expected to occur within the Exit Glacier study area, although a smaller number likely nest there due to limited available nesting habitat. Sixty-two species have been identified in the study area to date (NPS 2002c). A survey of the occurrence and distribution of bird species in the Exit Glacier study area was conducted in 2000 and 2001 (Wright 2001a). Wright noted 199 individual observations representing 32 species and recorded the habitat type where each observation was made.

The species most commonly observed by Wright (2001a) were Wilson's warbler (*Wilsonia pusilla*), varied thrush (*Ixoreus naevius*), hermit thrush (*Catharus guttatus*), fox sparrow (*Passerella iliaca*), ruby-crowned kinglet (*Regulus calendula*) and orange-crowned warbler (*Vermivora celata*). Other passerine (songbird) species commonly

encountered include Steller's jay (*Cyanocitta stelleri*), black-billed magpie (*Pica hudsonia*), northwestern crow (*Corvus caurinus*), common raven (*Corvus corax*), chestnut-backed (*Poecile rufescens*) and black-capped chickadee (*Poecile atricapillus*), common redpoll (*Carduelis flammea*), snow bunting (*Plectrophenax nivalis*), white-winged cross bill (*Loxia leucoptera*), and dark-eyed junco (*Junco hyemalis*). Raptor species include bald eagle (*Haliaeetus leucocephalus*), golden eagle (*Aquila chrysaetos*), northern goshawk (*Accipiter gentilis*), sharp-shinned hawk (*Accipiter striatus*), great horned owl (*Bubo virginianus*) and northern saw-whet owl (*Aegolius acadius*). Additionally, willow ptarmigan (*Lagopus lagopus*), rock ptarmigan (*Lagopus mutus*), white-tailed ptarmigan (*Lagopus leucurus*), and spruce grouse (*Falcipennis canadensis*) inhabit the Exit Glacier area.

Amphibians

Wood frog (*Rana sylvatica*) and boreal toad (*Bufo boreas*) are both reported as occurring on the Kenai Peninsula (Hodge 1976); however, neither species has been observed in Kenai Fjords National Park. An intensive survey for amphibians was conducted in the Exit Glacier area in 2001 and 2002 (Wright 2002). This survey resulted in no documented observations.

Threatened and Endangered Species

No federally listed species are known to occur in the Exit Glacier study area. Several State of Alaska Species of Special Concern and Alaska Audubon Society watch list species are present in the Exit Glacier study area. A State of Alaska Species of Special Concern is any species or subspecies of fish or wildlife or population native to Alaska that has entered a long-term decline in abundance or is vulnerable to a significant decline due to low numbers, restricted distribution, dependence on limited habitat resources, or sensitivity to environmental disturbance. Audubon's Watch List species are those facing population declines and/or threats such as habitat loss on their breeding and wintering grounds, or with limited geographic ranges.

Townsend's warblers, a State Species of Special Concern, have been sighted in the study area during the breeding season (NPS 2002c) and conifer habitat suitable for nesting is available. Decreasing populations in Alaska for this species are thought to be due to habitat loss in neo-tropical wintering grounds.

Gray-cheeked thrush, also a State Species of Special Concern have rarely been reported in the study area during the breeding season (NPS 2002c) and suitable woodland nesting habitat is available. Decreasing population numbers for this species in Alaska are thought to be due to habitat loss in neo-tropical wintering grounds.

Golden eagles, on the Audubon Watch List, are observed infrequently in the study area, primarily in the early spring. No known golden eagle nesting sites have been identified in Kenai Fjords National Park. Populations of golden eagle have been observed to be in decline in some areas; however, populations in Alaska appear to be stable.

Wildlife Disturbances under Existing Conditions

Park management has, for more than twenty years, worked to facilitate an increase in visitation to the Exit Glacier area. As a result annual visitation has increased from less than 2,000 in 1982 to over 180,000 in 1997. Facilities constructed to support visitation have included a bridge over the Resurrection River, a paved road into the park, a paved trail to the glacier, the Harding Icefield trail and other trails, a Ranger Station, three residential cabins for seasonal staff, a campground, and restroom facilities. It is likely that these changes have impacted certain wildlife species in the area, particularly brown bears, wolves, wolverine, and lynx, all species which have large home range requirements and a low tolerance for human disturbance (Zielinski 1995). A lack of predevelopment data, however, makes it difficult to assess whether the current scarcity of these species in the Exit Glacier area, relative to surrounding areas, is a direct result of park development and increases in visitation (Martin 2002).

Other species are subject to periodic disturbance, displacement, or mortality by the activities of visitors and park staff, but remain relatively abundant in the area. Mountain goats and marmots are subject to human disturbance along the Harding Icefield trail (Tetreau 1989). Snowmachine activity in winter is concentrated in and adjacent to winter moose browse areas and the scientific literature is replete with examples of the direct impacts of snowmachines on wildlife, particularly ungulates (Creel et al. 2002, Colescott and Gillingham 1998, Dorrance et al. 1975, Freddy et al. 1986, Mahoney et al. 2001, Neumann and Merriam 1972). A moderate amount of small mammals (red squirrels, voles and shrews) and birds (warblers and thrushes) are killed along the park road by vehicles. Informal surveys by park staff indicate that 1-3 animals are road killed each week (Wright 2003). Food conditioning of squirrels, jays, and bears has been observed, but has not yet resulted in any injuries to animals or humans (Martin 2003).

VISITOR EXPERIENCE

The overall visitor environment at Exit Glacier is dominated by the natural environment and the spectacle of the glacier and icefield. Visitor amenities and services are limited, and more than 90% of visitors take self-guided hikes to the glacier and Harding Icefield trail having only occasional or no contact with the roving park rangers (Swanson et al. 2003). Visitors are asked to stay on the trails, especially near the glacier due to management concerns regarding safety and impacts to soils and vegetation. Other than the requirement to stay on the trails, the visitor experience is largely unstructured and visitors are able to create their own experience.

Based on the 2001 visitor surveys at Exit Glacier, Swanson et al. (2003) summarized the summer visitor experience at Exit Glacier in three main points:

- Most visitors were primarily motivated to visit the Exit Glacier area by the unique opportunity to approach the glacier easily and closely with their families and/or friends.
- Exit Glacier was rarely the sole trip destination and most visitors spent less than two hours in the area.

- With a few exceptions, the desired experiences of Exit Glacier visitors were remarkably similar.

More than 75% of the visitors surveyed reported that experiencing new and different things was either very important or extremely important. Approaching and touching the glacier was also an important desired experience for a majority of visitors.

Most summer visitors to Exit Glacier report having positive recreational experiences. The 2001 survey (Swanson et al. 2003) indicated that 50% of visitors rated their experience as "very good" while less than 0.5% rated their visit as "poor" or "very poor".

The winter experience at Exit Glacier is highly variable and can range from quiet solitude to a soundscape that includes the sounds of snowmachines, dog teams and other visitors. Baseline soundscape inventories have been conducted, however, the winter data have not yet been analyzed.

Visitation

Kenai Fjords National Park is one of the more popular road-accessible visitor attractions in Alaska. In 2001 Kenai Fjords ranked fourth in total visitation out of the fifteen park units in Alaska, reporting a total of 262,098 recreational visits (NPS 2002a). Visitation to the Exit Glacier area represents approximately one half of the park's total annual visitation (NPS 2002a).

Caution must be used when interpreting the visitor use data for the park due to changes in how the numbers have been calculated over the years. For example, starting in 1996 passengers on the all-day commercial tour boats that cruise the fjords were included in the total park visitation, which caused a large increase in the number of visitors reported. Visitor use at Exit Glacier was based primarily on electronic vehicle counters until 2001 when data from the fee collection booth was used as the primary source of visitor counts. This change in the method of counting visitors at Exit Glacier likely resulted in approximately a 5% decrease in reported visitation from years prior to 2001 based on an analysis of visitor counts from July and August of 2002 when the counting methods were compared.

Total annual visitation to the Exit Glacier area has increased dramatically since the park was established in 1980 (Figure 1). Large increases in visitation occurred in 1982 when a footbridge was installed across the Resurrection River at the park boundary, and again in 1986 when the footbridge was replaced with a vehicle bridge. The next large increase in reported visitation occurred in 1993, possibly as a result of an intensive state-wide tourism marketing campaign undertaken by the State of Alaska. Visitation at Exit Glacier peaked in 1995 and 1997 and has been leveling off since then (Figure 2).

While the original park planners did not foresee such a dramatically rapid increase in visitation, neither did the authors of the 1996 Frontcountry Development Concept Plan (NPS 1996) predict the subsequent lack of growth. Although visitor use in the years

immediately following the DCP exceeded predictions, current use levels are now below even the low growth scenario that was described (Figure 2).

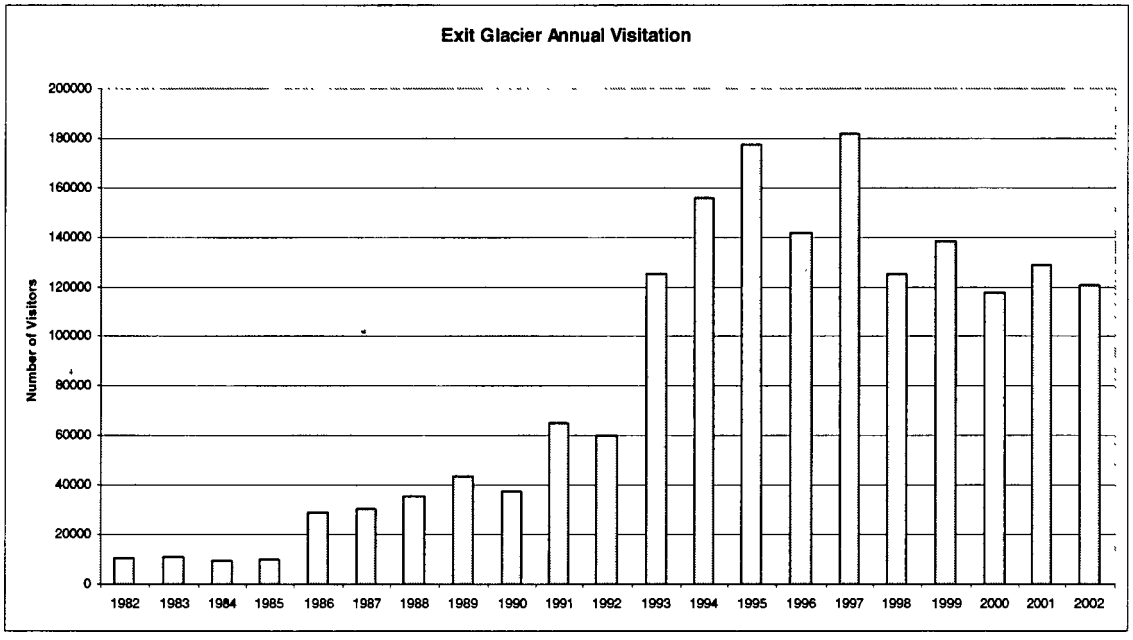
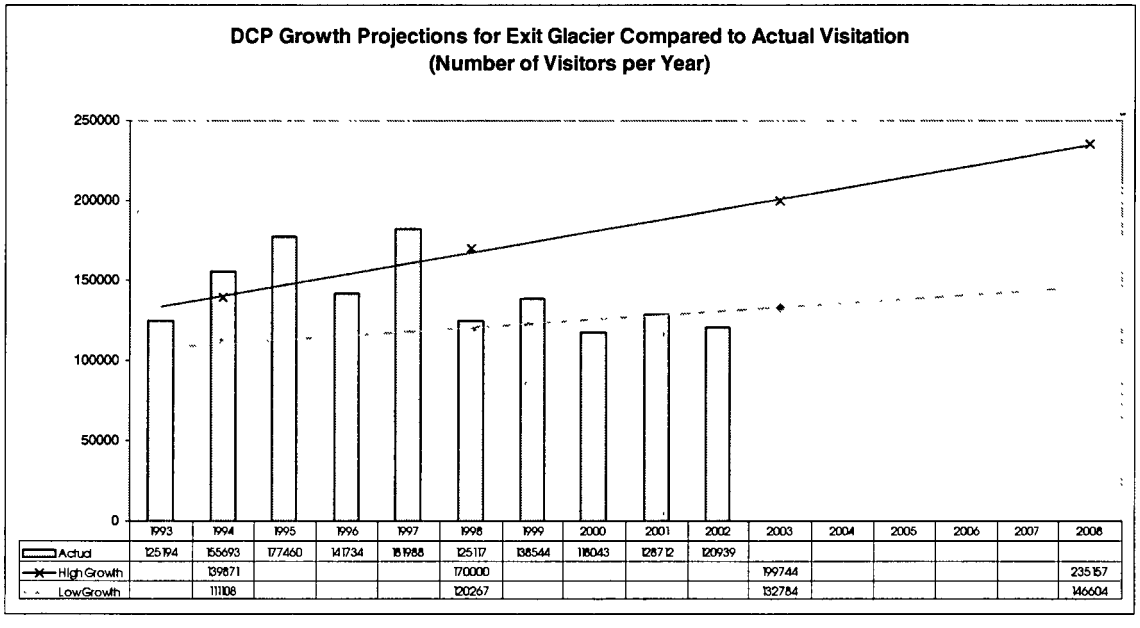


Figure 1. Annual visitation for Exit Glacier.



	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Actual	125194	155693	177460	141734	181988	125117	138544	118043	128712	120939						
High Growth		139871				170000					199744					235157
Low Growth		111108				120267					132784					146604

Figure 2. Total annual visitation to Exit Glacier compared to projected figures (from NPS 1996).

Visitation at Exit Glacier is extremely seasonal, and winter use currently represents only a small fraction of total annual visitation. Although winter use figures are known to be inaccurate due to the difficulty associated with counting winter visitors, the best information (opportunistic visitor counts by winter caretakers at Exit Glacier) indicates

that winter visitation currently represents no more than one or two percent of the annual total. Visitation begins to increase in spring, peaks in July and August, and decreases substantially in late September. Snow cover on the road to the park is the primary controlling factor, and early snowfall or warm springs can have a dramatic effect on shoulder season visitation.

Visitor Profile

The information on summer visitor profile is based on a 2001 General Visitor Survey (GVS) administered by the USGS, Biological Resources Division, Forest and Rangeland Ecosystem Science Center, Cascadia Field Station (Swanson et al. 2003). The population represented by the GVS is all Exit Glacier visitors over the age of 17 visiting the Exit Glacier area from July 2, 2001 to August 30, 2001 between approximately 9:00 a.m. and 9:00 p.m. The accuracy of the survey results ranges from ± 3.2% to ± 4.7% depending on sample size.

Most of the visitors to Exit Glacier were not from local communities. Approximately 76% were United States residents from outside Alaska and 8% were from outside the country. Alaskan residents from outside the Kenai Peninsula accounted for 14% of the total, and 2% were local residents.

The majority of the survey respondents were Caucasian with college degrees and currently employed. The ethnic diversity of respondents was very limited, with 95% being Caucasian, 3% Asian, and the other ethnic groups each made up less than 1% of the total. Almost half of the respondents indicated that they have graduate level or professional training, and another quarter indicated that they have a college degree. Most of the respondents (69%) were currently employed, with retirees making up the second largest group at 19%.

Most visitors came as part of family groups. The average age of visitors was 38.8, with the most common age group being 40 to 49 years (about 20% of visitors). Family groups represented 59% of the total visitation, with friends and a mixture of family and friends making up 17% and 14%. Organized tour groups accounted for only 2.5% of the total. 25% of the groups reported having children under the age of 18 in their party.

The average length of stay for visitors at Exit Glacier was 5.6 hours, with most visitors staying 1 to 2 hours (37%) or 2 to 3 hours (24%). Visitors reporting having stayed more than 24 hours represented 6.5% of those surveyed. Currently, no information is available on the profile of winter visitors to Exit Glacier.

Visitor Access

Summer Access to the Exit Glacier Area

The road to Exit Glacier (Figure 3) is in good condition as the pavement is relatively new (partially paved in 1995 and the remainder paved in 2001) and receives mainly summer use. While good for vehicles, the narrow shoulders do not provide a safe route for pedestrians and cyclists (although there have not been any serious accidents, anecdotal

information suggests that many pedestrians and cyclists avoid traveling on the road during peak use periods).

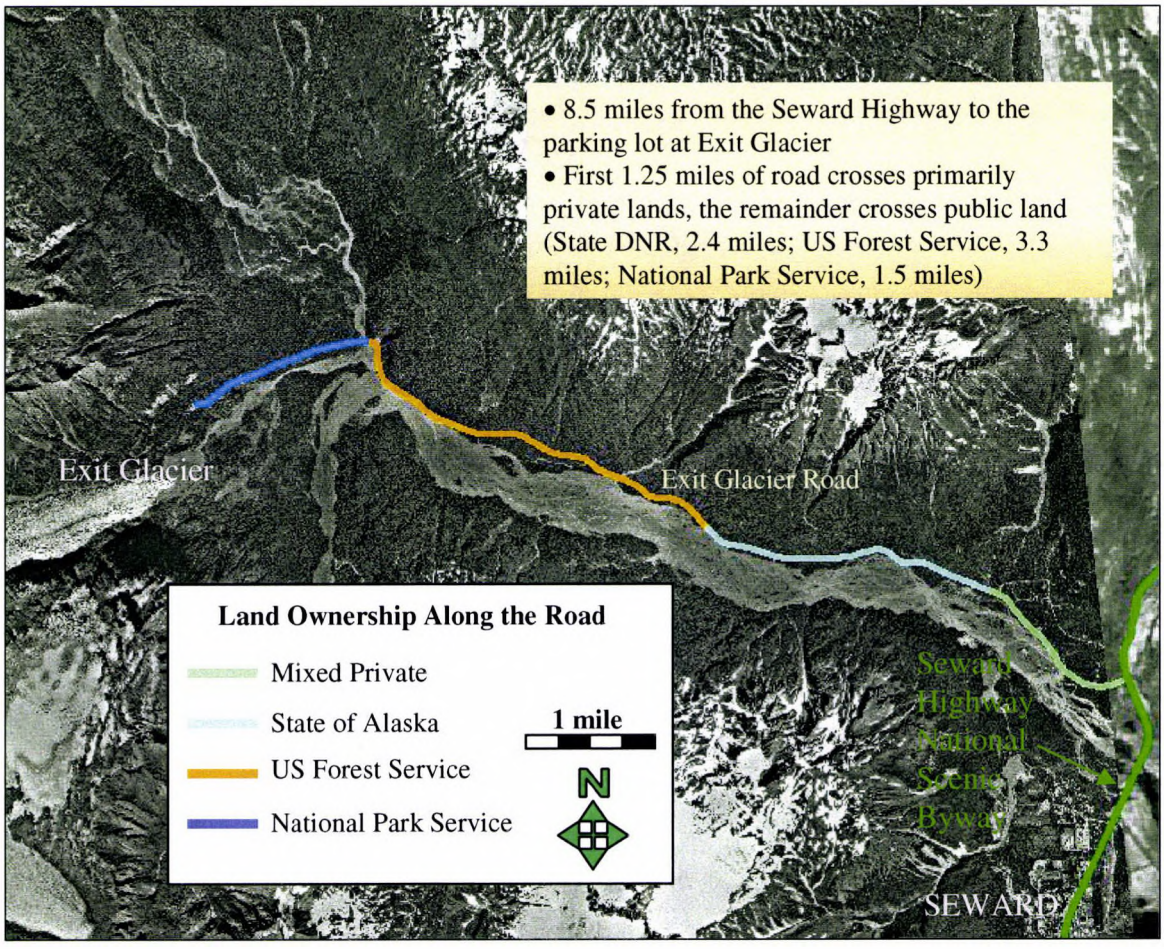


Figure 3. Land ownership along the access road to the Exit Glacier area of Kenai Fjords National Park.

There are three major land owners and three gates along Exit Glacier Road that can be used to control access. Jurisdictional questions regarding the road are not uncommon as most visitors do not differentiate between the different agencies involved with road management decisions. The first gate is located at mile 1.25 where the State Exit Glacier Special Use Area begins. A second gate is located at the U.S. Forest Service boundary at mile 3.7. The final gate is on the east end of the Resurrection River bridge near the park boundary at mile 7.0. The three agencies coordinate the opening and closing of these gates seasonally and to control traffic during emergency situations such as floods. There is a State right-of-way that encompasses the road for the first seven miles to the park boundary. The easement ends at that point and the National Park Service has proprietary jurisdiction within the park.

Most people drive to Exit Glacier in private vehicles. In 2001 approximately 94% of visitors to Exit Glacier arrived in private vehicles, with the remaining 4% arriving in

buses, taxis or other commercial vehicles (based on fee booth data for June through September 2001). The other 2% of visitors arrive at Exit Glacier on foot, bicycle, and via other non-motorized means.

Summer Access Within the Exit Glacier Area

After arriving at Exit Glacier, most visitors stay for less than three hours, except for a small subset of visitors (probably Harding Icefield Trail hikers) who stay longer (Swanson et al. 2003).

The Exit Glacier area contains a variety of trails (Table 6) that visitors use to access the glacier and the Harding Icefield. This trail system represents the only developed trails within Kenai Fjords National Park. Vehicle access in the Exit Glacier area is restricted to the road and parking lot, except for limited use of maintenance and emergency vehicles on the paved trail (snowmobile access in the winter is addressed under the winter access section below). The parking lot, plaza, restroom facilities, and Nature Center are accessible to all visitors. The trail to the glacier meets accessibility standards up to the junction of the outwash plain trail and Overlook Loop trail. The trails beyond this point are more primitive and not completely accessible to visitors of all ability levels.

Table 6. Existing trails in the Exit Glacier study area.

Trail	Length	Width	Surface
Harding Icefield Trail	3.8 miles	18 to 24 inches	Native materials, may have rocks or low obstacles
Overlook Loop Trail	0.7 miles	36 to 48 inches	Native materials, tread is smooth and free of obstacles
Nature Trail	0.7 miles	36 to 48 inches	Native materials, tread is smooth and free of obstacles
Main Trail to Glacier	0.6 miles	10 feet	Paved for 0.3 miles, native materials for 0.3 miles

To access the glacier, visitors follow a paved trail for 0.3 miles at which point the trail becomes compacted gravel for the next 0.3 miles to the glacier. Visitors can access the terminus of the glacier via the Outwash Plain Trail or the Overlook Loop Trail which climbs steeply over bedrock to a viewpoint near the edge of the glacier. While the Outwash Plain Trail is wider and can accommodate more visitors, frequent flooding on that trail in recent years has forced visitors onto the narrower Overlook Loop Trail. Traffic is directed one-way around the upper loop trail to reduce resource impacts and safety concerns associated with visitors passing head-on. According to electronic trail counter data for July through October, 2001, approximately 40,000 visitors walked the Overlook Loop Trail during that period, representing approximately 45% of the total visitation to Exit Glacier.

On their return from the glacier visitors have the option of walking on the Nature Trail back to the parking lot. This 0.7 mile gravel trail winds through the forest and along the banks of Exit Creek, and provides self-guided interpretive wayside exhibits along the way. This trail receives relatively light use, although counting the number of visitors on this trail has proven difficult due to problems with the electronic counters. Examining

what appears to be the most reliable data (NPS 2002a), approximately 17,727 visitors walked the trail between June 7 and October 4, 2001, representing 15% of the total visitation to Exit Glacier for that period.

The only other trail in the Exit Glacier area is the Harding Icefield Trail. Climbing 3,100 feet in 3.8 miles, this steep trail affords visitors who reach the top a spectacular view of Exit Glacier and the Harding Icefield. Total visitor use on the Harding Icefield Trail increased dramatically during the 1990's (from approximately 2,000 hikers to approximately 8,000 hikers), but has decreased slightly in recent years (approximately 6,500 hikers). This information is based on voluntary trailhead registration and thus has several sources of error, but it does provide trend data and is deemed to be a reasonable portrayal of the volume of use. Electronic trail counters were used in 2000 to determine daily use patterns and the number of hikers passing the counter during one hour intervals (a measure of visitor density on the trail).

Winter Access

The road to Exit Glacier is not maintained in the winter, thus the road becomes closed to wheeled vehicles once sufficient snow cover is present to support alternate modes of travel, such as skis or snowmachines. The timing of the first substantial snowfall is highly variable, but the road is typically closed by mid-November. As the snow deepens, the gates along the road generally close in order, starting with the park boundary, then the forest boundary and finally the state boundary at mile 1.25 of Exit Glacier Road. Thus winter visitors must travel 7.25 miles over snow to reach the parking lot at Exit Glacier. The winter trail is typically well-traveled by snowmobiles and thus remains hard-packed through most of the winter. The road is usually plowed open by mid-May with the exact timing being dictated by snow conditions.

Beyond the parking lot, winter visitors follow the main summer trail to the outwash plain and also use the Exit Creek drainage as a travel corridor (Figure 4). There are no other official or commonly-used winter routes or trails in the study area.

Visitor Activities

The following information on summer visitor activities is based on a 2001 General Visitor Survey administered by the USGS, Biological Resources Division, Forest and Rangeland Ecosystem Science Center, Cascadia Field Station (Swanson et al. 2003).

Exit Glacier is currently the most easily accessible glacier in Alaska, thus most visitors come with the goal of getting near or touching the glacier. Viewing the scenery, wildlife and vegetation are also important to visitors, as is walking and hiking. The 2001 General Visitor Survey indicates that the most common activities that visitors engaged in were viewing Exit Glacier (97%), taking photographs (88%), walking up to and/or touching the glacier (72%), taking unguided walks/hikes (72%), viewing wildflowers, geological features and wildlife (64%, 55.7%, 45%), and reading educational materials (44%). Less than 25% of the respondents to the survey participated in other activities.

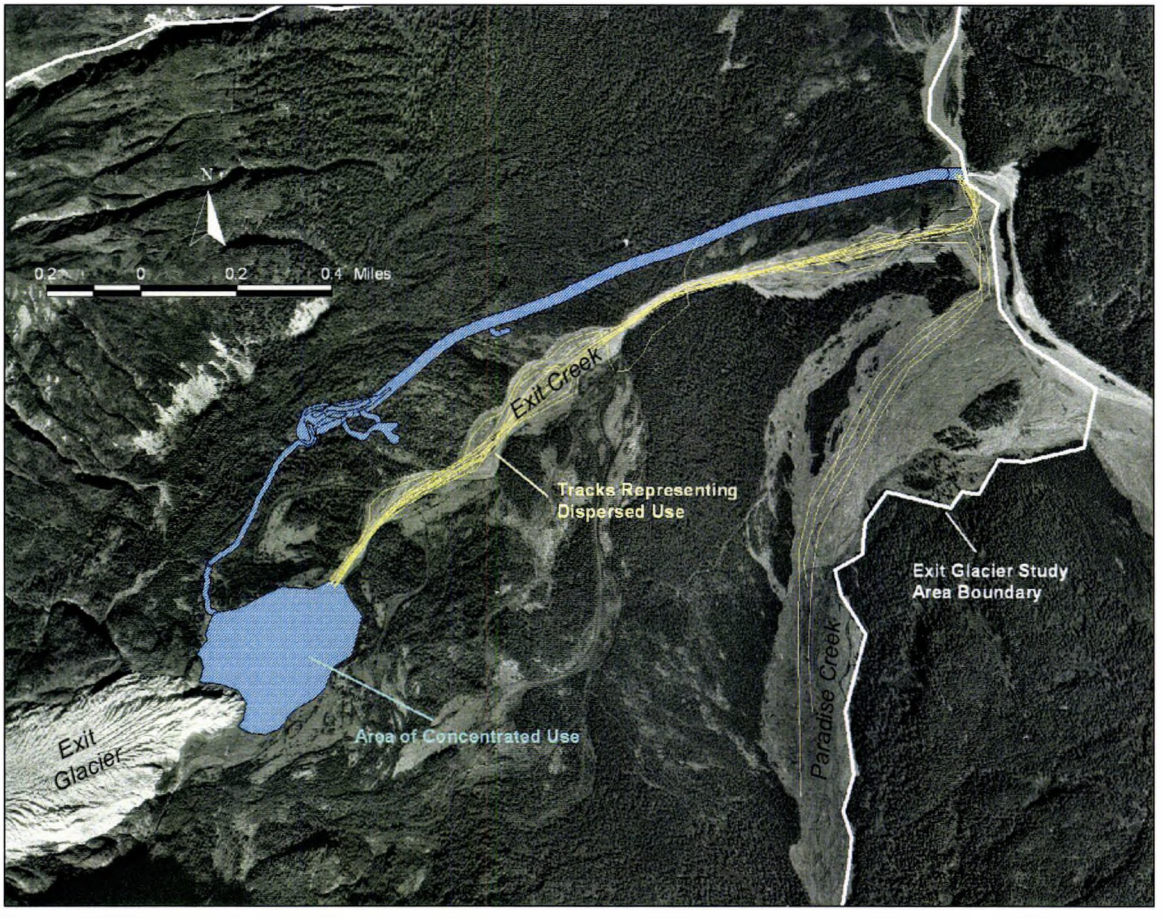


Figure 4. Concentrated and dispersed snowmachine use in the Exit Glacier Study area from November 1999 through February 2000 based on track surveys. The tracks shown in this figure represent the results of on-the-ground surveys. One track may represent multiple snowmachines.

Participants in the General Visitor Survey were asked specifically if they hiked on the Harding Icefield Trail, to which 13.5% responded positively. This proportion is markedly higher than the number of hikers indicated by the voluntary trailhead register, approximately 5% of total visitors. It is possible that some of the respondents to the survey hiked on the lower part of the trail and either did not make it to the register (located approximately 0.25 miles up the trail) or did not bother to register if they were not hiking the entire trail. The Nature Trail also receives limited use, with approximately 15% of visitors taking that alternate route back to the parking lot from the glacier.

Overnight camping at Exit Glacier is not a common activity, and only 3.3% of the General Visitor Survey respondents indicated that they stayed overnight in the park. Camping in the Exit Glacier study area is allowed only in the designated campground (there is no fee or reservation system) or in areas at least 0.5 miles from roads or trails. Use at the Exit Glacier campground represents the majority of overnight summer visitation in the study area and is tracked by counting the number of tents present in the campground in the morning. Assuming two people per tent, visitor use of the campground for 1999 through 2002 represents on average 1% of the total visitation to

Exit Glacier. Although data is not collected on how many times all 12 of the campground sites are occupied each summer, an estimate can be made by looking at the distribution of the number of tents in the campground each morning. The data indicates that the campground is not at capacity most of the time.

Snowmachine use for traditional activities is permitted within the Exit Glacier study area, provided the use does not damage vegetation or soils. Traditional activities have not been defined for Kenai Fjords National Park. The park Superintendent announces through a press release when the requirement is met for adequate snow cover. Dogs are allowed inside the park in the winter provided that they are physically restrained and being used for transportation such as dogsledding or skijoring.

Winter visitor use at Exit Glacier has been difficult to measure, but observations by park managers and winter visitors indicate that motorized winter use has increased in the past decade. Motorized use currently makes up approximately 83% of total winter visitation. Estimates of winter use are based upon observations by the winter caretakers at Exit Glacier. These observations should be considered as minimum counts since they are based solely on visitors that are seen or heard. Nonetheless, the amount of snowmachine use that was reported in the early 1990's was around 200 to 300 per winter (the period during which the road is closed to wheeled vehicles) (Tetreau 1999). In recent years the reported number has varied from 450 to 800, with a best estimate of current use of approximately 465 per winter. This includes use by the military recreation camp in Seward (the Seward Resort) which rents snowmachines and provides a fairly steady stream of use to Exit Glacier when snow conditions allow.

Snowmachine use at Exit Glacier occurs mostly on the road, main trail to the glacier, outwash plain and Exit Creek, although there is limited use in the Paradise Creek drainage and other areas if snow conditions are favorable (Figure 5). The ride to Exit Glacier is usually quite easy, making the area attractive for families and novices. The outwash plain in front of the glacier is a popular area for riding since it is mostly wide-open snow. In addition, the snow-covered glacial moraines provide jumps for the more aggressive riders. The number of nice winter weekend days with good snow conditions varies tremendously from year to year. On a nice winter weekend day with good snow conditions the outwash plain is busy with snowmachines throughout much of the day, and the average number of snowmachiners in the Exit Glacier area is approximately 10 to 30. Based on weather conditions and amount of snowfall, access to the Paradise Creek drainage can be easy or difficult, and use high (as in the winter of 2003/04) or low (as in the winter of 2002/2003). Also based on snow conditions, snowmachiners use a path between Exit Creek and Paradise Valley which travels through a semi-wooded area that is prime moose winter habitat.

The winter caretakers estimated the volume of dispersed use (in areas other than the road, main trail to the glacier and outwash plain) from November 1999 to February 2000 by conducting regular surveys for snowmachine tracks. Of the 16 tracks they mapped during that period (one track may represent multiple machines running single file), four of them went into the Paradise Creek drainage (Figure 5). During this same time period

they counted a total of 371 snowmachine visitors within the entire study area. Approximately 2% of motorized users stay overnight at Exit Glacier.

Non-motorized use currently makes up approximately 17% of the total winter visitation, with 25 to 50% of the non-motorized use by overnight visitors. Non-motorized winter use represents the majority (73%) of winter overnight use. Many skiers do not make the 14.5 mile round trip to the glacier and back in one day, and although few visitors camp out (from January 1999 to December 2002 only 16 campers were recorded), the winter public use cabin is popular with skiers. Dog teams are also rare at Exit Glacier as most mushers run shorter courses that end before they reach the park boundary. The first 3.5 to 4 miles of Exit Glacier Road are heavily used by all user groups during the winter, which has led to increasing conflicts as the number of winter recreationists continues to increase.

Crowding

Levels of visitation and crowding do not seem to be major factors affecting the current visitor experience. The 2001 visitor surveys indicated that almost two thirds of Exit Glacier visitors did not feel crowded at all during their visit and that current levels of visitor density are very rarely (if ever) high enough to cause major detractions from visitor experiences. The largest factor that seemed to have a negative impact on visitor experience was the behavior of other visitors, especially when other visitors were breaking rules or behaving dangerously (typically this meant getting too close to the glacier).

During summer at Exit Glacier, visitor numbers increase rapidly starting around 8:30 am and plateau during the middle of the day from approximately 10:30 am to 3:30 pm (NPS 2002a). Data in recent years reveal a slight but consistent dip in visitor numbers just after mid-day, after which the number rebounds before dropping off sharply in the late afternoon. In the evening visitation tails off more gently as visitors enjoy the long daylight hours.

The total number of vehicles present at one time in the Exit Glacier parking lot in 2001 exceeded the parking lot capacity of approximately 100 vehicles on three days between July 21 and August 29 (NPS 2002a). The number of vehicles in the parking lot at one time was based on electronic counters on the entrance and exit lanes of the parking lot.

The total number of visitors present at one time is estimated by multiplying the number of vehicles by an average of 3.1 people per vehicle (which is the current multiplier used for estimating total visitation at Exit Glacier). On average, the number of visitors present at one time during the peak hours of the day in July and August ranges between approximately 175 and 220.

SOCIOECONOMIC ENVIRONMENT

Regional Context
Kenai Fjords National Park is located on the 100 mile wide and 170 mile long Kenai Peninsula. The peninsula is bounded by Cook Inlet to the west and Prince William Sound to the east. The park lies along the southeastern coast of the peninsula, with the Resurrection River forming the park's northern boundary.

The land mass, as well as the waters surrounding the Kenai Peninsula, falls under a variety of jurisdictions including the Chugach National Forest, the Kenai National Wildlife Refuge, and the Alaska Maritime National Wildlife Refuge (Gulf of Alaska Unit). These are conservation system units established under the Alaska National Interest Lands Conservation Act of 1980 (ANILCA). Several major parks and state recreation areas have been established in this area by the State of Alaska including Kachemak Bay State Park and Kachemak Bay State Wilderness Park, Captain Cook State Recreation Area, and Caines Head State Recreation Area. In addition, five park units located in Resurrection Bay are administered as Alaska State Marine Parks.

Kenai Fjords National Park is located entirely within the Kenai Peninsula Borough. Other state, borough, and private lands are contained within the region. Extensive native village and regional corporation lands, selected under the Alaska Native Claims Settlement Act of 1971 (ANCSA) lie along the western side of the peninsula, and village corporation lands belonging to the Port Graham Native Corporation are also within the boundary of Kenai Fjords National Park; however, none of these lands borders the Exit Glacier study area. Exit Glacier is located in the northeast part of the park, approximately 10 miles by road from Seward, the nearest community.

Surrounding Community
The City of Seward and the outlying business and residential areas of the Kenai Peninsula Borough within a 10 mile radius make up the surrounding community. The city dates to 1903 when it was selected as the southern terminus of the Alaska Central Railroad because of its deep, ice free harbor. In this century it has been a busy seaport and center for miners, loggers, trappers, and fishermen. In 1964, the Good Friday earthquake and resulting tidal waves destroyed over 90% of the city's industries and businesses, and severely damaged many residential areas. Thereafter, Seward entered a period of decline. The population did not return to pre-earthquake levels until the mid-1970s. Today, the city's economy is strongly based in seasonal tourism, with other anchors in the traditional industries of fishing and transportation.

Population
The population of the Kenai Peninsula Borough has grown from 40,802 in 1990 to 49, 691 in 2000, an increase of 21.8%. The population of Seward has grown from 2,699 in 1990 to 2,830 in 2000, an increase of 4.8% (NPS 1996, Alaska Dept. of Labor 2002a). In 2000, the outlying area of Seward had a population of 1,840, for a total area population of 4,670. This number includes the inmates in the Alaska State Spring Creek Correctional

Center (400+) and the Bear Creek Census Area, which extends from the northern Seward city limits to approximately mile 8 of the Seward Highway.

Seward Economy

Seward and the outlying area have a diverse economy, with a traditional industrial base tied to the sea and fishing, as well as tourism, education, and state corrections (Fried and Windisch-Cole 1999). As the southern terminus of the Alaska Railroad (AKRR), Seward has long been a transportation center. The AKRR Ocean Terminal, Alaska Marine Highway (ferry) dock, and Marine Industrial Center are important components of the transportation industry. Related services, including provisioning and ship maintenance, repair and refueling provide support to this industry. Fishing and fish processing and related services continue to be a substantial part of Seward's economy. The Alaska Vocational Technical Education Center (AVTEC) offers a variety of training to approximately 1500 students annually. It is the state's largest facility of its type. The Alaska Sealife Center, opened in 1998, is a large regional research, wildlife rehabilitation, and education facility, serving 152,000 visitors in 2002. The University of Alaska, Institute of Marine Science (IMS) provides facilities for ocean research and homeports it oceanographic vessel, the R/V Alpha Helix, in Seward. The State of Alaska maximum security prison, Spring Creek Correctional Center (SPCC), is located just outside the city limits. It houses up to 500 inmates and employs approximately 200 staff.

Because tourism related employment is represented in several commonly tracked sectors, including Services, Retail, Trades, and Government, but is not broken out as a separate item, it is difficult to discuss actual employment figures and related economic impacts.

In 1998, Seward's total workforce was 2,037. Of this total, 404 (20%) were employed in the service sector, with 412 (20%) in trade. Government at all levels employed 656 people (32%), with Fishing, Agriculture, Finance, Construction, Manufacturing, Transportation, Communications, and Utilities combined for 565 jobs (28%).

Wages in the service and tourism sectors are generally the lowest of all the economic sectors, further minimizing the overall economic influence of tourism related employment (Fried and Windisch-Cole 1999).

A wide range of businesses rely on tourism income. These include lodgings; restaurants; retailers of groceries, sundries, and souvenir items, guides and outfitters; transportation services; gas stations, auto rental agencies, tow trucks, and repair shops; private and municipal campgrounds; and related services.

Employment

The average unemployment rate in the Kenai Peninsula Borough from May, 2002 through September, 2002 was approximately 8.6 %, while the average rate for the same area from October, 2001 through April, 2002 was 10.9 %. The statewide rates for the same periods were 5.65% and 6.1%, respectively. (Alaska Department of Labor 2002b). The national average unemployment rate for 2001 was 4.8%.

Employment is higher in summer and lower in winter months due to the seasonality of summer tourism and construction jobs. The Kenai Peninsula Borough unemployment rate from October 2001 through April 2002 averaged 11.02 % while from May 2002 through September 2002 it averaged 8.56%, a difference of 2.46% (Alaska Department of Labor 2002b).

SAFETY

Visitors to the Exit Glacier area have the potential to encounter a variety of safety hazards. Safety hazards that currently exist at Exit Glacier include:

- Injuries related to the wide mix of activities, both motorized and non-motorized, that occur in both winter and summer.
- Encounters with wildlife such as bears, mountain goats, and moose.
- The possibility of falling ice with visitors climbing on or getting too close to the glacier.
- The possibility of hypothermia and being swept away when crossing streams.
- Possible fecal coliform contamination of drinking water and stream water resulting from improper disposal of human waste.

Overall the accident rate at Exit Glacier is fairly low. Accidents within the Exit Glacier area that have taken place in the past resulted mainly in small injuries. Almost every year injuries such as sprained ankles, scrapped knees/palms, and broken bones occur. The majority of these accidents occur along the Harding Icefield Trail where the topography can be very steep and slippery. Such injuries also occur along the Overlook Loop Trail and in the outwash plain, although they are infrequent, when visitors lose their footing on loose rocks. Twenty-five such visitor injuries were documented in the past twenty years, with 19 of them occurring in the past 4 years (NPS 2002b).

Two snowmachine accidents have been documented, one in 1998 and the other in 2002 (NPS 2002b). In one of these accidents, a rider hit a tree, breaking several bones. There are no documented accidents inside the park between snowmachiners and non-motorized users such as skiers, but anecdotal information indicates that there have been several close calls on Exit Glacier Road outside of the park (Ireland 2002). Trails are continuously being improved to meet NPS standards in order to increase visitor safety. Speed limits are posted and enforced to maintain safe traveling speeds for motorized vehicles.

Wildlife encounters can be dangerous interactions especially when food is involved. One encounter was documented in 1996 with a black bear, but there were no injuries (NPS 2002b). Anecdotal information indicates that wildlife is often harassed when hikers want to pass an animal on a trail (Ireland 2002). Such harassment has ranged from people shouting and throwing rocks so animals will move off the trail to animals being disturbed and leaving just from the presence of people. Additionally, there have been observations of animals obtaining food from visitors (Ireland 2002). Information to educate the public about wildlife safety is posted on bulletin boards in the area.

Although only one fatal incident in the past 20 years has occurred involving ice falling from the glacier, the risk of injury is considered high due to the number of people who venture too close to the glacier. Each year, visitors are warned by rangers that they are too near the glacier (Ireland 2002). Warning signs about falling ice and indicating area closures are placed around the glacier to help prevent future injuries.

Although the majority of visitors do not often cross streams, backpackers and park staff cross Exit Creek when accessing the area to the south. There have not been any documented accidents recorded relating to stream crossings. Since stream crossings are such an infrequent occurrence, there are no educational or training mechanisms in place to increase safety.

Toilet paper and human waste found outside of the developed area indicate that visitors occasionally dispose of their waste improperly. Evidence is often found in at least two locations along the Harding Icefield Trail where hikers stop to rest. Waste has also been noted near the picnic area and parking lot on occasion (Wright 2003). Water quality analyses (Wright 2001b) revealed small numbers of fecal coliforms in stream water, but the level was within allowable limits and could be caused by natural factors (e.g., wildlife). Bulletin boards in the Exit Glacier area contain Leave No Trace information which includes how to properly dispose of human waste.

Regulations are in place and visitors are educated to help prevent or minimize the safety hazards discussed above. Visitor information regarding regulations and general safety in the study area are provided at numerous locations and in various forms. The park newspaper and brochure, which contain maps and safety information, are distributed at the entrance booth, the Nature Center, and the Visitor Center in Seward. Three bulletin boards are located within the Exit Glacier area at the campground, the Nature Center and the Harding Icefield trailhead. Bulletin boards display a number of safety topics including wildlife safety, trail conditions, emergency contacts, park and campground regulations, and Leave No Trace methods. Rules and regulations can also be accessed on the park's website. Park staff and trail patrols are available for visitor information or help at the Visitor Center and at Exit Glacier during the summer. In winter, caretakers reside at Exit Glacier and are available to assist visitors.

Environmental Consequences

INTRODUCTION

The National Environmental Policy Act (NEPA) mandates that environmental impact statements disclose the environmental impacts of proposed federal actions. In this case, the proposed federal action is the implementation of the Visitor Experience and Resource Protection plan for the Exit Glacier area at Kenai Fjords National Park. This chapter of the document analyzes the potential effects of the four management alternatives on natural and cultural resources, the visitor experience, the local socioeconomic environment, and park operations. Examining the environmental consequences of all alternatives provides a basis for comparing the advantages and disadvantages of the alternatives, helping decision makers decide which approach creates the most desirable combination of the greatest beneficial results with the fewest adverse effects on the park.

The Environmental Consequences chapter is arranged by alternative, under which potential effects on each resource are analyzed. The existing conditions for all of the impact topics that are analyzed here were identified in the Affected Environment chapter. All of the impact topics are assessed for each alternative. Each impact topic includes the methodology the planning team used to identify impacts, impact level definitions, a description of the positive and negative effects of the alternative, a discussion of cumulative effects when this project is considered in conjunction with other actions occurring in the region, and a conclusion statement. Table 5, which is included at the end of the Alternatives, including the Preferred Alternative chapter, compares and summarizes the impacts of each alternative.

Methodology

The environmental consequences to each impact topic were assessed based on context, intensity, and duration of the impacts, and whether the impact would be direct or indirect as presented in *Director's Order 12: Conservation Planning, Environmental Impact Analysis and Decision-making* (NPS 2001d). Cumulative effects were also identified. Definitions of each of these concepts are provided below.

The effects that an alternative could have on an impact topic could be either adverse or beneficial. In some cases, the action could result in *both* adverse and beneficial effects for the same impact topic.

Context
Impacts are evaluated in particular geographic contexts such as site-specific, park wide, regional, etc. as appropriate. The same effect may be minor in one context but major in another.

Intensity
Impact intensity is the degree to which a topic is positively or negatively affected. Each impact is identified as negligible, minor, moderate, or major in conformance with the criteria for these classifications provided below by impact topic.

Duration
Impact duration refers to how long an impact would last.

Cumulative Impacts
Impacts on the environment can result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency or person undertakes such other action. Cumulative impacts can result from individually minor, but collectively significant, actions taking place over a period of time.

The impact analyses and conclusions were based on information available in the literature, data from park studies and records, and information provided by experts within the National Park Service and other agencies. Unless otherwise stated, all impacts were assumed to be direct. All the impact analyses assumed that mitigating measures would be applied at the time the alternative was implemented in order to minimize or avoid impacts. Mitigating measures were described in the "Alternatives, including the Preferred Alternative" chapter of this document.

Soils

Impacts to soils were assessed by evaluating whether the actions in each alternative would result in measurable impacts to soils, mostly in the form of compaction or erosion. Since there is no soil map for the study area and very little study of the soils has been conducted to date, the anticipated impacts are based on the best professional judgment of the interdisciplinary planning team with input from additional consultants as needed.

Impact Level Definitions
- *Negligible* – A measurable change to soil properties in a total area of less than 5 acres (2 ha) to the extent that the impact would not measurably change the impacted area's overall biological productivity.
- *Minor* – A measurable change to soil properties in a total area of greater than 5 acres (1 ha) and less than 10 acres (4 ha) to the extent that the impact would not measurably change the impacted area's overall biological productivity -OR- a measurable change to soil properties in a total area of less than 5 acres (2 ha) to the extent that the impact would measurably change the impacted area's overall biological productivity.
- *Moderate* – A measurable change to soil properties in a total area of greater than 10 acres (4 ha) and less than 25 acres (10 ha) to the extent that the impact would not measurably change the impacted area's overall biological productivity -OR- a measurable change to soil properties in a total area of greater than 5 acres (2 ha) and less than 10 acres (4 ha) to the extent that the impact would measurably change the impacted area's overall biological productivity.
- *Major* – A measurable change to soil properties in a total area of greater than 10 acres (4 ha) to the extent that the impact would measurably change the impacted area's overall biological productivity.

Water Quality

Impact levels were assessed by evaluating baseline water quality data for the study area, study area maps and aerial photos, NPS, Alaska DEC and EPA water quality literature, and via consultation with NPS and USGS hydrologists and planners. Impact level definitions are based on Alaska Department of Environmental Conservation (DEC) anti-degradation policy and definition of high quality waters. The anti-degradation policy states that existing water uses and the level of water quality necessary to protect existing uses must be maintained and protected. If high quality water constitutes an outstanding national resource, such as a water of a national or state park or wildlife refuge or a water of exceptional recreational or ecological significance, the quality of that water must be maintained and protected (DEC 1999).

Impact Level Definitions
Duration Definitions:
Short-term: Water quality recovers from changes in one year or less.
Long-term: Water quality takes more than one year to recover from changes.
(Note: these definitions also apply to the *Floodplains* and *Wetlands* topics)

- *Negligible* – No detectable changes in water quality.
- *Minor* – Changes in water quality are well-below DEC water quality acceptable limits for high quality waters. Changes, when detectable, are short-term.
- *Moderate* – Changes in water quality approach DEC water quality acceptable limits for high-quality waters and are long-term -OR- Changes in water quality are equal to DEC water quality acceptable limits on a short-term basis.
- *Major* – Any changes in water quality exceed DEC water quality acceptable limits for high-quality waters.

Floodplains

Methodology for assessing floodplain impacts included referral to area topographical and GIS maps and aerial photos, and NPS documents such as Director's Order (DO) 77-2. The extent of impacts on floodplains was determined based on potential for loss of floodplain function and resources.

Impact Level Definitions
- *Negligible* – No detectable change in floodplain function and structure.
- *Minor* – Short- term changes that occur in areas of 5 acres (2 ha) or less of one stream system's floodplain.
- *Moderate* – Short-term changes encompassing areas of 5 to 10 acres (2 to 4 ha) of floodplain of one or more stream system -OR- long- term changes in areas of 5 acres (2 ha) or less.
- *Major* – Long term or permanent changes; encompassing over 10 acres (4 ha) of floodplain of one or more stream system.

Wetlands

Methodology for assessing wetland impacts included referral to area topographical, GIS, and vegetation maps and aerial photos, and NPS documents such as Director's Order (DO) 77-1. Two major classes of inland wetlands are found in the study area. One is riparian, or riverine, wetland found adjacent to rivers or streams. The other is palustrine wetland, which includes marshes, bogs, or swamps. Due to the close proximity and overlapping of wetland types in the study area, they are grouped together and referred to as "wetlands" in general in the analyses. The extent of impacts on wetlands was determined based on potential for loss of wetland function, area, or structure.

Impact Level Definitions

- *Negligible* – No detectable changes to short- term changes that occur in areas of less than 1 acre (0.4 ha).
- *Minor* – Short-term changes in areas of 1 to 5 acres (0.4 to 2 ha). -OR- long- term changes in an area of less than 1 acre (0.4 ha).
- *Moderate* – Long term changes affecting 1 to 10 acres (0.4 to 4 ha). -OR- Short-term changes affecting 5 acres (2 ha) or more.
- *Major* – Long term to permanent changes over a large or regional scale, encompassing over 10 acres (4 ha).

Air Quality and Visibility

Impacts from visibility and odors were determined from personal observations by park employees, site photographs and NPS guidelines (NPS 2002g). Park photographs provide a visual record of the study area encompassing the past 40 years (KEFJ Photo Archives) and serve as a means to compare visual quality of the area over that period of time.

Impact Level Definitions

- *Negligible* – No changes in air quality through visibility or smell are detectable in the study area.
- *Minor* – Changes in air quality through visibility or smell are detectable but not objectionable. Visibility changes and/or odors do not exceed 12 total hours a day and are limited to areas immediately surrounding the source.
- *Moderate* – Changes in air quality through visibility or smell are detectable and may be objectionable to some individuals. Visibility changes and/or odors do not exceed 18 total hours a day and are noticeable in areas extending from the immediate source to greater areas, but not exceeding 50% of the study area. -OR- Visibility changes and/or odors do not exceed 12 total hours a day and are noticeable in areas greater than 50% of the study area.
- *Major* – Changes in air quality through visibility or smell are readily detectable, and uncomfortable or objectionable to most individuals. Visibility changes and/or odors exceed 18 hours a day and are noticeable in 50% or more of the study area. -OR- any impact that exceeds local, state or federal regulatory standards for air quality.

Soundscape

A study in the Exit Glacier study area was recently conducted to document the existing soundscape by identifying, evaluating and recommending for monitoring the sources, intensities and duration of sounds. The impact level definitions below were derived from data gathered during a soundscape pilot study (Wright and Hetrick 2002). Natural soundscape data used to develop the impact level definitions, and impact statements include the documentation of seasonal patterns and duration of flowing water, blowing wind, bird calls, and insect noise. Human-generated soundscape data include sound intensity and duration associated with seasonal patterns of motor vehicle noise and humans voices. Ongoing fieldwork will be used to augment the data set and validate the results of the baseline study.

Impact Level Definitions

- *Negligible* – Natural sounds predominate. No detectable increases in man-made noise intrusions.
- *Minor* – Natural sounds predominate. Intrusions do not exceed three total hours a day, are short-term, limited to the duration of an action, such as construction, or to a season, not exceeding 4 months and not readily audible at distances exceeding 1 mile (1.6 km).
- *Moderate* – Natural sounds predominate. Intrusions do not exceed six total hours a day, are short-term, limited to the duration of an action, such as construction, or to a season, not exceeding 4 months and may not be heard at distances exceeding 3 miles (4.8 km). -OR- Intrusions do not exceed three total hours a day, are long-term, not linked to a specific action and exceed a season or 4 months, but not readily audible at distances exceeding 1 mile (1.6 km). -OR- Intrusions may exceed six total hours a day, are short term and not readily audible at distances exceeding 1 mile (1.6 km).
- *Major* – Occurrence of man-made noise is near or equal to natural sounds; exceeds six total hours a day, is long-term or unlimited, not linked to a specific action and exceeds a season or 4 months. Intrusions are audible at distances exceeding 3 miles (4.8 km).

Vegetation

Vegetation impact levels were assessed by evaluating existing information on floral distribution and abundance in the Exit Glacier area. Assessments of potential impacts from proposed actions are based on interpretation of the scientific literature and the observations and professional judgment of KEFJ Resource Management staff. The extent of impacts on vegetation was determined based on potential for negative effects on demographics to current and future generations of a species or population.

Impact Level Definitions

- *Negligible* – Impacts may occur but are so insignificant that there is no measurable effect on population numbers, population structure, or other demographic factors. Species are not at risk of being extirpated from the Exit Glacier area.

- *Minor* – Impacts are measurable but the severity and timing of changes are not outside natural variability and will not affect more than one growing season. Population numbers, population structure, and other demographic factors may exhibit changes in the current growing season, but long-term, multi-generation, characteristics remain stable. Species are not at risk of being extirpated from the Exit Glacier area.
- *Moderate* – Impacts are measurable and the severity and timing of changes to population numbers, population structure, and other demographic factors are outside the natural variability for the current growing season. Changes within natural variability may affect more than one growing season, but are expected to rebound within several generations to pre-impact numbers. Species are not at risk of being extirpated from the Exit Glacier area.
- *Major* – Impacts are measurable and the severity and timing of changes to population numbers, population structure, and other demographic factors are outside the natural variability for more than one growing season or permanently. Species may be extirpated from the Exit Glacier area.

Wildlife

Wildlife impact levels were assessed by evaluating existing information on faunal distribution and abundance in the Exit Glacier area. Most information regarding terrestrial species in this area has come from anecdotal reports by park staff and visitors, supported by a small number of systematic surveys focused on birds, bats and microtines (Wright 2001a), mountain goats (Tetreau 1989), moose (Everitt 2001) and an ongoing survey of furbearer occurrence and distribution (Martin 2001). Assessments of potential impacts from proposed actions are based on interpretation of the scientific literature and the observations and professional judgment of KEFJ Resource Management staff. The extent of impacts on wildlife was determined based on potential for negative effects on species presence in the study area, behavior, and demographics of current and future generations of a species or population.

Impact Level Definitions

- *Negligible* – Impacts may occur but are so insignificant that there is no measurable effect on behavior, population numbers, population structure, genetic variability, or other demographic factors. Species are not at risk of being extirpated from the Exit Glacier area, and habitat for all species remains functional.
- *Minor* – Impacts are measurable but the severity and timing of changes are not outside natural variability and will not affect more than one generation of a species or its habitat. Behavior, population numbers, population structure, genetic variability, and other demographic factors may exhibit changes in the current generation, but long-term, multi-generation characteristics remain stable. Species are not at risk of being extirpated from the Exit Glacier area, and habitat for all species remains functional.
- *Moderate* – Impacts are measurable and the severity and timing of changes to behavior, population numbers, population structure, genetic variability, and other demographic factors are outside the natural variability for the current generation.

Changes within natural variability may affect more than on generation but are expected to rebound within several generations to pre-impact numbers. Species are not at risk of being extirpated from the Exit Glacier area, and habitat for all species remains functional.

- *Major* – Impacts are measurable and the severity and timing of changes to behavior, population numbers, population structure, genetic variability, and other demographic factors are outside the natural variability for more than one generation or permanently. Species may be excluded from the Exit Glacier area, or habitat for any species is rendered nonfunctional.

Visitor Experience

Visitation

Impacts to visitation were assessed by evaluating whether the actions in each alternative would draw additional visitors to the area or serve to detract visitors. Current visitation statistics for the area were used as a baseline (NPS 2002a), as were the results of the 2001 visitor survey (Swanson et al. 2003). The visitor survey documents the reasons that visitors come to the area, what they like or disliked about their visit, and why they may avoid it in the future. The predicted amount of change in visitation is based on best professional judgment and is related only to the actions associated with each alternative analyzed.

Impact Level Definitions

- *Negligible* – Less than a 1% change in total annual visitation.
- *Minor* – A 1% to 10% change in total annual visitation, without a statistically significant (95% confidence interval) shift in the seasonal, daily, or hourly distribution of use.
- *Moderate* – A greater than 10% change in the total annual visitation -OR- a statistically significant (95% confidence interval) shift in the seasonal, daily, or hourly distribution of use.
- *Major* – A greater than 10% change in the total annual visitation AND a statistically significant (95% confidence interval) shift in the seasonal, daily, or hourly distribution of use.

Visitor Profile

Impacts to visitor profile were assessed by evaluating whether the actions in each alternative would be likely to cause a change in the characteristics of the average visitor to Exit Glacier. Visitor profile data from the 2001 visitor survey (Swanson et al. 2003) were used as a baseline for the analysis. The predicted changes in visitor characteristics are based on best professional judgment and logical cause-and-effect deduction.

Impact Level Definitions

Note: for the purpose of the impact level definitions, the visitor profile describes the average visitor to Exit Glacier over the entire year, with both summer and winter seasons are included in the average profile.

- *Negligible* – Little or no change in profile of the average visitor to Exit Glacier.
- *Minor* – A statistically significant (95% confidence interval) shift in the distribution of any one of the following demographic variables: visitor age, percentage of visitors that are from local communities, or the length of stay at Exit Glacier.
- *Moderate* – A statistically significant (95% confidence interval) shift in the distribution of any two of the following demographic variables: visitor age, percentage of visitors that are from local communities, or the length of stay at Exit Glacier.
- *Major* – A statistically significant (95% confidence interval) shift in the distribution of all three of the following demographic variables: visitor age, percentage of visitors that are from local communities, or the length of stay at Exit Glacier.

Visitor Access

Impacts to visitor access were assessed by examining the distribution of official trails and routes under each of the alternatives and the number of visitors that are likely to be affected as compared to existing conditions. Road access was not determined to be a significant issue, thus access under this section refers only to trail access.

Impact Level Definitions

Note: for the purpose of these impact level definitions, an area is considered "accessible" if there is an NPS-defined route or trail that leads to that area. This should not be confused with accessibility for visitors who are physically challenged.

- *Negligible* – No significant changes to access.
- *Minor* – Increased access to areas that are already accessible, or decreased access to areas without complete loss of access from those areas provided that such change does not result in more than a 25% change in the total number of seasonal (either summer or winter) visitors to those areas.
- *Moderate* – Increased access to areas that previously were not accessible, or the complete loss of access in an area provided that such change does not affect more than 25% of the total number of seasonal (either summer or winter) visitors to the Exit Glacier area, -OR- increased access to areas that are already accessible, or decreased access to areas without complete loss of access from those areas provided that such change results in more than a 25% change in the total number of seasonal (either summer or winter) visitors to those areas.
- *Major* – Increased access to areas that previously were not accessible, or the complete loss of access in an area provided that such change affects more than a 25% of the total number of seasonal (either summer or winter) visitors to the Exit Glacier area.

Visitor Activities

Impacts to visitor activities were assessed by evaluating how the actions in each alternative would affect the likelihood of visitors participating in different activities. The results of the 2001 visitor survey (Swanson et al. 2003) were used as a baseline for determining current visitor activities, along with winter visitor data for the winters of 1999-2000, 2000-2001 and 2001-2002. The predicted changes in visitor activities are based on best professional judgment and logical cause-and-effect deduction.

Impact Level Definitions

- *Negligible* – Little or no change in activities that are available to or participated in by visitors to Exit Glacier.
- *Minor* – A change that is statistically significant (95% confidence level) but less than 5 percentage points in the proportion of visitors either viewing Exit Glacier or walking up to and/or touching the glacier, -AND/OR- a change that is statistically significant (95% confidence level) but less than 10 percentage points in the proportion of visitors participating in one or two non-critical activities.
- *Moderate* – A change of 5 to 10 percentage points in the proportion of visitors either viewing Exit Glacier or walking up to and/or touching the glacier -OR- a change of 10 to 20 percentage points in the proportion of visitors participating in a non-critical activity, -OR- a change that is statistically significant (95% confidence level) but less than 10 percentage points in the proportion of visitors participating in more than two non-critical activities.
- *Major* – A change greater than 10 percentage points in the proportion of visitors either viewing Exit Glacier or walking up to and/or touching the glacier -OR- a change greater than 20 percentage points in the proportion of visitors participating in a non-critical activity, -OR- a change greater than 10 percentage points in the proportion of visitors participating in more than two non-critical activities.

Crowding

The impact level definitions for crowding apply only to the peak summer season. Crowding was not determined to be an issue during the winter season under any of the alternatives based on anticipated levels of use.

Impacts to crowding (the number of visitors present at one time) were assessed by evaluating how the actions in each alternative would affect total daily visitation as well as the distribution of visitors throughout the day. Visitation statistics for 2001 were used as a baseline, as were the results of the 2001 visitor survey (Swanson et al. 2003). The predicted amount of change in visitation is based on best professional judgment and is related only to the actions associated with each alternative analyzed.

Impact Level Definitions

- *Negligible* – Average daily peak visitation changes by no more than 10 parties present at one time at Exit Glacier.
- *Minor* – Average daily peak visitation changes by more than 10 but less than 25 parties present at one time at Exit Glacier.
- *Moderate* – Average daily peak visitation changes by at least 25 but less than 60 parties at one time at Exit Glacier.
- *Major* – Average daily peak visitation changes by at least 60 parties present at one time at Exit Glacier.

Overall Impact Levels for Visitor Experience

The following table looks at how each individual component impacts the overall visitor experience. For example, cell A-I indicates that a negligible impact to the level of visitation by itself would result in a negligible impact to the overall visitor experience,

whereas cell C-IV indicates that even a major impact on visitor access by itself would have only a moderate impact on the overall visitor experience since visitor access is only one component of the overall visitor experience. Thus what the table indicates is the relative weight that each component carries. These weights are based on best professional judgment by park resource managers.

This approach to determining the overall impact is limited to a certain range of impact levels and loses applicability in extreme cases. Because the overall visitor experience has multiple components, typically even a major change in any one component by itself will only result in moderate or minor overall impact. However, careful interpretation of the impacts must be employed if the impact on one or more components is very severe. This is due to the open-ended nature of most of the definitions for what constitutes a major impact (i.e. there is no upper limit). It is possible that if the impact to a single component is so major that it is "off-the-scale", then it stands to reason that the impact on the overall visitor experience will likely be major. Because it is impossible to capture all of the possible interactions of the various components for all levels of impact, the numerical ratings are useful for most impact levels, but lose validity in extreme cases.

Ratings for the impact of individual component of overall visitor experience (used in table below):
0 = Negligible
1 = Minor
2 = Moderate
3 = Major

		I	II	III	IV
		Negligible	**Minor**	**Moderate**	**Major**
A	**Visitation**	0	0	1	2
B	**Visitor Profile**	0	0	1	1
C	**Visitor Access**	0	1	2	2
D	**Visitor Activities**	0	1	2	2
E	**Crowding**	0	1	2	3

To evaluate the overall impact of an alternative on visitor experience, the component impacts are summed and then the combined level of impact is evaluated on the following scale:

Total Score Level of Impact

0	Negligible
1 to 3	Minor
4 to 7	Moderate
8 to 10	Major

Socioeconomic Environment

These analyses were conducted by comparing proposed actions to past and present socioeconomic conditions, utilizing economic data from state and federal sources where possible to develop a theoretical model of the likely socioeconomic changes.

Impact Level Definitions

- *Negligible* – No measurable change is seen in average annual growth / decline of local businesses or any sector of the regional economy. Employment and income levels remain unchanged. No measurable change to the quality of life, including population migration or immigration.
- *Minor* – Average annual growth / decline in all but two sectors of the regional economy remain unchanged, and those sectors may see slightly increased or decreased economic activity (though not enough to be felt by the entire community). Employment and income levels may be affected, but overall employment and income statistics for the community of Seward remain unchanged. No measurable change to the quality of life, including population migration or immigration.
- *Moderate* – Average annual growth / decline in all but two sectors of the regional economy remains unchanged, and those sectors may see slightly increased or decreased economic activity. Employment and income levels may be affected, and overall employment and income statistics for the community of Seward may change as a result. Changes to the quality of life, including population migration or immigration, would be noticeable; however, most residents would not be affected to the point that they would move.
- *Major* – Average annual growth / decline in three or more sectors of the regional economy changes, and affected sectors may undergo significant changes that are felt by the entire community. Individual employment and income levels would likely be affected to the extent that the overall employment and income statistics for the community of Seward are altered. Changes to the quality of life, including population migration or immigration, would be obvious, causing several residents to move away permanently.

Economic Sectors:

- Agriculture, Forestry, Fishing
- Mining
- Construction
- Manufacturing
- Transportation, Communication, Utilities
- Wholesale Trade
- Retail Trade
- Finance, Insurance, and Real Estate
- Economic activity
- Government, Federal
- Government, State
- Government, Local

Safety

Visitor safety impacts were assessed by evaluating case incident reports from 1981 to 2002 (NPS 2002b). Expert advice was sought for examples of injuries that fall under major and minor categories.

Impact Level Definitions

- *Negligible* – An increased potential for injuries that are not disabling or where the visitor can walk away from the scene of the accident. Types of injuries would include scrapes, bruises, minor bleeding, and contusions. Potential for more serious injuries is present but remains nonexistent to low.
- *Minor* – An increased potential for injuries that may be disabling for less than one month and where the injured person may need medical attention but can walk away from the scene of the accident. Types of injuries would include sprains, hyperextension, and moderate bleeding. Potential for more serious injuries is present but remains low to medium.
- *Moderate* – An increased potential for injuries that may be disabling for one to six months and where the injured person needs medical attention and cannot walk away from the scene of the accident on their own. Types of injuries would include broken bones, dislocations, and concussions. Potential for more serious accidents is present and remains medium to high.
- *Major* – An increased potential for injuries that may be disabling for six months or more and where the injured person needs immediate medical attention and transportation from the accident scene to a medical facility. Types of injuries would include internal injury, severe bleeding, amputation, or death. Potential for these types of accidents is high.

IMPACTS OF THE NO-ACTION ALTERNATIVE

Soils

Analysis of Impact

Under the no-action alternative, the cutting and filling required to maintain existing trails, roads and campgrounds would not result in measurable impacts on soils over that which is currently occurring (as described in Chapter 3: Affected Environment). Small natural watercourses and groundwater seeps along trails would continue to be intercepted by trail maintenance. Trail maintenance may inadvertently cause small amounts of erosion by diversion of such water courses. Water could collect on the surface of the trail tread and flow down trail causing erosion and rilling, leading to damage to the trail bed and removal of fine particles. Trail users stepping off of the path as necessary for passing, taking pictures, resting, etc. would continue to cause localized compaction and churning beyond the actual trail tread. These actions would impact less than five acres with no impacts to biological productivity. The rate and extent of soil impacts would be expected to correspond with visitation levels.

Cumulative Impacts

Currently there are approximately 30 acres (12 ha) of impacted soils within the analysis area. Soils in and near the study area have been altered in the past due to construction of buildings, roads, trails and other facilities. Besides the actual footprint of the facilities, the immediate surrounding areas are impacted primarily by compaction from pedestrian and vehicle traffic, and occasionally by isolated areas of erosion where fill slopes exist. In addition to the soil impacts adjacent to facilities, there have been dispersed impacts caused by off-trail pedestrian traffic that has resulted in compaction over broad areas as well as limited erosion on steeper slopes. Concentrated areas of compaction and erosion often take the form of unofficial social trails. The NPS or other government or private entities plan no additional reasonably foreseeable actions that would adversely affect soils in the study area other than what is described in this plan. Cumulatively, these other past, present, and reasonably foreseeable future actions would have moderate impacts on soils. The additional contribution of negligible impacts from this alternative results in a continued moderate rating for overall cumulative impacts to soils.

Conclusion

The overall impact on soils as a result of implementing this alternative would be negligible. The total estimated area of impacted soils remains close to what is currently impacted and would not measurably change the impacted area's overall biological productivity. These impacts would primarily be associated with the normal impact from trampling that typically occurs along margins of trails. The level of impacts to soils anticipated from this alternative would not result in an impairment of KEFJ resources that fulfill specific purposes identified in the establishing legislation or are key to the natural integrity of this park.

Water Quality

Analysis of Impact

Under the no-action alternative, water quality is expected to remain within DEC water quality acceptable limits. Data from a 2001 visitor survey (Swanson et al. 2003) shows that approximately 25% of hikers using the Harding Icefield Trail (HIT) admitted to relieving themselves at some point along the trail. If visitation and trail use increase, that percentage could be expected to rise, causing seasonal changes in water quality, such as increased fecal coliform levels, since no new sanitary facilities would be added. These changes, though measurable, would be seasonal and below DEC water quality acceptable limits as visitation is not expected to increase markedly over the next 10 to 15 years.

Increased visitor use could also bring increased vehicle traffic and increased possibilities of pollutants from airborne exhaust particulates, oil and gasoline runoff entering surface and ground waters adjacent to roads and parking areas. However, vehicle use is limited by parking lot size, and measurable changes to water quality are not expected.

Winter use of snowmachines along the road and parking lot may concentrate hydrocarbon pollution in waters directly adjacent to these areas. Particulate matter from exhaust or fuel spills on surfaces can enter waters as the snow melts. If winter visitation increases,

hydrocarbon impacts to water may also increase. Current levels of snowmachine use have not resulted in measurable hydrocarbons in streams adjacent to Exit Glacier Road. Unless visitation increases dramatically, water quality would be expected to remain within DEC standards. Furthermore, with the increasing availability of machines with improved technology, hydrocarbon pollution could be expected to decrease over the next 10 years, resulting in negligible changes to water quality that would not likely differ from current conditions.

Cumulative Impacts

Past actions in the study area that may have affected water quality include installing a large septic system, paving the road, and expanding the parking area to accommodate more vehicles. Current conditions affecting water quality include high visitor use of existing trails, particularly the HIT, combined with the absence of toilet facilities outside of the developed area. Impacts from all these actions, if any, are unknown, as historical data is unavailable. However, water quality baseline testing was conducted just prior to implementing the paving project (Wright 2001b). Testing revealed water quality was well within state and national standards, implying past actions had no or negligible affects on water quality. Regularly scheduled testing of wells used for drinking water has revealed no contamination (Cook 2003). The NPS or other government or private entities plan no additional reasonably foreseeable actions that would adversely affect the water quality in the study area. Cumulatively, these other past, present, and reasonably foreseeable future actions would have minor impacts on water quality. The additional contribution of minor impacts from this alternative results in a continued minor rating for overall cumulative impacts to water quality.

Conclusion

Under the no-action alternative, minor impacts to water quality would be expected, primarily from possible increases in visitation without additional sanitary facilities. Although visitation could increase, access to the study area would be limited by the parking capacity. The level of impacts to water quality anticipated from this alternative would not result in an impairment of KEFJ resources that fulfill specific purposes identified in the establishing legislation or are key to the natural integrity of this park.

Floodplains

Analysis of Impact

Under the no-action alternative, actions to prevent flooding of infrastructure, such as diverting stream channels, placing culverts or building berms would continue. These actions would alter floodplain structure and function to varying degrees, depending on the action. Due to the dynamic quality of the Exit Glacier area, major flood events can be expected, necessitating alterations of the floodplain, and further altering the natural hydrology in order to protect infrastructure. Although future actions may not be accurately predicted as they are dependant on flood events, they are expected to be similar to past actions, which have had long-term to permanent effects in areas totaling up to 5 acres.

Cumulative Impacts

Past actions in the study area affecting floodplains have included diverting stream channels away from infrastructure, building a levee to support the road to Exit Glacier, installing gabions to divert flood waters away from state-maintained portions of Exit Glacier road, and installing various culverts, all altering floodplain function and structure. Current actions include a temporary ditch to divert runoff away from the new Nature Center's foundation, altering the natural course of the stream. The NPS or other government or private entities plan no additional reasonably foreseeable actions that could adversely affect the floodplains in the study area. Cumulatively, these other past, present, and reasonably foreseeable future actions would have moderate impacts on floodplains. The additional contribution of moderate impacts from this alternative results in a continued moderate rating for overall cumulative impacts to floodplains.

Conclusion

Under the no-action alternative, there would be moderate impacts on floodplain resources or function, as alterations to floodplains would continue in order to prevent damage to infrastructure. The level of impacts to floodplains anticipated from this alternative would not result in an impairment of KEFJ resources that fulfill specific purposes identified in the establishing legislation or are key to the natural integrity of this park.

Wetlands

Analysis of Impact

Under the no-action alternative, changes to wetland ecosystems over time would be negligible, as no new activities are planned that would affect wetland function or area. Threats from hydrocarbons and other vehicular pollutants entering wetlands via airborne particulates from exhaust, or direct oil and gasoline runoff from the road would remain. Hydrocarbons may be directly toxic to aquatic flora and fauna, or may have indirect impacts such as impairing fish reproduction, ultimately adversely affecting wetland function. However, threats would not be expected to increase measurably from current levels, as the parking lot would not be enlarged to accommodate any more vehicles, thus limiting the number of vehicles passing through wetland habitat. Additionally, current vehicle use levels have not had adverse effects on wetland ecosystems. The no-action alternative would have negligible impacts on wetland area, function, and structure as "Best Management Practices/Conditions" (NPS 2002d) would continue to be followed.

Cumulative Impacts

Wetlands in and near the study area have been altered in the past to facilitate bridge and road building to Exit Glacier, causing impacts such as loss of wetland area. Several acres of wetland area and structure were permanently altered by placement of fill necessary to construct a levee to accommodate the road. Creation and alteration of wetlands by beavers has also occurred in the past. NPS or other government or private entities plan no additional reasonably foreseeable actions that could adversely affect wetlands in the study area. Cumulatively, these other past, present, and reasonably foreseeable future actions would have moderate impacts on wetlands. The additional contribution of

negligible impacts from this alternative results in a continued moderate rating for overall cumulative impacts to wetlands.

Conclusion
Under the no-action alternative, there would be negligible impacts to wetlands. The level of impacts to wetlands anticipated from this alternative would not result in an impairment of KEFJ resources that fulfill specific purposes identified in the establishing legislation or are key to the natural integrity of this park.

Air Quality and Visibility

Analysis of Impact
Under the no-action alternative, no new actions are planned that would contribute negative impacts to air quality.

The parking area would not be expanded, thus the number of vehicles creating emissions would be limited by parking area size. In past instances when the parking lot filled to capacity, no detectable visible changes in air quality were noted, although exhaust odors were noticeable in the immediate vicinity (Tetreau 2003). Though visitation isn't expected to change substantially over the life of this plan, if it were to increase, occasions when the parking area is filled may also increase.
Wood burning firepit/fireplaces would continue to be provided for visitors in the campground and picnic areas. These would not be used constantly throughout the summer visitor season, but smoke from these sources could continue to cause both visual and odor changes to air quality, primarily between 5-10:00 pm when visitors would most likely be cooking. Smoke would generally remain in the immediate vicinity but in occasional windy situations may drift and be detectable in a larger area, perhaps up to 50% of the study area. Winter caretakers at Exit Glacier would be housed in a wood heated cabin. Smoke from the woodstove may be detectable for 12 or more hours a day, depending on the cabin's occupancy, and may drift from the vicinity of the hut, but may not be detectable in over 50% of the study area. Diffuse wood smoke odors would not likely be considered objectionable.

Winter snowmachine use in the study area would continue. Visible emissions and odors would not likely be detectable for greater than 6 hours a day, due to short winter days; however, odors and exhaust may be considered objectionable by many individuals. Snowmachine use would be concentrated primarily in the more level areas and river corridors, however, depending on winds, exhaust odors could drift and be detectable in over 50% of the study area. Snowmachine hydrocarbon emissions may decrease over the next decade as technology improves and more efficient machines become available.

Cumulative Impacts
Past impacts to air quality include dust and fine particulate matter from the road and parking area as well as smoke or haze produced by forest fires outside of the study area. Actions continuing to affect air quality include smoke and haze produced by forest fires outside of the study area, from as far away as Siberia, and industry on the Kenai

Peninsula. Impacts from dust were eliminated when the road and parking area were paved. Effects of forest fires are also transient and have had no permanent impact on air quality.

Future actions adding to cumulative impacts include the possibility of increased bus or motorcoach activity and associated emissions if visitation to the study area increases, and generator use for the Nature Center. NPS or other government or private entities plan no additional reasonably foreseeable actions that could affect air quality in the study area. Cumulatively, these other past, present, and reasonably foreseeable future actions would have minor impacts on air quality and visibility. The additional contribution of moderate impacts from this alternative results in a moderate rating for overall cumulative impacts to air quality and visibility.

Conclusion

The no-action alternative would have moderate adverse impacts on air quality, as vehicle emissions, snowmachine and woodstove use would continue. The level of impacts to air quality and visibility anticipated from this alternative would not result in an impairment of KEFJ resources that fulfill specific purposes identified in the establishing legislation or are key to the natural integrity of this park.

Soundscape

Analysis of Impact

The natural soundscape would be expected to remain similar to the current soundscape. Noise intrusions such as voices, cars and other noises currently occurring in the study area would continue. Increases in visitation, although predicted to be small, may result in somewhat increased noise levels in areas with the heaviest visitor concentrations such as around the parking lot and adjacent to visitor services. Such noise intrusions would be primarily apparent during the middle of the day during the summer season, not likely audible over ¼ mi away, and concentrated around these high use areas.

Under the no-action alternative, NPS would continue to manage the Exit Glacier area as it has in the past, although actions affecting soundscape identified in the 1996 DCP that have not been implemented, such as the proposed gathering pavilion, would be completed. Some noise would be generated from the construction of this building. Intrusions from tools and heavy equipment would be most noticeable during regular working hours, approximately 8am to 5pm during the summer season, and not likely to exceed 4 months duration. Noises would be intermittent and concentrated in the construction area, not likely to be clearly audible over ¼ mile away.

A diesel-powered generator providing electricity to the study area currently runs on demand, and is housed in a sound dampening enclosure adjacent to the parking lot. Generator noise would be limited to times of its operation, usually during daylight hours during the summer season and not heard at distances exceeding 100 yards. As part of a demonstration project at Exit Glacier, a fuel cell is slated to provide power to the Nature Center in spring of 2004, reducing the need for the generator to a backup system.

As most trail maintenance would be performed with hand tools, noise intrusions associated with power-tools such as chainsaws would be brief and intermittent and limited to the summer season. Dense vegetation adjacent to trails would also help to muffle occasional power tool noises, which would not likely be audible at distances over one mile.

Snowmachines have unlimited access to the study area, causing noise intrusions of varying amounts of time, depending on snow conditions. Noises are audible throughout the study area, mostly during daylight hours, which usually would not total over 6 hours due to short winter days. High intensity noise is concentrated along popular access routes such as Exit Glacier Road. With the popularity of snowmachining increasing, snowmachine use could be expected to increase over the next decade. However, the intensity of snowmachine noise may also decrease over the next decade as snowmachine technology improves and quieter machines are produced. If these improved machines are used, overall noise levels, even within the concentrated use areas could be reduced from current levels.

Cumulative Impacts

Past actions affecting soundscape in the study area include road construction and paving, and the construction of a new restroom facility and Nature Center. These new or improved facilities resulted in transient and permanent impacts on the natural soundscape. The transient impacts included the operation of power tools and heavy equipment during the construction phases of these projects, while permanent impacts include noise from increased vehicle traffic to and from the study area and increased human presence as amenities and access have improved over time.

Current noise sources include intrusions produced by general use of the area such as voices, vehicles, maintenance activities, and the generator. Winter noise sources include voices and snowmachines. Intrusions from outside the study area, such as aircraft noise, also occur.

The NPS and other government and private entities plan no additional reasonably foreseeable actions that would affect soundscape in the study area. However, the possibility exists for future noise-producing activities to occur outside of park boundaries. Such activities could be audible within the park, specifically helicopter-assisted skiing in the Chugach National Forest. The Forest Service (USFS 2004) has issued a Draft EIS outlining commercial heli-skiing use. Pending the completion of the EIS and operational requirements and regulations for heli-skiing in areas adjacent to the Exit Glacier area, impacts from these activities remain unknown. Cumulatively, these other past, present, and reasonably foreseeable future actions would have minor impacts on soundscape. The additional contribution of minor impacts from this alternative results in a continued minor rating for overall cumulative impacts to soundscape.

Conclusion

Implementation of the no-action alternative would result in minor impacts to the soundscape of the Exit Glacier area. Many of the impacts to the soundscape would be

transient (seasonal) or limited to construction of discrete projects. The level of impacts to the soundscape from this alternative would not result in an impairment of KEFJ resources that fulfill specific purposes identified in the establishing legislation or are key to the natural integrity of this park.

Vegetation

Analysis of Impact

Use of existing trails would continue to impact vegetation in several ways. Social or informal trails that establish would become devoid of vegetation and may gully and collect water in low areas. Shortcuts may develop between switchbacks on the Harding Icefield Trail in steep areas and further denude vegetation. Trails may eventually widen and trail braiding could develop with increased traffic on wet or steep slopes. Trail widening would lead to increased trampling of vegetation and bare ground. Shrub-dominated communities, through which trails travel, are slower to recover than grass-dominated communities. Lichens are particularly sensitive to trampling and may not recover for several years in high-use trail areas in the alpine zone. Under current conditions, these types of impacts occur in localized areas along existing trails with a total area of impact of less than five acres. Because there would be a net loss of native vegetation, these impacts would be considered to be outside of the natural variability. However, the continued existence of shrub-dominated vegetation and lichen communities would not be threatened overall because trails, and associated impacts, cross only a small proportion of these habitats.

In areas where backcountry camping is allowed, bare mineral surfaces can form from compaction and trampling of campsites. Vegetation could also be affected in areas where campfires are permitted. Limbs may be removed from surrounding trees and shrubs, and dead and downed wood may be collected for campfires. These activities would cause localized changes that are measurable but not outside of natural variability for more than one growing season as backcountry camping would continue to be dispersed. However, the number of visitors camping in the backcountry is expected to remain low as such remote areas are difficult to access.

Trail maintenance would continue at current levels, primarily in response to damage in the most heavily used areas. Social trails and bare ground would be rehabilitated as staffing levels and budget allow. Maintenance or rehabilitation of trails would require some manipulation of the natural vegetation to restore damage or to re-seed denuded areas. Care would be taken in reseeding efforts to use local seed sources to avoid impacts on genetic stocks in the park and to eliminate introduction of exotic species. Both maintenance and revegetation efforts could be expected to have measurable positive impacts by replacing damaged vegetation or restoring impacted areas. These benefits would last for one or more growing seasons.

Increased trampling of soils and vegetation on the outwash plain, as well as increased off-trail use on all existing trails, may occur. Without long-term monitoring of indicators and standards, and subsequent management actions, trampling could compact fragile

developing soils and delay or prevent normal plant succession. Vegetation which is resistant to trampling and soil compaction may become established in high use areas, displacing or out-competing existing vegetation and altering species composition; this often occurs from an area dominated by herbs to an area dominated by grasses. Under current conditions, these types of impacts occur in localized areas comprised of 5 acres or less. Because there would be a net loss of native vegetation and natural succession processes would be disrupted in these areas, these impacts would be considered to be outside of the natural variability for more than one growing season. However, the continued existence of herb-dominated vegetation would not be threatened because trampling of soils and vegetation occur only a small proportion of these habitats.

Under the no-action alternative off-road use of motorized vehicles in winter would continue. Impacts to vegetation associated with off-road activities would include breaking of limbs of woody plants, compacting vegetation under snow, or damaging vegetation with inadequate snowcover, thus causing measurable adverse impacts. This action would not likely extirpate species, and though impacts would be recurring, vegetation would rebound within one growing season; therefore, long-term characteristics of the vegetation community would remain stable.

Continued high visitation during summer may have the potential to impact vegetation indirectly through the introduction and spread of exotic plant species in the study area, particularly along the road and adjacent to visitor services. Indirect impacts could include introduction of exotic plants via seeds which may be carried by boots, tire treads, or other equipment. If unchecked, exotic species introduced via these actions may have long term adverse impacts on the native vegetation, lasting many generations and affecting plant populations by competing with or displacing native species. However, exotic plant control would be implemented as a mitigation measure, with few expected negative impacts to native vegetation.

Cumulative Impacts

Past actions in the study area have resulted in numerous permanent and temporary measurable impacts to vegetation. Impacts include the removal of trees for construction of the parking area, destruction of mosses and lichens on bedrock along the Overlook Loop Trail from foot traffic, development of switchbacks and social trails, and introduction of exotic species. These actions have resulted in measurable, long-term impacts in limited areas which affect more than one generation, although no known species have been extirpated. Lesser impacts include picking of wildflowers and brushing of trail corridors. These actions have not had effects lasting longer than one growing season.

Current actions include a revegetation project to restore areas disturbed during the construction of the parking area and visitor contact station. This is a neutral action as it would result in no net gain or loss of vegetation in the project area.

Another current action affecting vegetation in the study area is an exotic species control project along Forest Service and NPS portions of Exit Glacier Road initiated by the

Seward Ranger District of the Chugach National Forest. The project initially involves the manual removal of exotic plant species along the road corridor, extending from the Forest Service boundary to the Exit Glacier parking area (USFS 2002). This effort is expected to have positive long-term impacts by reducing the overall numbers of invasive species.

NPS or other government or private entities plan no additional reasonably foreseeable actions that could adversely affect vegetation in the study area. Cumulatively, these other past, present, and reasonably foreseeable future actions would have major impacts on vegetation. The additional contribution of moderate impacts from this alternative results in a continued major rating for overall cumulative impacts to vegetation.

Conclusion
The combined impacts of the proposed actions in the no-action would be moderate as vegetation would continue to be impacted by foot traffic and motorized use in winter; however, trail maintenance would continue, and exotic species would not be allowed to spread unchecked. The level of impacts to vegetation from this alternative would not result in an impairment of KEFJ resources that fulfill specific purposes identified in the establishing legislation or are key to the natural integrity of this park.

Wildlife

Analysis of Impact
Wildlife species in the Exit Glacier would continue to be subject to periodic disturbance, displacement, or mortality due to the activities of visitors and park staff, though most species would remain relatively abundant in the area.

The most severe impact to wildlife species under the no-action alternative would arise from the unrestricted use of off-road motorized vehicles during winter. Numerous studies have shown the direct impact of repeated snowmachine use on wildlife behavior and levels of physiological stress (Creel et al. 2002, Colescott and Gillingham 1998, Dorrance et al. 1975, Freddy et al. 1986, Mahoney et al. 2001, Neumann and Merriam 1972). These studies indicate that exposure of wildlife to snowmachine 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, especially during winter, when energy conservation 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.

Snowmachine use is concentrated in and adjacent to preferred winter foraging areas for moose. The best estimate of current snowmachine use is 465 snowmachines per winter. On nice winter weekend days with good snow conditions, the Exit Glacier area, especially the outwash plain, is busy with snowmachines throughout most of the day. If snowmachine use continues at this level, individual moose would likely continue to be subject to periodic disturbance or displacement. However, as indicated by the fact that moose currently utilize this habitat in spite of snowmachine use, they would not be

disturbed to such an extent that they would abandon the area or otherwise be permanently impacted over multiple generations.

It is possible that snowmachine use would increase in the future rather than remain the same if greater numbers travel to the area on weekends or if use increases during the weekdays. If snowmachine use increased in this way, moose could be subject to nearly continual disturbance during periods of high use (daylight hours on good weather days throughout the entire week). As a result, some individuals may avoid habitat near areas of snowmachine use entirely. Some individuals remaining may be displaced from browsing or resting frequently enough to produce an energy deficit sufficient to affect reproduction or survival outside the range of natural variability. However, even in this extremely high-use situation, moose would have periods of reprieve from snowmachine activity during bad weather days and in the evenings. Further, as evidenced by moose living in the middle of urban areas (e.g., Anchorage), it is unlikely moose would be extirpated from the Exit Glacier area nor would their winter habitat be rendered nonfunctional solely as a result of high levels of motorized use.

As with moose, if snowmachine use continues at current levels, wolves, wolverine, and lynx would continue to pass through the Exit Glacier area as they do now. If unrestricted motorized use becomes nearly continuous from dawn through dusk on good weather days, the occurrence of these species in the Exit Glacier area may become more and more infrequent. However, given that they would have periods of reprieve from snowmachine activity during bad weather days and in the evenings, it's unlikely they would abandon the area altogether in the winter nor would their habitat be rendered nonfunctional. Additionally, non-motorized recreation, such as cross-country skiing, can cause behavioral disturbance to wildlife, particularly large ungulates, such as moose, that may be startled by the quiet approach of skiers (Freddy et al. 1986).

Cumulative Impacts

Park management has, for more than twenty years, worked to facilitate an increase in visitation to the Exit Glacier area. Impacts resulting from past park development of this area have undoubtedly had undocumented and possibly profound effects on species which have large home range requirements and a low tolerance for human disturbance such as brown bears, wolves, wolverine, and lynx (Zielinski 1995). A lack of predevelopment data, however, makes it difficult to assess whether the current scarcity of these species in the Exit Glacier area, relative to surrounding areas, is a direct result of park development and increases in visitation (Martin 2002). Under this alternative, development outside of the NPS boundary but still in the general area and unrestricted winter motorized use are likely to increase, making it conceivable that these species could be permanently excluded from the area. Additionally, the Resurrection River Valley is an important travel corridor for these species. Present and future development of the Exit Glacier area may effectively block the movement of wildlife species along the valley. The extent to which this could occur is difficult to assess with current information. Measurable changes in the occurrence and distribution of carnivore species are expected, though it is unlikely that current plans for this area would result in the long term absence of these species.

Cumulatively, these other past, present, and reasonably foreseeable future actions would have major impacts on wildlife. The additional contribution of moderate impacts from this alternative results in a continued major rating for overall cumulative impacts to wildlife.

Conclusion

Overall, the no-action alternative continuing current management practices could have a moderate impact on wildlife in the Exit Glacier area. Unrestricted use of motorized vehicles is the current management practice most likely to harm wildlife species in the Exit Glacier area.

The level of impacts to wildlife from this alternative would not result in an impairment of KEFJ resources that fulfill specific purposes identified in the establishing legislation or are key to the natural integrity of this park.

Visitor Experience

The analysis of impacts under the no-action alternative is based on an assessment of what changes, if any, would occur under the current management regime if no additional actions were implemented. All of the impacts described in this analysis are expected to last for the duration of the plan, 15 to 20 years, unless other future actions not prescribed in this plan are implemented that would negate or mitigate these impacts.

Analysis of Impact

Visitation

At this time, total annual visitation at Exit Glacier is not expected to change substantially over the next 15 to 20 years under current management. Thus, under the no-action alternative, impacts to visitation would be minor. Recent inter-annual variation in visitation falls within the minor impact range of 1% to 10% change. As described in Chapter 3, Affected Environment and Figure 2, visitation to the Exit Glacier area has recently been level or slightly declining. While no major changes in summer visitation would be expected, any significant changes in the tourism industry of the Seward area could have a large impact on visitation at Exit Glacier. As with total annual visitation, there are currently no indicators of change in the trends of seasonal, daily, or hourly distribution of use; however, there is the potential for winter snowmachine visitation and other activities to increase or decrease based on weather and snow conditions.

Visitor Profile

None of the actions that would take place under this alternative would have a measurable impact on the age or the length of stay of the average visitor. On average, the population of the United States is getting older (Siegel 1996) and over time this may cause a slight but statistically insignificant increase in the average visitor age. None of the actions in this alternative, particularly changes in facilities or interpretive and education programs, would be expected to affect the average length of stay for visitors.

The potential impact of this alternative on the percentage of visitors that are from local communities is difficult to determine, although visitor surveys in 1990 and 2001 showed a decline in visitors from Alaska. This is based on limited data from the 1990 Visitor Services Project (Littlejohn 1990) and the 2001 General Visitor Survey (Swanson et al. 2003). Data for local (Kenai Peninsula) residents for 1990 was not available for this analysis. Note that the 1990 survey included visitors on tour boats, the Seward visitor center and Exit Glacier, whereas the 2001 survey only included visitors to Exit Glacier. Assuming that this decline is real and not a result of limitations of the survey data, the change follows the overall change in the visitor experience at Exit Glacier from a place where local and other Alaskan residents took their families and friends for a quiet walk, to an international tourist destination dominated in the summer by non-Alaskan visitors. The majority of this change has probably already occurred (see discussion below under *Cumulative Impacts*). The distribution of data for visitor residences would not change dramatically over the life of this plan as a result of implementing this alternative. Thus, the impact of this alternative on visitor profile would be negligible.

Visitor Access

The implementation of this alternative would not result in any impact to visitor access as no new routes or trails would be added or removed.

Visitor Activities

This alternative would result in negligible impacts to visitor activities in the summer season and throughout the year as a whole, but there would likely be minor impact in the winter. Approaching Exit Glacier would remain the primary visitor activity and there are no actions that would change the distribution of other visitor activities. Impacts to winter activities are more difficult to assess as there is little data for analysis. Winter use is highly variable and is dependent on weather and snow conditions. In general, a greater number of winter visitors in the last decade has lead to increases in user conflicts, especially between motorized and non-motorized users, a trend which is expected to continue. While difficult to predict, such user conflicts could result in a detectable but minor shift in the distribution of winter activities.

Crowding

As discussed under the *Visitation* analysis above, total annual visitation at Exit Glacier would not change substantially over the next 15 to 20 years if this alternative were implemented. Thus, the impact to crowding would be negligible. As described in Chapter 3, Affected Environment, visitation to the Exit Glacier area has recently been level or slightly declining. While no major changes are expected, any significant changes in the tourism industry of the Seward area could have a large impact on visitation at Exit Glacier. Daily peak visitation could be affected by a large increase in the number of tour buses or a similar change in transportation mechanisms that could bring large numbers of visitors to Exit Glacier at one time.

Cumulative Impacts

The visitor experience at Exit Glacier has changed from a primitive backcountry experience to a rustic frontcountry experience since the park was created in 1980. A

footbridge was installed across the Resurrection River in 1982 and a hiking trail to the glacier was constructed. The two-mile trail to the glacier was primitive with few signs or other amenities. The most noteworthy changes to the visitor experience occurred in 1986 and 1987 when the vehicle bridge was constructed and many of the current amenities were added. The vehicle bridge was opened for use in the fall of 1986 and a parking lot was constructed 0.6 miles from the glacier. In 1987 the first 0.25 miles of the trail to the glacier were paved. In addition, vault toilets, an interpretive shelter, wayside exhibits and a picnic shelter were constructed. Since then, there have been incremental changes that have made the experience less rustic such as the installation of additional signing, construction of new flush toilet facilities, paving of the road and parking lot, and improvement of the main hiking trails to the glacier. Comments from local residents indicate that for some people the paving of the road was a significant threshold event in relation to visitor experience.

Outside the park, the growing tourism industry has had an impact on the visitor experience at Exit Glacier. Over the last 20 years the economy of Seward has steadily shifted toward a seasonal tourism market, which has resulted in more summer visitors to the Seward area. Visitation at Exit Glacier apparently responded dramatically to an intensive state-wide tourism marketing campaign undertaken by the State of Alaska in the early 1990's, nearly tripling between 1992 and 1995. Improvements to the road leading to Exit Glacier, including paving, has made it easier for both private and commercial vehicles to access the area.

In general, since the first bridge over the Resurrection River was installed in the early 1980's, the Exit Glacier area has changed from a place where local and other Alaskan residents took their families and friends for a quiet walk, to an international tourist destination dominated in the summer by non-Alaskan visitors. Prior to the construction of the footbridge in 1982, the area received only light use from some local hikers, snowmachiners and cross-country skiers (NPS 1982). The completion of the vehicle bridge in July 1986 lead to an increased variety of visitors including greater numbers of seniors, children, bus tours and other organized tour groups (Cline 1986). Evaluating how many local and Alaskan residents have been displaced by this change is problematic if not impossible. The implementation of a fee collection program at Exit Glacier in 1998 may have deterred even more local residents from using or visiting the area.

The winter visitor experience has also changed noticeably due to cumulative impacts since the early 1980's. In the 1990's there was a marked increase in winter recreation throughout southcentral Alaska. Greater numbers of winter recreationists has lead to an increase in user conflicts, especially between motorized and non-motorized users. In the late 1980's, the relatively few visitors on snowmachines traveled at lower average speeds and in general took part in a more leisurely visit. A majority of the motorized visitors in recent years travel at higher average rates of speed and, based on their tracks, seem to prefer the steep creek banks and moraines (Tetreau 2003). This trend is expected to continue and the change in use patterns has prompted both conflicts and efforts to resolve them along the entire Exit Glacier road corridor as well as the surrounding region.

Cumulatively, these other past, present, and reasonably foreseeable future actions would have major impacts on visitor experience. The additional contribution of negligible impacts (averaged over the entire year) from this alternative results in a continued major rating for overall cumulative impacts to visitor experience.

Conclusion

The impact of this alternative on visitor experience is anticipated to be negligible when averaged over the entire year. The key factor is the recent trend in visitation that has been flat or slightly declining. Without large changes in visitation or area infrastructure, there would be little change in the visitor experience. The breakdown of impacts by sub-category and season are as follows:

	Annual average	
Sub-category	Impact Level	Impact Rating
Visitation	Minor	0
Visitor Profile	Negligible	0
Access	Negligible	0
Visitor Activities	Negligible	0
Crowding	Negligible	0
Total Impact Rating		0

The impacts to visitor experience that are described here are difficult to classify as either positive or negative. While maintaining the outwash plain open to snowmachine use may be a positive to some visitors who ride snowmachines, it is a positive impact to non-motorized users who seek a different experience. Increased visitor crowding is the only impact that most people would agree upon as being negative, and the analysis indicates that the impacts to crowding would be negligible under this management alternative.

Socioeconomic Environment

Analysis of Impact

Under the no-action alternative, activities that affect the local socioeconomic environment would continue unchanged. Winter use patterns and levels would likely remain relatively unchanged. Total annual visitation at Exit Glacier is not expected to change substantially over the next 15 to 20 years under current management. Government expenditures into the local economy would continue at approximately the same levels they are today.

Under the no-action alternative, park staffing and related expenditures would likely continue to increase over time to meet changing management needs associated with growth in visitation, impacts to resources, aging infrastructure, etc. Under this alternative, the park expects expenditures for salaries, supplies, and materials to increase by as much as $583,000 within five years. This includes two new permanent year round positions, extension of three half time positions to full time, and as many as eight new seasonal or less than full time positions. These expenditures represent a minor positive economic benefit through increases in the government sector. Such benefits are local, long term, and year round.

Cumulative Impacts

Kenai Fjords National Park was established in 1980. As a result of increased park visitation since that time, the tourism related sectors of the regional economy have grown. Past actions taken at Exit Glacier have included the improvement of the access road including a vehicle bridge over the Resurrection River, development of a small campground, enlargement of the parking lot, development of a hiking trail system, restrooms, cabins, ranger station, and wells. Each of these developments has increased access to a larger population, resulting in increased visitation and subsequent economic growth.

The regional economy has a broad base in fishing, transportation, education, government, as well as recreation. Past economic activities have served to diversify this base and reduce the seasonality of employment through development of facilities like the Spring Creek Correctional Center, the Alaska Vocational and Technical Education Center (AVTEC), and the Alaska SeaLife Center, with its on-going research programs. Foreseeable future economic activity focuses on further developing the year round, non-tourism related industries. Examples include ship servicing at the Seward Marine Industrial Center, expansion of the University of Alaska Fairbanks Marine Sciences program, and potential plans for development of a large fuel storage facility, as well as steady growth in tourism related sectors such as lodging, retail, and food and beverage service.

These past, present, and foreseeable future actions increase economic activity. By diversifying the economic base, especially in non tourism related areas, they minimize the overall economic impact of any changes made at Exit Glacier in the foreseeable future.

The only non-NPS land adjacent to the study area is managed by the Chugach National Forest. There are no reasonably foreseeable actions on this land which could add to the overall cumulative impact of this alternative to the socioeconomic environment.

Cumulatively, these other past, present, and reasonably foreseeable future actions would have minor impacts on the socioeconomic environment. The additional contribution of negligible impacts from this alternative results in a continued minor rating for overall cumulative impacts to the socioeconomic environment.

Conclusion

Overall, the proposed actions in the no-action alternative would have a negligible impact on the socioeconomic environment. There will be no measurable change in economic growth rates or the overall quality of life for area residents as a result of this alternative.

Safety

Analysis of Impact

Under the no-action alternative, non-motorized and motorized winter recreationists would have access to the entire study area. As motorized and non-motorized users continue to

recreate in the same area, there would be potential for user conflicts to occur with injuries to individuals and/or damage to personal property.

Under the no-action alternative no new trails are proposed. Visitor safety on trails would be similar to current levels. Injuries on trails could still exist on the Harding Icefield Trail.

Vegetation and topography generally restricts all users to the narrow path to the glacier terminus. Limited visibility and the difficulty in moving out of the path fast enough to avoid collisions would be a continued safety concern.

The potential for wildlife encounters would remain low under this alternative. No injuries in the past have been documented from wildlife encounters. However, as visitation increases, so does the potential for encounters as more people could come into contact with wildlife.

Fecal coliform contamination in the water would likely remain at current levels. Visitors consuming water without using a filter would be at risk from *E.coli* and Giardia. No records document any visitors acquiring *E.coli* or Giardia from drinking water in the Exit Glacier area. This impact would remain low to nonexistent.

Cumulative Impact

In the past brochures and interpretive bulletin boards have been made available to visitors to the Exit Glacier study area illustrating proper hiking gear and what to do in case of wildlife encounters. A park website has also been created with visitor safety topics. One handrail exists on a steep section of the HIT installed in 2002. The handrail allows secure footing on a very steep portion of the trail, thus improving visitor safety. Check steps for visitor safety have also been installed. With paving of the entrance road, the risk of motor vehicle/wildlife accidents increased due to higher driving speeds. In the future there is more work planned on trails to improve visitor safety. The NPS or other government or private entities plan no additional reasonably foreseeable actions that could adversely affect the safety in the study area. Cumulatively, these other past, present, and reasonably foreseeable future actions would have minor impacts on safety. The additional contribution of negligible impacts from this alternative results in a continued minor rating for overall cumulative impacts to safety.

Conclusion

Implementing the no-action alternative would have negligible impacts on visitor safety. Injury rates would not change substantially from previous years. The main issue that could constitute a threat to visitor safety is the mixing of motorized and non-motorized activities in winter.

IMPACTS OF THE PREFERRED ALTERNATIVE

Soils

Analysis of Impact

The designation of management zones would protect soils from high levels of impact in the majority of the study area. Over 85% of the study area would be zoned as Backcountry Semi-Primitive and Backcountry Primitive, thus expected to receive little visitation as no trails would be present. Approximately 10% of the area would be zoned Hiker and Pedestrian, where most visitors would spend time, resulting in the greatest impacts to soils. However, the application of the new management zones and carrying capacity framework under the preferred alternative ultimately require resource protection standards be established to insure that desired resource conditions are met. Once developed, these standards would serve as clearly defined triggers and would provide a more systematic approach for implementing management actions to reduce or eliminate impacts than would occur under the no-action alternative. This would likely produce future long-term beneficial effects on soils.

The construction of a bike path to the Exit Glacier parking lot would result in impacts to soils under the paved path and along the margins of the path. Impacts would result from maintaining the bike path and from path users stepping off of the tread as necessary for passing, taking pictures, resting, etc. Local impacts to soils would include compaction and churning beyond actual path tread. The impacts along the margins of this path would likely result in increased erosion and changes of soil porosity through compaction. Impacts would be limited to 1.5 ft (0.5 m) out from the trail's edge. Given that the trail would be approximately 1.5 miles (2.4 km) long and 8 feet (2.4 m) wide, the total impact expected would be 2 acres (0.8 ha). Bike path impacts may measurably change the impacted area's overall biological productivity as the main path would be a paved surface that traverses wetland and lowland forest habitat types.

The construction of a new backcountry trail into Paradise Valley would have little impact on soils as most of the route would be located within an active floodplain that is regularly being reworked by Paradise Creek. In places where the trail is outside the active floodplain, the soil impacts would be limited to compaction in areas along the margins of the trail where hikers step off of the path as necessary for passing, taking pictures, resting, etc. This trail would be expected to receive relatively light use, and impacts along the margins would be limited to an average of 0.75 ft (0.225 m) out from the trail's edge. Given that the trail would be approximately 2.5 miles (4 km) long and 3 ft (0.9 m) wide, the total impact expected would be 1.2 acres (0.5 ha). The impact would be discontinuous and would likely not result in impacts that would measurably change the impacted area's overall biological productivity.

Impacts to soils along the Unnamed Peak Trail would be similar to those described for the Paradise Valley Trail; however, this trail would be steep and would pass through a variety of soil types, some of which are very susceptible to erosion. This trail would be expected to receive relatively light use and impacts along the margins would be limited to

an average of 0.75 ft (0.225 m) out from the trail's edge. Given that trail would be approximately 2.25 miles (3.6 km) long and 3 ft wide (0.9 m), the total impact expected would be 1.1 acres (0.4 ha). The impact would not likely result in changes to the impacted area's overall biological productivity.

Minor changes or additions to existing infrastructure (as described in Chapter 2: Alternatives, Including the Proposed Action) would result in negligible impacts to less than one acre of soils.

Cumulative Impacts

Past, current and future impacts to soils are discussed in the *no-action alternative.* The actions associated with the implementation of this alternative would add an estimated 5.3 acres (2.1 ha) of impacted soils to the existing 30 acres (12 ha) that are already impacted. Cumulatively, these other actions would have moderate impacts on soils. The additional contribution of minor impacts from this alternative results in a continued moderate rating for overall cumulative impacts to soils.

Conclusion

The overall impact on soils as a result of implementing the preferred alternative would be minor. The total estimated area of soils that would likely be measurably impacted is 5.3 acres (2.1 ha) and on most of this area there would not likely be impact that would measurably change the impacted area's overall biological productivity. The majority of this impact is associated with the construction of new routes and trails and the normal impact from trampling that typically occurs along margins of trails. The level of impacts to soils anticipated from this alternative would not result in an impairment of KEFJ resources that fulfill specific purposes identified in the establishing legislation or are key to the natural integrity of this park.

Water Quality

Analysis of Impact

The designation of management zones would protect water quality from high levels of impact in the majority of the study area. The majority of the bodies of water in the Exit Glacier area would occur in the Backcountry Semi-Primitive Zone where visitation would be low. The greatest impacts to water quality would occur in the Hiker Zone along Harding Icefield Trail streams and Paradise Creek. The application of the new management zones and carrying capacity framework would be the same as described under *Soils* above.

Under the preferred alternative, two new hiking trails would be built, bringing more visitors in contact with surface water sources. Temporary, primarily summer seasonal changes in water quality may result from unconfined human waste entering streams that may be used for drinking water or recreation. Data from a 2001 visitor survey (Swanson et al. 2003) shows that approximately 25% of hikers using the Harding Icefield Trail (HIT) admitted to relieving themselves at some point along the trail. However, due to the rustic nature of the planned trails, use levels are predicted to generally be low with

correspondingly low incidents of improper waste disposal. Water quality would be expected to remain well below DEC standards.

Increased visitor use from improved recreational opportunities such as new trails could also bring increased vehicle traffic and increased possibilities of pollutants from airborne exhaust particulates, oil and gasoline runoff entering surface and ground waters adjacent to roads and parking areas. Under the preferred alternative, the construction of a bike path is planned which is expected to slightly reduce vehicular traffic and associated pollutants. A slight reduction in traffic assumes that the bike bath continues outside the park to the Seward Highway, as proposed in the State Transportation Improvement Plan. However, since the actual amount of vehicle reduction cannot be accurately predicted, projected pollution reductions cannot be determined.

Water quality would be expected to remain within DEC standards, as visitation is not expected to increase markedly and current visitor use levels have not resulted in any detectable changes in water quality.

The majority of winter snowmachine use would be on the road, parking area, and Paradise Valley Trail, which may concentrate hydrocarbon pollution in waters in or directly adjacent to these areas. Particulate matter from exhaust or fuel spills on surfaces can enter waters as snow melts. However, if overall snowmachine use levels remain similar to current levels and use of machines with improved technology increases, hydrocarbon pollution and associated changes to water quality can be expected to decrease over the next 10 years. Use of a snow coach would not be expected to contribute adverse impacts to water quality, whether it burns gasoline or diesel, as it would be equipped with pollution-control devices and burn fuel efficiently, thus producing little emission. The snow coach would make a limited number of daily trips and transport more visitors per trip than a snowmachine, resulting in less pollution per visitor.

Cumulative Impacts

Past, current and future impacts to water quality are discussed in the *no-action alternative.* Cumulatively, these other actions would have minor impacts on water quality. The additional contribution of minor impacts from this alternative results in a continued minor rating for overall cumulative impacts to water quality.

Conclusion

Under the preferred alternative, minor impacts to water quality would be expected. The level of impacts to water quality anticipated from this alternative would not result in an impairment of KEFJ resources that fulfill specific purposes identified in the establishing legislation or are key to the natural integrity of this park.

Floodplains

Analysis of Impact

The application of management zones would have little additional impact to floodplains in the study area. The high visitor use areas at Exit Glacier have historically been located

within the floodplain, as this is the most accessible part of the park. Designating these areas as the Visitor Facilities and Pedestrian zones would not change floodplain structure or processes.

Under the preferred alternative, constructing a bike path and hiking trails in a floodplain are proposed. The hiking trails would be rustic and follow natural geographical contours. No berming, ditching, diverting stream channels, or otherwise altering the natural floodplain hydrology would be conducted. The bike path would be constructed parallel to an existing road over an existing levee. Because of all these considerations, no changes to the floodplain are expected from developing hiking trails.

NPS activities that have the potential to have adverse impacts on floodplains are subject to the provisions of Executive Order 11988 (Floodplain Management) as implemented through NPS Director's Order 77-2. The DO requires a "Statement of Findings" (SOF) to be written justifying any unavoidable impacts to floodplains resulting from a preferred alternative. Bike and hiking trail construction are considered "excepted" from SOF requirements because the actions fall under the description of "....foot trails in non-high hazard areas provided that the impacts of these facilities on flood plain values are minimized" and "Isolated backcountry sites, ...sites along trails or roads."

Actions to protect infrastructure, especially in the Visitor Facilities and Pedestrian zones, such as diverting stream channels, placing culverts or building berms would likely continue. These actions would alter floodplain structure and function to varying degrees, depending on the action. Although future actions may not be accurately predicted as they are dependant on flood events, they are expected to be similar to past actions, which have had long-term to permanent effects in areas totaling up to 5 acres.

Cumulative Impacts

Past, current and future impacts to floodplains are discussed in the *no-action alternative.* Cumulatively, these other actions would have moderate impacts on floodplains. The additional contribution of moderate impacts from this alternative results in a continued moderate rating for overall cumulative impacts to floodplains.

Conclusion

Under the preferred alternative there could be moderate impacts on floodplain resources or function as changes to protect infrastructure would continue and are expected to be long-term. The level of impacts to floodplains anticipated from this alternative would not result in an impairment of KEFJ resources that fulfill specific purposes identified in the establishing legislation or are key to the natural integrity of this park.

Wetlands

Analysis of Impact

The designation of management zones would protect the majority of wetlands in the study area from high levels of impact. The majority of wetlands at Exit Glacier would be located in the Backcountry Semi-Primitive Zone where many visitors would not be

expected. There might be some impacts to the small percentage of wetlands that occur in the Visitor Facilities Zone. The application of the new management zones and carrying capacity framework would be the same as described under *Soils* above.

Under the preferred alternative, a bike path adjacent to Exit Glacier road would be developed. This path would not only provide visitors with an opportunity to view wetland and other ecosystems, but would also provide an alternative to motorized transportation to access the park. The bike path would be connected to a non-motorized trail along Exit Glacier (Herman Leirer) Road currently planned. Encouraging non-motorized transportation to Exit Glacier via a bike path may slightly decrease the number of vehicles using the road, as discussed in the *Floodplains* section above. Direct and indirect benefits from decreased vehicular use may not be limited to wetlands directly adjacent to roads and could potentially encompass areas greater than 5 acres.

Bike path construction activities adjacent to wetlands may temporarily affect a small area of up to 0.25 acre and alter natural wetland function by increasing water turbidity and disturbing substrates, possibly disrupting or displacing plant and invertebrate life. The impacts would be limited to the duration of construction, not exceeding 3 months. The trail would be constructed primarily on top of existing riprap that was installed during the construction of the roadbed levee. Utilizing this riprap as a base for the bike trail would minimize any further encroachment into wetlands; however, additional areas totaling less than one acre may be lost where riprap is unavailable.

Other planned actions in the study area, such as hiking trails, would not be constructed in wetlands.

NPS activities that have the potential for adverse impacts on wetlands are subject to the provisions of Executive Order 11990 (Protection of Wetlands) as implemented through NPS Director's Order 77-1. The Director's Order requires a "Statement of Findings" to be written justifying any unavoidable impacts to wetlands resulting from a preferred alternative. Bicycle trail construction is considered "excepted" from the Statement of Findings requirements because it fits the following category of "water dependent" actions or other actions with "minimal impacts": Scenic overlooks and foot/bike trails or boardwalks, including signs, the primary purposes of which are public education, interpretation, or enjoyment of wetland resources. However, the "Best Management Practices/Conditions" listed in Appendix 2 of the *NPS Procedural Manual #77-1: Wetland Protection* (NPS 2002d) must be applied to minimize wetland impacts.

Cumulative Impacts

Past, current and future impacts to wetlands are discussed in the *no-action alternative.* Cumulatively, these other actions would have moderate impacts on wetlands. The additional contribution of minor impacts from this alternative results in a continued moderate rating for overall cumulative impacts to wetlands.

Conclusion
The preferred alternative would have minor impacts to wetlands, as little additional wetland area would be affected. The level of impacts to wetlands anticipated from this alternative would not result in an impairment of KEFJ resources that fulfill specific purposes identified in the establishing legislation or are key to the natural integrity of this park.

Air Quality and Visibility

Analysis of Impact
The designation of management zones would protect air quality and visibility from high levels of impact in the majority of the study area. Emissions associated with motor vehicles, power tools, burning woodstoves and campfires would originate predominantly in the Visitor Facilities Zone which comprises 1.5% of the study area. The application of the new management zones and carrying capacity framework would be the same as described under *Soils* above.

Under the preferred alternative, new hiking trails would be constructed. Trail construction would involve some use of two-stroke engines such as chainsaws, causing localized exhaust and odors. Chainsaw use would be limited to removal of large trees and would be employed only brief periods of time, therefore, emissions affecting visibility and smell would not likely exceed 6 hours a day total, and would be limited to the duration of the project, not likely exceeding four months.
Emissions associated with the parking area would be similar to the *no-action alternative.*

Wood burning firepit/fireplaces would continue to be provided for visitors in the campground and picnic areas, and impacts would be similar to the *no-action alternative.*

Under the preferred alternative, the majority of winter snowmachine use would be on the road, parking area, and the Paradise Valley Trail, resulting in a net decrease in overall winter emissions from current levels. Visible emissions and odors considered objectionable would be largely limited to the road corridor and Paradise Valley. In some weather conditions and depending on winds, exhaust may drift further, but would not be detectable in 50% of the study area, or last greater than 6 hours a day, due to short winter use days. However, snowmachine hydrocarbon emissions may decrease over the next decade as technology improves. If improved machines are used, overall emission levels could be reduced from current levels.

A snow coach would be implemented to provide winter access to the study area for recreation and winter educational programs. Skiers accessing the study area may choose to use the snow coach instead of snowmachines. Whether the snow coach would be diesel or gasoline powered has not been determined, however, it is expected to have substantially lower emissions than a two-stroke snowmachine (Fussell 1997). A snow coach would also make a limited number of daily trips and transport more visitors per trip than a snowmachine, resulting in less pollution per visitor.

Cumulative Impacts

Past, current and future impacts to air quality are discussed in the *no-action alternative.* Cumulatively, these other actions would have minor impacts on air quality and visibility. The additional contribution of minor impacts from this alternative results in a continued minor rating for overall cumulative impacts to air quality and visibility.

Conclusion

The preferred alternative would have minor adverse impacts on air quality, as visitation may increase but snowmachine use would be reduced. The level of impacts to air quality and visibility anticipated from this alternative would not result in an impairment of KEFJ resources that fulfill specific purposes identified in the establishing legislation or are key to the natural integrity of this park.

Soundscape

Analysis of Impact

The designation of management zones would protect the soundscape from high levels of impact in the majority of the study area. Desired soundscape conditions call for natural sounds to predominate, with few intrusions, in over 95% of the study area (Backcountry Primitive, Backcountry Semi-Primitive, and Hiker zones). Noise would be expected more often in the Visitor Facilities and Pedestrian zones. The application of the new management zones and carrying capacity framework would be the same as described under *Soils* above.

Under the preferred alternative, two new hiking trails are planned: the Paradise Valley Trail and the Unnamed Peak Trail. These trails could bring more visitors into naturally quiet backcountry areas, increasing the number of noise intrusions such as human voices and bear bells. However, these trails would be rustic and require a river crossing for access, which may exclude inexperienced hikers. Therefore, large numbers of visitors are not expected in these areas. Additionally, these trails are located primarily within densely vegetated alder thickets and forests, often near rushing streams. The dense vegetation and the sound of flowing water could muffle or mask noise intrusions. These physical factors, combined with expected low visitor use, could minimize changes in the natural soundscape. Intrusions would not likely be audible at distances over a mile and would be transient and intermittent, as hikers pass through areas fairly quickly. Intrusions would not total more than three hours per day, primarily during the summer season.

Power tools with accompanying noise intrusions would be used to construct hiking trails and the bike path. However, because power tools would not be used continuously throughout the day, noise is expected to total less than six hours per day during trail construction, which is anticipated to last one season or up to four months. Since the proposed trails would be rustic, large amounts of clearing and tree-felling utilizing noise-generating power tools would not be required, thus reducing the incidence of intrusive noises. Dense vegetation would also help to muffle noises, decreasing the intensity and limiting the distance the noise would travel to less than one mile.

Under the preferred alternative, winter motorized vehicle use would occur primarily along the road, parking lot, and Paradise Valley Trail. Although snowmachine noise would travel outside of the source areas and be heard at distances of over a mile, the highest intensity noise would be concentrated around the use areas. Highly objectionable noise intrusions are not expected in the area surrounding the glacier terminus. Noise would usually not total over 6 hours due to short winter use days. With the popularity of snowmachining increasing, snowmachine use could be expected to increase over the next decade. However, the intensity of snowmachine noise may also decrease over the next decade as snowmachine technology improves and quieter machines are produced. If these improved machines are used, overall noise levels, even within the concentrated use areas could be reduced from current levels.

Implementation of a snow coach is also planned. The snow coach would make a limited amount of daily trips to and from the study area and would be equipped with an automobile-type muffler system and would not be expected to generate more noise than a similarly sized passenger van or SUV. It is believed that some skiers and snowshoers accessing the study area would choose to use the snow coach instead of snowmachines. Although there would not be a marked noise reduction by snow coach use, no net increase of noise levels is expected. An increase in winter visitors arriving by snow coach could also increase the number of noise intrusions such as voices, in the study area. Intrusions would not be audible at distances over ¼ mile. Intrusions would be transient, as visitors would pass through areas fairly quickly or spend time indoors at the Nature Center. Noise would not be produced on a continual basis, and would not total more than six hours per day.

The summer bicycle trail would be utilized as a winter ski trail and would require motorized grooming. Noise associated with grooming could increase after major snow events, or decrease during periods of low snow accumulation. Noise from grooming would be of short duration, not exceeding three hours a day, and limited to less than a mile from the trail.

Cumulative Impacts

Past, current and future impacts to the soundscape are discussed in the *no-action alternative.* Cumulatively, these other actions would have minor impacts on soundscape. The additional contribution of minor impacts from this alternative results in a continued minor rating for overall cumulative impacts to soundscape.

Conclusion

Implementation of the preferred alternative would result in minor impacts to the soundscape of the Exit Glacier area. Many of the impacts to the soundscape are transient (seasonal) or limited to construction of discrete projects. As such, the combined impacts to the soundscape of the Exit Glacier area over the next decade would be minor. The level of impacts to the soundscape from this alternative would not result in an impairment of KEFJ resources that fulfill specific purposes identified in the establishing legislation or are key to the natural integrity of this park.

Vegetation

Analysis of Impact

The designation of management zones would protect vegetation from high levels of impact in the majority of the study area. Impacts to vegetation would be greatest in the Hiker, Pedestrian, and Visitor Facilities zones, which comprise approximately 10% of the study area, where visitation and development would be highest. The rest of the Exit Glacier area would receive few impacts to vegetation. The application of the new management zones and carrying capacity framework would be the same as described under *Soils* above.

Under the preferred alternative, several actions that may impact vegetation are planned. These actions include the construction of two new hiking trails, the Paradise Valley Trail and the Unnamed Peak Trail, construction of a bicycle path and a viewing platform for a spotting telescope. Approximately 5.3 acres (2.1 ha) of previously undisturbed lands would be altered in order to accommodate these actions. The actual use of the trails and bike path, increased visitation, and the potential for introduction of exotic plant species could also impact vegetation.

Due to the rustic nature of the proposed hiking trails, construction activities would primarily involve brush removal and pruning of woody shrubs. Trees would be removed only when necessary for trail access or for safety reasons. Because there would be a net loss of native vegetation, these impacts would be considered to be outside of the natural variability and the trail footprint could be altered for many years, or permanently.

The viewing area with the spotting scope would be situated on an unvegetated disturbed area, although a substantial amount of brushing of approximately 100 square feet of woody vegetation would be necessary to provide 360 degree views. Although vegetation removed would be capable of regrowth, continuous pruning would be necessary to maintain unobscured access to views.

A bike path would be located primarily on the shoulder of the existing road on currently unvegetated, compacted gravel surfaces. Portions of the trail would leave the shoulder area and traverse developing cottonwood forests. Near the road, measurable impacts to nearby vegetation, such as inadvertently broken branches of woody plants adjacent to the trail, may occur during construction activities. These plants, primarily alder and willow species, regenerate quickly and impacts would not likely be apparent after one or two growing seasons. In areas where the trail enters forest, trees would be removed only when necessary, although the changes from this activity would be permanent. Some trampling or destruction of herbaceous plants, such as fireweed and grasses, may also occur during construction, although this type of vegetation could also rebound quickly and not be impacted longer than one or two growing seasons. No measurable direct impacts would be expected to vegetation from bike path use along portions situated on the unvegetated road shoulder. Occasional detectable changes, including broken limbs of woody vegetation and trampling of plants, could occur along forested portions of the trail.

Regardless of these impacts, the long-term stability of plant populations would remain intact.

Use of the proposed new hiking trails could impact vegetation in several ways. Social or informal trails could establish and become devoid of vegetation, gully, and collect water in low areas. Shortcuts may develop between switchbacks in steep areas and further denude vegetation. Trails can eventually widen, and trail braiding could develop with increased traffic on wet or steep slopes. Trail widening could lead to increased trampling of vegetation and bare ground. Shrub-dominated communities, through which these trails travel, are slower to recover than grass-dominated communities. Lichens are particularly sensitive to trampling and may not recover for several years in high-use trail areas in alpine habitat. The proposed trails would primarily traverse gravel bars and alder-willow scrub vegetation communities, but largely avoid heavily-vegetated areas. Portions of the Unnamed Peak Trail would be located in more sensitive alpine areas.

Although the potential exists for the above impacts to occur, due to the rustic nature of the trails and the difficulty in accessing them, intensive trail use and associated impacts are not anticipated to be large and natural succession is not likely to be disrupted, therefore, not outside of natural variability for more than one growing season. Additionally, it is expected that hikers attracted to this area would tend to be experienced and self-sufficient. These individuals would likely be familiar and compliant with "Leave No Trace" concepts. Given these assumptions, the potential for the types of impacts described above would be further reduced.

In areas where backcountry camping is frequent, impacts to vegetation would be similar to those in the *no-action alternative.*

Under the preferred alternative there would be little off-road use of motorized vehicles in winter, other than on the Paradise Valley Trail. Since deep snow is required to navigate Paradise Valley, most vegetation would be covered by snow and protected from snowmachine impacts. Overall impacts to vegetation associated with off-road activities, such as breaking of branches on woody plants, could be greatly reduced or eliminated, resulting in long-term positive impacts.

Trails would be maintained in such a way as to reduce impacts to vegetation. Associated social trails and bare ground would be rehabilitated. Maintenance or rehabilitation of trails generally requires some manipulation of the natural vegetation, either to restore damaged areas or to re-seed areas denuded of natural vegetation. Care would be taken in reseeding efforts to use local seed sources to avoid impacts on genetic stocks in the park and to eliminate introduction of exotic species. Both maintenance and revegetation efforts could be expected to have measurable positive impacts by replacing damaged vegetation or restoring impacted areas. These benefits would last for one or more growing seasons.

Increased recreational opportunities, such as new hiking trails and the bike path, could result in overall increased visitation in the study area. Impacts to vegetation from use of the existing trails (see the *no-action alternative*) could be somewhat reduced with the

addition of new trails, as hikers would be somewhat more dispersed throughout the study area. However, measurable beneficial impacts would not likely occur, as existing trail use would not markedly decrease. Visitors not wishing to utilize the more challenging and less accessible trails would continue to travel on the existing trails and in the outwash plain. Increased trampling of soils on the outwash plain, as well as increased off-trail use may occur. Trampling could compact fragile developing soils and delay or prevent normal plant succession. Vegetation which is resistant to trampling and soil compaction may become established in high use areas, displacing or out-competing existing vegetation and altering species composition; often from an area dominated by herbs to an area dominated by grasses. Under the preferred alternative, these types of impacts would occur in localized areas comprised of 5 acres or less. Because there would be a net loss of native vegetation and natural success processes would be disrupted in these areas, these impacts would be considered to be outside of the natural variability. However, the continued existence of herb-dominated vegetation would not be threatened because trampling of vegetation would occur only a small proportion of these habitats.

The actions discussed above, trail construction, trail use, and increased visitation have the potential to impact vegetation indirectly through the introduction and spread of exotic plant species, particularly along the road, bike path and in areas adjacent to other visitor services. Indirect impacts of a bike and hiking trails to vegetation would include an increased possibility of introduction of exotic plants via seeds which may be carried by boots, tire treads, or other equipment. Any fill materials, such as gravel, that may be used for construction may contain seeds of exotic plant species.

The potential for introduction and/or spread of exotic species can be expected to increase as visitation increases even slightly. Although large numbers of visitors would not be expected on the proposed hiking trails, and potential for introduction of exotic species in these areas would be low, threats of introduced species from increased vehicle traffic and bike path use would remain a concern for possible negative impacts on native vegetation. If unchecked, exotic species introduced via the above actions may have long term adverse impacts on native vegetation, lasting many years and affecting plant populations by competing with or displacing native species. However, exotic plant control would be implemented as a mitigation measure, with few expected negative impacts to native vegetation.

Cumulative Impacts

Past, current and future impacts to vegetation are discussed in the *no-action alternative.* Cumulatively, these other actions would have major impacts on vegetation. The additional contribution of moderate impacts from this alternative results in a continued rating for overall cumulative impacts to vegetation.

Conclusion

The combined impacts of the proposed actions in the preferred alternative would be moderate as large amounts of visitors are not anticipated on proposed new trails and exotic species would not be allowed to spread unchecked. The level of impacts to vegetation from this alternative would not result in an impairment of KEFJ resources that

fulfill specific purposes identified in the establishing legislation or are key to the natural integrity of this park.

Wildlife

Analysis of Impact

The designation of management zones would result in little impact on wildlife in the study area. Disturbance of wildlife and impacts on wildlife habitat would be greatest in the Visitor Facilities, Pedestrian, and Hiker zones, which comprise just over 10% of the study area, where the majority and visitation and development would occur. The application of the new management zones and carrying capacity framework would be the same as described under *Soils* above.

Under this alternative there are a number of proposed actions which may impact wildlife species in the Exit Glacier area. For the purpose of this analysis similar actions have been grouped under the following headings: new trails, winter visitation, and winter use of motorized vehicles.

New Trails

Three new trails, a bike path from the bridge to the Exit Glacier parking lot, the Unnamed Peak Trail, and the Paradise Valley Trail, would be constructed. Impacts to wildlife from these new trails would be primarily behavioral responses to approaching hikers and from habitat alterations, habitat fragmentation, and habitat loss due to trail construction.

Behavioral responses of wildlife species to trail construction, trail maintenance, and hikers may include flight from approaching humans, avoidance of trail areas, habituation to humans, association of humans with food, and adjustments to timing of activities such as feeding. Behavioral responses are generally of short duration, only having an impact while the particular behavior is elicited. However, prolonged or repeated disturbance may lead to long-term or permanent disruptions in demographics. This is particularly true if the response disrupts breeding, displaces wildlife from critical resources, reduces rearing success, or alters mortality rates through factors such as predation and defense of life and property (DLP) killings of bears.

Encounters between humans and bears could be expected to increase with an expanded trail system. The trail system in this alternative would almost triple the existing trail system (from 3.5 to 9.75 miles). Titus and Beier (1991) demonstrated a strong positive correlation between cumulative miles of road (as a measure of human access) and bear mortality. At Exit Glacier, a corresponding increase in human bear encounters might be expected with an expanded trail system, even if overall visitation does not increase. To date, there are no recorded DLP killings in the Exit Glacier area; however, more bear-human encounters could lead to DLP mortalities to both black and brown bears. Any increase in encounters between bears and humans or bear mortality as a result of actions proposed in this alternative is not expected to have long term effects on black bear population numbers or this species' presence in the Exit Glacier area.

Of the proposed new trails, only the bike path traverses any known important breeding and foraging habitat for wildlife. The bike path would cut through wetland and riparian areas important to songbirds such as warblers. Some recent research (Miller et al. 1998) has focused on the effects of hiking and recreational trails on bird populations, where effects of disturbance may be subtle, such as changes in diversity, nesting success, or distribution. Recreational trails have been shown to adversely affect both the numbers and breeding success of some bird species using habitats adjacent to trails, although it is not clear whether those effects were due primarily to the edge effect of the trail or to human disturbance. The proposed bike path route follows the existing road corridor so no additional impacts to songbirds in this area are expected, except those attributed to habitat loss and encroachment of non-resident species.

Habitat fragmentation and loss due to the construction of the proposed bike path could impact up to 5% the available emergent wetlands habitat type. Breeding songbirds utilizing this habitat type may experience a corresponding decrease in populations. This decrease, however, is not outside the expected range of natural variation for bird populations.

Construction of the other trails proposed in this alternative would not likely result in significant habitat damage or loss, though the proposed Paradise Valley Trail could increase human presence in important brown bear habitat on the adjacent Chugach National Forest (see discussion below in the *Cumulative Impacts* section).

The proposed new trails may also allow for the establishment or encroachment of non-resident species such as corvids along trail corridors. Gutzwiller et al. (2002) found that gray jay occurrence at human intruded sites was 125% higher than at control sites. Increased corvid occurrence due to human intrusion can dramatically increased nest predation on migratory songbirds such as warblers. This would be of greatest concern along the proposed bike path where corvid occurrence could show a similar increase to that found by Gutzwiller et al. (2002). Because existing songbird populations in the Exit Glacier area do not appear threatened by corvids (Wright 2002), an increase in corvids along the bike path would not be expected to have marked long term impacts on resident bird populations in the Exit Glacier area, though some increase in predation is expected due to the opportunistic nature of corvids.

During winter, 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. Cross-country skiing can cause behavioral disturbance to wildlife, particularly large ungulates, such as moose, that may be startled by the quiet approach of skiers. The proposed multi-use trail along Paradise Creek is adjacent to areas of winter moose browse. Impacts to moose due to disturbance and displacement are expected. Measurable changes in the number of moose present and moose behavior are likely to be observed, however, these changes should remain within the range of natural variation as numbers fluctuate from year to year based on the availability of forage and climatic conditions.

Winter Visitation

Actions in the preferred alternative intended to facilitate winter visitation to the Exit Glacier area, including grooming the bike path for winter use, developing winter interpretive and school programs, and operating a snow coach to transport winter visitors to the park, would be likely to impact wildlife, particularly moose, mountain goats, wolverines, lynx, and wolves.

Overwintering moose rely on early successional willow stands below Exit Glacier for critical winter forage. Increasing the human presence in these areas during winter may displace moose and goats from these critical foraging areas during periods of high human use. Additionally, increased winter encounters between humans and moose may result in reducing winter energy reserves by eliciting behavioral responses such as flight or limiting bedding time. For example, cross-country skiing can cause behavioral disturbance to wildlife, particularly large ungulates, such as moose, that may be startled by the quiet approach of skiers (Freddy et al. 1986). Under this alternative, winter visitation would rise from a total of about 560 people to almost a 1,000 people, an average use level of about 60 people per week assuming a 17 week season. Given this level of human use, though moose may be temporarily disturbed by skiers and other recreationists, the frequency and duration of disturbance is unlikely to be sufficient to impact species population numbers or in other ways cause changes that are outside the range of natural variation.

The above mentioned increase in human activity during winter may also impact wolves, wolverine, and lynx, all species which have large home range requirements and a low tolerance for human disturbance (Zielinski 1995). See the no-action alternative for a description of winter carnivore surveys. It is possible, if winter use increases, that the occurrence of these species in the Exit Glacier area may become more infrequent, though because most human use would remain concentrated in the developed areas of Exit Glacier, changes in behavior of these animals would probably be minor and it is unlikely that these species would be excluded from the area entirely.

Winter Use of Motorized Vehicles

Reduced motorized winter use would likely have a positive effect on wildlife by limiting human activity, such as snowmaching, in much of the Exit Glacier area during winter. Reduction in physiological stress levels of moose could occur if snowmachine use is reduced in areas of prime winter moose browse. Even with motorized vehicle use occurring primarily on the road, parking lot and Paradise Valley Trail, impacts to wildlife, particularly moose, wolves, wolverines, and lynx, could still occur from motorized use.

Numerous studies have shown the direct impact of repeated snowmachine use on wildlife behavior and levels of physiological stress (Creel et al. 2002, Colescott and Gillingham 1998, Dorrance et al. 1975, Freddy et al. 1986, Mahoney et al. 2001, Neumann and Merriam 1972). These studies indicate that exposure of wildlife to snowmachine use can result in behavioral alteration, habitat avoidance, and increased energy expenditures. These changes occur at critical times when animals are under extreme stress during

winter and when energy conservation 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. Approximately 10% of available winter browse lies adjacent to the areas where winter motorized vehicle use would be permitted. Moose utilizing these areas would be subject to periodic disturbance and displacement. However, because winter visitation, though greater than under current conditions, would still be relatively low (1,000 visitors per winter or an average of 60 people a week), impacts related to disturbance or displacement would probably not be sufficient to impact species population numbers or in other ways cause changes that are outside the range of natural variation.

Cumulative Impacts

Past, current and future impacts to wildlife are discussed in the *no-action alternative.* Cumulatively, these other actions would have major impacts on wildlife. The additional contribution of moderate impacts from this alternative results in a continued major rating for overall cumulative impacts to wildlife.

Conclusion

Overall, the proposed actions in the preferred alternative could have a moderate impact on wildlife in the Exit Glacier area. Of the proposed actions, new trails and actions designed to promote increased winter visitation are those most likely to impact wildlife by spatially and temporally altering human intrusions on wildlife. The new trails proposed in this alternative may result in a measurable decline in resident songbird populations, though this decline is not expected to be outside the range of natural variation over more than one generation. Increasing winter visitation may lead to a decreased occurrence of far ranging, large carnivores such as wolves, lynx, and wolverines; though any measurable decrease is unlikely to be outside the natural range of variability. It is unlikely that these species would be excluded from the area entirely. The positive impacts of the proposed reduction motorized use areas in winter, however, may provide a counter balance to negative impacts arising from other actions.

The level of impacts to wildlife from this alternative would not result in an impairment of KEFJ resources that fulfill specific purposes identified in the establishing legislation or are key to the natural integrity of this park.

Visitor Experience

The application of the new management zones and carrying capacity framework under the preferred alternative ultimately require standards be established that would maintain a high quality visitor experience. Attributes of the visitor experience that would be protected include solitude in the Backcountry Primitive and Backcountry Semi-Primitive Zones, well maintained trails and moderate potential for solitude in the Hiker zone, ability to view the glacier without being crowded in the Pedestrian zone, and availability of information and other visitor services in the Visitor Facilities Zone. The application of

the new management zones and carrying capacity framework would be the same as described under *Soils* above.

Analysis of Impact

Visitation

The construction of a bike path from the Resurrection River Bridge to the Exit Glacier parking lot could result in an increase in the number of visitors accessing the area by non-motorized means, provided that the path continues outside the park to the Seward Highway as is proposed in the current State Transportation Improvement Plan (note: if the path is not continued outside the park to the Seward Highway, then the action taken in the study area would have no measurable impact on visitation). This action would not affect the majority of summer visitors who would continue to access the area via private vehicles, generally staying less than three hours with a primary goal of getting close to the glacier (Swanson et al. 2003). The number of cyclists and pedestrians is not currently recorded, but an estimate can be obtained from the fee booth data for "individuals". In the summer, "individual" fee booth entries make up 1 to 2 percent of the total summer visitation (2001 fee booth data for Exit Glacier, June 1 through September 30), but according to fee booth personnel very few of these "individuals" are cyclists or pedestrians; the remaining individuals arrive primarily via taxis or other commercial vehicles. Cyclists and pedestrians currently make up no more than 0.1% of the total summer visitation. This number may double or triple with the construction of a bike path, but even a ten-fold increase would only represent 1% of the total summer visitation.

Having a designated and groomed non-motorized route to the glacier in the winter would result in a measurable increase in the number of skiers and other non-motorized users, provided that the path continues outside the park. The existing multi-use trail is often rutted and icy from extensive snowmachine use. Because of the typically poor trail conditions and close proximity to snowmachine traffic, many skiers avoid long trips on Exit Glacier Road. The construction of a bike path from the Seward Highway to Exit Glacier would provide a winter route that would be dedicated to non-motorized use and would be maintained and groomed by local clubs and user groups. According to anecdotal comments from local residents, more skiers would embark on the 14.5-mile round trip to Exit Glacier if there were a dedicated, groomed trail. Non-motorized use currently makes up approximately 17% of the total winter visitation, with 25 to 50% of the non-motorized use by overnight visitors (Kenai Fjords National Park, winter visitor use data for Exit Glacier, 1999 to 2002). There is no data from which to build a predictive model to estimate the impact of this action on visitation, thus a best professional estimate based on general knowledge of use patterns is used for this analysis. Given the length of the trip from the winter trailhead to the glacier and back (approximately 15 miles), the number of additional day users could be small, with most of the increased use being overnight visitors. Therefore, the presence of a groomed, non-motorized trail to Exit Glacier could increase non-motorized use in the study area by up to 50% (note: if the path is not continued outside the park to the Seward Highway, then the action taken in the study area would have no impact on visitation).

The construction of a new backcountry trail into Paradise Valley would be a minor additional attraction to the area compared to the glacier and the icefield. The lack of a bridge across Exit Creek would likely limit the use of this trail to only hardy, experienced backcountry hikers. If this trail were connected to the alpine trail at Caines Head State Recreation Area it may attract a few additional hikers who would visit the area primarily to hike this trail. At most this trail would receive on the order of hundreds of hikers per year, which would cause only a fraction of a percent change in the total visitation to the Exit Glacier area. The lower portion of the route would be marked but not groomed in the winter, and would not change the amount of winter visitation as it would not be attractive enough to draw additional skiers to the area. An estimate of the number of hikers that would use this trail is approximately 250 per year.

The Unnamed Peak Trail would not create a substantial additional attraction to the area as it would primarily provide an alternate route for visitors who have already come for a view of the Harding Icefield but wish to avoid the busier Harding Icefield Trail. This would likely result in an undetectable amount of additional summer visitation.

In winter, snowmachine and other motorized vehicle use would occur mainly on the entrance road, parking lot and Paradise Valley Trail. Some of the motorized users that go to Exit Glacier to ride their machines on the outwash plain and in Exit Creek may instead ride in Paradise Valley, while others would find similar areas in which to ride outside of the study area. However, those winter visitors who have the goal of seeing the glacier, or are out for an easy ride with family or novice riders would probably still ride their machines to the parking lot and then travel on foot to the glacier. There is no data available that documents what percentage of snowmachiners visit Exit Glacier primarily to see the glacier versus to simply ride their snowmachines, thus a best professional estimate based on general knowledge of use patterns is used for this analysis. It is estimated that approximately 50% of the current snowmachiners in the Exit Glacier study area are there primarily to ride and not to see the glacier. The current annual number of snowmachiners is approximately 465, thus roughly 200 would be displaced by closing the outwash plain to motorized use. Reducing the number of snowmachiners in the Backcountry Semi-primitive zone to meet desired conditions of the zone would decrease the number of snowmachiners by approximately another half. Designating the Paradise Valley Trail as multi-use would not increase snowmachine or skier use in the area. Thus, on a nice winter weekend day with good snow conditions the average number of snowmachiners expected in the Exit Glacier area would be approximately 5 to 15.

Because the current volume of snowmachine use in the study area displaces some non-motorized users (based on public comments provided during the scoping for this plan), a reduction in the volume of snowmachine use could result in an increase in non-motorized use. Specifically, the study area may be more attractive to overnight non-motorized users due to the distance involved in a one day round trip to the Exit Glacier area and back (approximately 15 miles). The impact on non-motorized visitors is estimated to be an increase of roughly 50 users per season from the current use level of 95.

The NPS would implement actions to encourage winter visitation and activities, emphasizing non-motorized activities within the study area, which could result in increased numbers of winter visitors. Snow coach transportation to the Exit Glacier parking lot would bring additional non-motorized visitors and school groups to the area. These actions would likely result in 250 to 500 additional winter visitors, based on an estimate of weekly programs with 15 to 30 attendees each over a 17 week season from December 1 to March 31. For analysis purposes, the high estimate of 500 additional visitors is used.

The implementation of this alternative would result in negligible impacts to total annual visitation at Exit Glacier. The actions associated with this alternative would result in a 0.4% increase in summer visitation (assuming a current summer visitation of 125,000 people and an additional 500 visitors as a result of this alternative) and a 71% increase in winter visitation (assuming a current winter visitation of 560 people and an additional 400 visitors as a result of this alternative), for an increase in total annual visitation of 0.7%. These changes do not represent a detectable shift in the ratio of summer to winter visitation since, even with the expected increases; winter visitation would represent less than 1% of the annual total.

Visitor Profile

The construction of a bike path to the Exit Glacier parking lot could result in an increase in the number of visitors accessing the area by non-motorized means, provided that the path continues outside the park to the Seward Highway as is proposed in the current State Transportation Improvement Plan. Visitors accessing Exit Glacier via non-motorized modes of travel are likely to be younger than the average visitor (based on a comparison with data from a 1991 U. S. Consumer Products Safety Commission report on Bicycle Injury and Exposure). A high percentage of local visitors may use this path as a venue for exercise, and the average length of stay for visitors on the path would then be slightly longer as a result of travel time within the study area. Less than one percent of visitors would be affected by this action (see *Visitation* analysis above).

The construction of a new backcountry trail into Paradise Valley would attract a few hardy, experienced backcountry hikers. The type of users would be affected by the primitive nature of the trail, including at least one significant stream ford that would discourage many potential hikers. To understand the visitor profile for hikers in this area, existing social science data for the Exit Glacier area was used. Visitor profile data was collected for two groups of visitors in 2001: general visitors to the Exit Glacier area and Harding Icefield Trail hikers (Swanson et al. 2003). Of these two groups for which data is available, the Harding Icefield Trail hikers serve as a better proxy for Paradise Valley Trail hikers since hiking those two trails would be more comparable than a general visit to the glacier. Although the mean age for both general Exit Glacier visitors and Harding Icefield trail hikers are very similar (33.47 and 32.66 respectively), the age distribution for general visitors shows a bimodal distribution with peaks in both the 0 to 10 year-old and 40 to 49 year-old categories, whereas the age distribution for Harding Icefield Trail hikers is more evenly distributed around a central peak in the 30 to 39 year-old category (Swanson et al. 2003). Also, the length of stay for Harding Icefield Trail hikers is

markedly greater than for general Exit Glacier visitors (9.58 hours and 5.6 hours, respectively) (Swanson et al. 2003). There was no major difference in where the visitors come from between Harding Icefield Trail hikers and general Exit Glacier visitors (Swanson et al. 2003). Thus, the additional hikers that would hike the Paradise Valley trail would likely be closer to the 30 to 39 year-old age category and stay longer than the average Exit Glacier visitor. Where the average visitor comes from would not be affected by this action. Less than one percent of visitors would be affected by this action (see *Visitation* analysis above).

The Unnamed Peak Trail would likely attract the same type of visitors who would hike the Harding Icefield Trail or the Paradise Valley Trail. For the same reasons noted above for the Paradise Valley Trail, these hikers would be younger and stay longer than the average Exit Glacier visitor, and less than one percent of visitors would be affected by this action (see *Visitation* analysis above).

The following minor changes or additions to existing infrastructure may cause a slight increase in the length of stay for the average visitor: construction of a trailhead for the Paradise Valley Trail; minor improvements or changes to existing trails; addition of educational signs or exhibits; construction of a gathering pavilion near the Nature Center; construction of a viewing platform with a spotting scope near the Harding Icefield trail junction. Additional signs and exhibits may result in some visitors staying slightly longer than the current average, but the change would not be detectable or significant.

In winter, snowmachine and other motorized vehicle use would occur mainly on the entrance road, parking lot and Paradise Valley Trail. The bike path would be maintained as a non-motorized trail. Although the anticipated decrease in snowmachine use and increase in the number of non-motorized users (see *Visitation* analysis) could reduce the motorized-to-non-motorized use ratio, not enough is known about the demographics of winter visitors to assess any potential impacts to visitor profile. However, less than one percent of total annual visitors would be affected by this action (see *Visitation* analysis above).

The NPS would implement actions to encourage winter visitation and activities, emphasizing non-motorized activities within the study area, which could result in increased numbers of winter visitors. The interpretive programs would be oriented towards a variety of age groups ranging from children to Elder Hostel, thus the average visitor age would not be affected. The length of stay for the additional visitors associated with this action would likely be longer than average since the interpretive programs would last from several hours to all day. Where the visitors come from would not be affected by this action as both local and non-local residents would be targeted by the interpretive programs. However, compared to the profile of the average summer or annual visitor, the additional visitors would more likely be Southcentral Alaska residents. Less than one percent of total annual visitors would be affected by this action (see *Visitation* analysis above).

The implementation of this alternative would result in negligible impacts to the annual average visitor profile at Exit Glacier due to the small numbers of visitors involved. Although the visitors affected by many of the winter actions typically differ from the average visitor, the total number of visitors involved is not sufficient to have an impact on the profile of the average visitor.

Visitor Access

The construction of a bike path to the Exit Glacier parking lot would increase summer access to the Exit Glacier area, which is already accessible by road, provided that the path continues outside the park to the Seward Highway as is proposed in the current State Transportation Improvement Plan (note: if the path is not continued outside the park to the Seward Highway, then the action taken in the study area would have no measurable impact on visitor access). According to the *Visitation* analysis above, the number cyclists and pedestrians may double or triple with the construction of the path, but even a ten-fold increase would only represent 1% of the total summer visitation. In the winter, the path would be groomed for non-motorized use, again increasing access to an area that is already accessible via the existing road.

The construction of a new backcountry trail into Paradise Valley would provide new summer access to the Paradise Creek valley, which is currently not accessible by official trails or routes. This route may be marked in the winter but would not be groomed or otherwise maintained, thus there would be no impact to winter access.

The construction of the Unnamed Peak Trail would provide new summer access to an alpine peak on the south side of Exit Glacier, which is currently not accessible by official trails or routes.

The implementation of this alternative would result in moderate impacts to off-road visitor access as a result of adding new routes and trails to areas that are currently non-accessible to visitors. These new trails would be primitive and somewhat difficult to access (hikers would need to ford Exit Creek) and thus would impact less than 1% of the visitors to the Exit Glacier area.

Visitor Activities

The construction of a bike path to the Exit Glacier parking lot could increase the number of pedestrians and cyclists in the summer and non-motorized visitors in the winter, provided that the path continues outside the park to the Seward Highway as is proposed in the current State Transportation Improvement Plan (note: if the path is not continued outside the park to the Seward Highway, then the action taken in the study area would have no measurable impact on visitor activities). As determined in the *Visitation* analysis above, this action is expected to result in an additional 240 pedestrians and cyclists in the summer and 50 non-motorized users in the winter. The actual use of the bike path in summer and winter for biking, walking, running, skiing, etc. is a non-critical activity (as defined in the impact level definitions). Summer pedestrian and other non-motorized forms of travel to the Exit Glacier area currently make up less than 0.1% of the total summer visitation (see *Visitation* analysis above). The doubling or tripling of this use as

described under the *Visitation* analysis would represent less than a one percentage point increase in the proportion of visitors participating in these activities, as even a ten-fold increase would only represent 1% of the total summer visitation. The expected increase of 50 additional winter users associated with the bike path represents an increase of 9% from current total winter visitation (see *Visitation* analysis above); however, the current distribution of winter visitors between critical and non-critical activities in unknown. For winter and summer combined, the change in the proportion of visitors participating in these activities on the bike path would likely be less than 1%. While the activities that would take place on the bike path (e.g. biking, walking, skiing, etc.) are non-critical activities, a certain percentage of those visitors may also be using the path with the intention of visiting the glacier (a critical activity). In the summer, even if all or none of the additional 240 pedestrians visited the glacier, this would represent a less than one percentage point change in the proportion of visitors participating in that critical activity. In the winter, the distribution of visitors between critical and non-critical activities is unknown.

The construction of a new backcountry trail into Paradise Valley could increase the number and proportion of visitors hiking and camping. As determined in the *Visitation* analysis above, this action is expected to result in an additional 250 hikers in the summer. An estimation of less than 50% of these hikers would camp overnight. This prediction is based on the following premises: very few (less than 0.1%) visitors currently camp in the backcountry of the study area; most visitors taking overnight hikes on this trail may travel beyond the study area boundary into the upper Paradise Creek drainages before camping for the night; very few visitors would want to ford Exit Creek with heavy overnight packs to camp in the lower Paradise Creek drainage. Backcountry hiking and camping are non-critical activities. Data from the 2001 Harding Icefield trail register and the 2001 Exit Glacier general visitor survey (Swanson et al. 2003), and visitor counts for the Exit Glacier campground (averaged for 1999 to 2002) were used to determine the current proportion of visitors participating in the non-critical activities of backcountry hiking and camping (approximately 5% and 0.1%, respectively). The 250 additional hikers represent an increase of less than one percentage point in the proportion of visitors participating in these non-critical activities.

The construction of the Unnamed Peak Trail would not have any measurable effect on the number of visitors or the activities in which they partake. As noted in the analysis of visitation above, the new trail would primarily provide an alternate route for visitors who have already come for a view of the Harding Icefield but wish to avoid the busier Harding Icefield Trail.

In winter, snowmachine and other motorized vehicle use would occur primarily on the road, parking lot, and Paradise Valley Trail. As a result, a number of the motorized users that go to Exit Glacier to ride their machines in the open areas of the outwash plain and floodplains may forgo the trip to the study area. However, those winter visitors who have the goal of seeing the glacier would likely still ride their machines to the parking lot and then travel on foot to the glacier. As described in the *Visitation* analysis above, the anticipated change as a result of this management action are about 200 fewer

snowmachiners each winter. According to the *Visitation* analysis above, it is estimated that approximately 50% of the current snowmachiners in the Exit Glacier study area (233 of 465) are there primarily to ride and not to see the glacier. Thus 42% of winter visitors currently partake in this activity, and that proportion would be expected to drop to less than 20% as a result of this action.

The NPS would implement actions to encourage winter visitation and activities. A park owned and/or a concessionaire operated snow coach would be used to bring groups, such as school children and Elder Hostel, to the Exit Glacier area in winter to participate in educational programs at the Nature Center and to improve access to the Exit Glacier area for individuals and families to participate in winter recreation activities and educational programs. This could have an impact on the number of visitors (see analysis of *Visitation* above) and could cause a measurable change in the distribution of winter visitor activities. There are currently no winter interpretive activities or programs at Exit Glacier. The additional visitors that participate may partake in the critical activity of viewing Exit Glacier and non-critical activities including taking guided walks, viewing wildlife, skiing, snowshoeing, visiting the ranger station and viewing geological features. The estimated 500 additional visitors resulting from this action (see analysis of *Visitation* above) would not likely cause a change of more than five percentage points in the proportion of visitors partaking in these activities over the entire year. However, although there is very little data on winter visitor activities, 500 additional winter visitors would almost double the current winter visitation, and thus the proportion of winter visitors participating in these activities would change by more than 20 percentage points since no formal winter interpretive programs currently exist at Exit Glacier.

The implementation of this alternative would result in negligible impacts to visitor activities throughout the year as a whole.

Crowding

The construction of a bike path to the Exit Glacier parking lot could result in an increase in the number of visitors accessing the area by non-motorized means, provided that the path continues outside the park to the Seward Highway as is proposed in the current State Transportation Improvement Plan (note: if the path is not continued outside the park to the Seward Highway, then the action taken in the study area would have no impact on crowding). According to the *Visitation* analysis above, this increase would represent less than one percent of the total summer visitation. Consequently, the impact of this action on summer average daily peak visitation would be undetectable.

The construction of a new backcountry trail into Paradise Valley would cause only a fraction of a percent change in the total visitation to the Exit Glacier area according to the *Visitation* analysis above. Consequently, the impact of this action on summer average daily peak visitation would be undetectable.

The construction of the Unnamed Peak Trail would result in an undetectable amount of additional summer visitation according to the *Visitation* analysis above. Consequently, the impact of this action on summer average daily peak visitation would be undetectable.

Based on this analysis, the actions associated with this alternative would have a negligible impact on crowding in the Exit Glacier area during the summer season. Crowding during the winter season was not identified to be an issue requiring analysis

Cumulative Impacts

Past, current and future impacts to visitor experience are discussed in the *no-action alternative.* Cumulatively, these other actions would have major impacts on visitor experience. The additional contribution of minor impacts from this alternative results in a continued major rating for overall cumulative impacts to visitor experience.

Conclusion

The impact of this alternative on visitor experience would be minor when averaged over the entire year. The key factors involved are the opening of the Paradise Valley area to visitor access by means of new backcountry trails into that area, limiting where snowmachine activity is allowed, and the implementation of a new winter interpretive program. The vast majority of visitors would experience only little change to their experience at Exit Glacier. The greatest impacts would be to winter visitors, which account for no more than one or two percent of total annual visitation. The impacts to Visitor Experience are summarized below. The breakdown of impacts by sub-category are as follows:

	Annual average	
Sub-category	Impact Level	Impact Rating
Visitation	Negligible	0
Visitor Profile	Negligible	0
Access	Moderate	2
Visitor Activities	Negligible	0
Crowding	Negligible	0
Total Impact Rating		2

The impacts to visitor experience that are described here are difficult to classify as either positive or negative. While closing the outwash plain to snowmachine use may be a negative impact to some visitors who ride snowmachines, it is a positive impact to non-motorized users who seek a different experience. Increased visitor crowding is the only impact that most people would agree upon as being negative, and the analysis indicates that the impacts to crowding would be negligible under this management alternative.

Socioeconomic Environment

Analysis of Impact

The designation of management zones would not appreciably impact socioeconomics of the local area. Key developments which would have socioeconomic impact are analyzed below.

This alternative would likely increase overall use of the area in winter for education programs by 71%. This proposal may provide slightly increased winter employment of

National Park Service staff leading education programs and some ancillary expenditure in the local economy, such as food and beverages of groups visiting the area.

Some current winter recreational users of the Exit Glacier Road corridor would likely characterize snow coach service as a noticeable negative impact on their quality of life due to increased crowds and the introduction of a large, slow motorized vehicle competing for time and space on the road with existing skiers, mushers, snowmachiners, and skijorers. Others may see it as a positive impact because it expands educational opportunities and expands the potential for non-motorized recreation in the area directly around Exit Glacier.

This alternative proposes restricting motorized winter recreation in the Visitor Facilities and Pedestrian zones. Currently, motorized recreation is unrestricted throughout the study area. Presently there is only one business, the US Army Seward Resort, providing commercial motorized access to the study area. Motorized winter recreation would continue both in the study area, though in a limited fashion, and on adjacent lands, so local businesses deriving economic benefit from this activity would see little or no economic impact.

The duration of this impact would be long term, but seasonal in nature, as this activity would only occur when adequate snow cover allows – generally late November through early April.

The Seward Resort currently rents snow machines to guests and facilitates their use at Exit Glacier by providing guides and a drop-off / pick-up service at the Box Canyon Creek gate on Exit Glacier Road. Generally, guests rent snow machines for ½ day, riding to Exit Glacier, exploring the area as conditions permit, then returning over a 4 hour period. Restricting motorized winter recreation in the outwash plain would likely cause the resort to restructure staff and services in this program, since their current activity of unstructured riding around the glacial terminus would be precluded. Guests could have the option of a "ride / ski" or "ride / snowshoe" package. Demand for this type of business could depend heavily on snow conditions and marketing, and could provide increased profitability though decreased costs (need for paid guides could be eliminated and wear and tear on machines could be reduced) and increased rental opportunities for nordic ski packages or snowshoes.

This alternative proposes use of a snow coach for winter access by non-motorized recreationists and school groups. This proposal could provide the opportunity for a new business or expansion of an existing business. This would increase winter employment, expenditures, tax base, and related economic benefits, however the scale of such impacts would be relatively small in the overall economy given the limited demand for such activity in the local and regional markets. It is assumed that if demand were great, the private sector would have attempted to develop it already, and it has not. Further, throughout recent planning processes for the planning of Exit Glacier Road and development of Exit Glacier, this idea was apparently not considered (NPS 1995, FHA 1990). It may also increase the desirability of Exit Glacier as winter recreation destination

/ experience in a regional tourism market by establishing it as a destination for day use nordic skiing, skijoring, snowshoeing, and winter educational programs, thus increasing overall winter tourism expenditures in the local economy.

Visitors who desire the recreational experience of riding a snow machine to the face of Exit Glacier would likely view this action as having a negative impact on the recreational aspect of their quality of life. Other users who seek designation of non-motorized winter recreation areas for physical fitness, silence, or other reasons would likely report a noticeable positive impact on the recreational aspect of their quality of life because it would increase non-motorized winter recreational opportunity.

The duration of this impact would be long term, but seasonal in nature, as this activity would only occur when adequate snow cover allows – generally late November through early April. Economic impacts, positive or negative, would be limited to the local area.

This alternative would develop a new rustic trail through the Paradise Valley, with a spur route to a peak adjacent to Exit Glacier. A bike trail would be constructed parallel to the Exit Glacier Road and the Overlook Loop Trail would be improved to better accommodate increasing visitation. More hiking / biking opportunities, and longer trails, would generally increase the duration of visitation of some visitors. Increasing the duration of visitation results in increased expenditures in the local economy, as extra time spent here results in extra meals purchased, extra nights in motels, etc. When viewed as a percentage of overall visitation, the number of additional hikers (estimated at 250 / year) would have little or no appreciable impact.

The development of a bike path may allow for new or expanded business opportunities for rentals and shuttle service. Presently there is one bike rental shop in town, and the development of a formal trail would likely increase demand for this service. New or expanded trails could improve quality of life for residents seeking these increased recreational and physical fitness opportunities of bicycling, walking, birdwatching, or jogging on this path.

Construction of new trails and significant improvement of existing trails could result in increased government expenditures in the local economy for labor, supplies, and material. These expenditures could be high for brief periods during initial construction, with smaller annual expenditures for routine maintenance. Construction costs for actions taken under this alternative are estimated to be at least $428,000, virtually all of which would likely be spent in the local economy for labor, supplies, and materials.

The above impacts of trail construction and improvement would be long term, and would impact the local economy and local residents as well as visitors.

Implementation and management of the proposed actions in the preferred alternative would require an increase in overall park personnel, supplies, and equipment. These expenditures are estimated to be $801,300 in 2003 dollars. This includes 3 additional year round, or nearly year round positions, increasing two 6 month positions to year

round, and as many as 7 seasonal positions in the summer. Together, these positions represent a minor positive increase in employment opportunities and expenditures into the local economy in the government sector.

Overall, the proposed actions in the preferred alternative would have a minor impact on the socioeconomic environment. Activity in the retail sales and federal government sectors would likely increase under this alternative. Positive or negative impacts to the regional economy and overall area employment would be very limited in scale. Impacts to the recreational opportunities associated with quality of life would be both positive and negative, depending on the user group, but none would be of such magnitude that it would significantly change the overall quality of life for area residents.

Cumulative Impacts

Past, current and future impacts to the socioeconomic environment are discussed in the *no-action alternative.* The proposed actions under this alternative would generally contribute to further economic growth, though likely on a much smaller scale than the earlier development actions. Past, present, and foreseeable future actions increase economic activity through diversification of the economic base, especially in non tourism related areas, thus minimizing the overall economic impact of any changes made at Exit Glacier in the foreseeable future. Cumulatively, these other actions would have minor impacts on the socioeconomic environment. The additional contribution of minor impacts from this alternative results in a continued minor rating for overall cumulative impacts to the socioeconomic environment.

Conclusion

Overall, the proposed actions in the preferred alternative would have a minor impact on the socioeconomic environment, with changes seen in retail sales and federal government sectors. Positive or negative impacts to the regional economy and overall area employment would be very limited in scale. Impacts to the recreational opportunities associated with quality of life would be both positive and negative, depending on the user group, but none would be of such magnitude that it would significantly change the overall quality of life for area residents.

Safety

Analysis of Impact

Allocation of management zones may have impacts on safety, especially in the more primitive zones where higher recreation risks would be involved and fewer safety precautions would be permitted as prescribed by desired zone conditions. For example, structures, such as bridges for stream crossings, would not be allowed in the Backcountry Primitive Zone and safety signs would be minimal in the Hiker and Backcountry Semi-Primitive zones.

Under the preferred alternative, visitors engaging in non-motorized winter activities would have access to designated trails. The bike bath would be groomed for skiers, skijorers, and dogmushers. Approximately 2% of the study area, specifically the road,

parking lot, and Paradise Valley would be accessible by motorized vehicles in the winter. Reducing motorized vehicle use could increase safety of snowmachiners since off-trail riding through areas of rough terrain would be limited, especially with the closing of the outwash plain to snowmachines. However, in previous years, there have been very few injuries of snowmachiners related to rough terrain; therefore, restricting off-road winter motorized use would improve safety only slightly.

Having separate designated trails for both non-motorized and motorized activities could enhance safety by reducing the potential for conflict between user groups. Potential for winter injuries would be low because of designated trails and limited access for motorized recreationists. Vegetation and topography generally restricts all users to the narrow path to the glacier terminus. Limited visibility and the difficulty in moving out of the path fast enough to avoid collisions is a safety concern alleviated by the designation of this route as non-motorized only.

The new Paradise Valley and Unnamed Peak trails would provide easier access to steep terrain. The terrain on these two trails would resemble that of the Harding Icefield Trail (HIT) where most of the injuries related to trails currently occur. The HIT is much steeper in terrain than any other trail in the study area. Since the Unnamed Peak Trail would resemble the HIT, it is assumed that the same types of injuries, such as sprains, cuts and scrapes could occur. Adding 3 miles of new trails provides more access to steep terrain within the study area on which these types of injuries may occur.

Under the preferred alternative, visitors hiking on new trails may lead to an increase in wildlife encounters. In previous years no injuries in the Exit Glacier area have been documented from conflicts with wildlife such as moose or black bears (NPS 2002b). With the three new miles of trails, human-wildlife conflicts are expected to remain low, as visitors are generally educated and aware of not disturbing wildlife. Wildlife is dispersed throughout the park and can avoid human contact, leaving low potential for such encounters.

Access to the new Paradise Valley Trail would involve crossing Exit Creek. Visitors crossing this river would be at increased risk to hypothermia or being swept down stream if footing is lost. The potential for a mishap is high, as Exit Creek is extremely silty and the bottom is seldom visible, increasing the difficulty to navigate it. Additionally it is glacially fed, making the water very cold with the potential for floating ice. However, since only experienced hikers are likely to venture on this trail and attempt river crossings, large numbers of accidents and severe injuries are not anticipated. Injuries such as cuts and sprains could occur from stream crossings, although the potential for more serious injuries remains low.

Under this alternative, the risk of fecal coliform contamination in the water could increase. New trails bringing visitors into contact with rivers and streams used for drinking water could increase the risk of contamination from unconfined human waste. Visitors consuming water without using a filter or boiling it would be at risk from *E. coli* and *Giardia* infections. Since there are no documented incidents of visitors acquiring *E.*

coli or *Giardia* from water sources in the Exit Glacier area, chances of acquiring an infection are expected to remain low.

Cumulative Impacts
Past, current and future impacts to safety are discussed in the *no-action alternative.* Cumulatively, these other actions would have minor impacts on safety. The additional contribution of minor impacts from this alternative results in a continued minor rating for overall cumulative impacts to safety.

Conclusion
Under the preferred alternative, visitor safety would be classified as a minor impact. Most of the safety issues would stay the same or visitor safety would improve. Stream crossing and increased use of trails pose potential for injuries to occur in the Exit Glacier area.

IMPACTS OF ALTERNATIVE A

Soils

Analysis of Impact
The designation of management zones would protect soils from high levels of impact in the majority of the study area. Over 92% of the study area would be zoned as Backcountry Semi-Primitive and Backcountry Primitive, thus expected to receive little visitation as no trails would be present. Approximately 7% of the area would be zoned Hiker and Pedestrian, where most visitors would spend time, resulting in the greatest impacts to soils. The application of the new management zones and carrying capacity framework would be the same as described under *Soils* in the *preferred alternative.*

The construction of a 10' x 10' wetland viewing platform would have little direct impact to soils as the platform would be built on piers. Construction of a platform access boardwalk on the south side of the park entrance near the bridge should not impact soils adjacent to the boardwalk footprint as visitors would remain on the boardwalk. Wet soils and streams should discourage visitors from stepping off the boardwalk into fragile wetland areas.

The effects of construction of a 0.3 mile long paved section of trail on the southern end of the main trail from the parking lot to the glacier to improve handicap access to the edge of the outwash plain could result in impacts to soils along the margins of the trail tread. A paved trail would tend to collect rainwater that could sheet and flow onto adjacent soils potentially increasing rates of erosion in areas where rainwater sheeting occurs. Trail users stepping off of the trail tread as necessary for passing, taking pictures, resting, etc. may cause soil compaction and/or churning beyond actual trail tread. Compacted soils lose porosity that could cause rainwater to flow on and erode surface soils. Impacts along the margins would be limited to an average of 0.75 ft (0.225 m) out from the trail's edge. Given that the new trail paving would be approximately 0.3 miles (0.5 km) long and 8 ft

(2.4 m) wide, the total impact expected would be 0.3 acre (0.1 ha). The impact would not likely result in measurable changes in the impacted area's overall biological productivity.

The construction of 0.75 mile long, 36" to 48" wide extension to existing social trails along the north side of Exit Creek from a location near the vehicle bridge past the campground, and connecting to the eastern end of the Nature Trail could result in impacts to the trail tread and along the margins of the trail. Soil impacts would be localized and include compaction or churning. Trail users stepping off of the path as necessary for passing, taking pictures, resting, etc. could cause compaction beyond actual trail tread. Once soil porosity is decreased, water may pond on the trail surface saturating the soil and eventually flow down trail causing rills that could damage the trail tread and remove fines. Impacts would be limited to 0.75 ft (0.225 m) out from the trail's edge. Given that the trail would be approximately 0.75 miles (1.2 km) long and 3 ft (0.9 m) wide, the total impact expected would be 0.5 acre (0.2 ha). These impacts would not measurably change the impacted area's overall biological productivity.

Construction of a 0.25 mile long, 18" to 24" wide spur trail from the Harding Icefield Trail, in the location of an existing social trail, leading to the glacier to provide access for ice climbers would result in minimal impacts to soils. It is anticipated that use of this trail would be limited to ice climbers and impacts would be confined to the trail tread and adjacent trail margins. The cutting and filling needed to construct the trail could result in increased erosion by changing hillslope morphology and runoff patterns and creation of visual scars. Impacts to soils would be similar to those described above for trails north of Exit Creek. Impacts along the margins would be limited to an average of 0.75 ft (0.225 m) out from the trail's edge. Given that the trail would be approximately 0.25 miles (0.4 km) long and 3 ft (0.9 m) wide, the total impact expected would be 0.1 acre (0.04 ha). The impact would not likely result in measurable changes in the impacted area's overall biological productivity.

Minor changes or additions to existing infrastructure (as described in Chapter 2: Alternatives, Including the Proposed Action)would result in negligible impacts to less than half an acre of soils.

Cumulative Impacts

Past, current and future impacts to soils are discussed in the *no-qction alternative.* The actions associated with the implementation of this alternative would add an estimated 1.4 acres (0.5 ha) of impacted soils to the existing 30 acres (12 ha) that are already impacted. Cumulatively, these other actions would have moderate impacts on soils. The additional contribution of negligible impacts from this alternative results in a continued moderate rating for overall cumulative impacts to soils.

Conclusion

The overall impact on soils as a result of implementing this alternative is negligible. The total estimated area of soils that could likely be measurably impacted is approximately 1.4 acre (0.5 ha). On most of this area there are not likely to be impacts that could measurably change the impacted area's overall biological productivity. All the impact in

this alternative is associated with the construction of new routes and trails and the normal impact from trampling that typically occurs along margins of trails. The level of impacts to soils anticipated from this alternative would not result in an impairment of KEFJ resources that fulfill specific purposes identified in the establishing legislation or are key to the natural integrity of this park.

Water Quality

Analysis of Impact
The designation of management zones would protect water quality from high levels of impact in the majority of the study area. The majority of the bodies of water in the Exit Glacier area would occur in the Backcountry Primitive Zone where visitation would be low. The greatest impacts to water quality would occur in the Hiker Zone along Harding Icefield Trail streams and Exit Creek. The application of the new management zones and carrying capacity framework would be the same as described under *Soils* in the *preferred alternative.*

Under alternative A, three social trails along the north side of Exit Creek would be converted to official trails, bringing slightly more visitors in contact with surface water sources. Temporary, primarily summer seasonal changes in water quality may result from unconfined human waste entering streams that may be used for drinking water or recreation. However, due to the fairly close proximity of the proposed Exit Creek Trail to sanitary facilities, no detectable changes are expected. Use of yurts would have no impact on water quality as they would not be located near surface waters and sanitary facilities are available nearby. Water quality would be expected to remain well below DEC standards.

Winter use of snowmachines would occur primarily on the road, parking lot and may concentrate hydrocarbon pollution in waters directly adjacent to these areas. Particulate matter from exhaust or fuel spills on surfaces can enter waters as snow melts. However, if snowmachine use levels remain similar to current levels and use of machines with improved technology increases, hydrocarbon pollution and associated changes to water quality can be expected to decrease over the next 10 years. Use of a snow coach would not be expected to contribute adverse impacts to water quality, as discussed in the *preferred alternative*

Cumulative Impacts
Past, current and future impacts to water quality are discussed in the *no-action alternative.* Cumulatively, these other actions would have minor impacts on water quality. The additional contribution of minor impacts from this alternative results in a continued minor rating for overall cumulative impacts to water quality.

Conclusion
Under alternative A, minor impacts to water quality could be expected. The level of impacts to water quality anticipated from this alternative would not result in an

impairment of KEFJ resources that fulfill specific purposes identified in the establishing legislation or are key to the natural integrity of this park.

Floodplains

Analysis of Impact

The application of management zones would have little additional impact to floodplains in the study area. The high visitor use areas at Exit Glacier have historically been located within the floodplain, as this is the most accessible part of the park. Designating these areas as the Visitor Facilities and Pedestrian Zones would not change floodplain structure or processes.

Under this alternative, constructing a wetland viewing platform and a trail in a floodplain are proposed. The hiking trail would follow natural geographical contours. No berming, ditching, diverting stream channels, or otherwise altering the natural floodplain hydrology would be conducted. The wetland viewing platform would be constructed parallel to an existing road over an existing levee (see *Wetlands* section below). Because of these considerations, no changes to the floodplain are expected.
NPS activities that have the potential to have adverse impacts on floodplains are discussed under the *preferred alternative*. Actions to protect infrastructure, especially in the Visitor Facilities and Pedestrian zones, are also discussed in the *preferred alternative*.

Cumulative Impacts

Past, current and future impacts to floodplains are discussed in the *no-action alternative*. Cumulatively, these other actions would have moderate impacts on floodplains. The additional contribution of moderate impacts from this alternative results in a continued moderate rating for overall cumulative impacts to floodplains.

Conclusion

Under alternative A, there could be moderate impacts on floodplain resources or function as changes to protect infrastructure would continue and are expected to be long-term. The level of impacts to floodplains anticipated from this alternative would not result in an impairment of KEFJ resources that fulfill specific purposes identified in the establishing legislation or are key to the natural integrity of this park.

Wetlands

Analysis of Impact

The designation of management zones would protect the majority of wetlands in the study area from high levels of impact. The majority of wetlands at Exit Glacier would be located in the Backcountry Primitive Zone where many visitors would not be expected. There might be some impacts to the small percentage of wetlands that occur in the Visitor Facilities Zone. The application of the new management zones and carrying capacity framework would be the same as described under *Soils* in the *preferred alternative*.

Under alternative A, a wetland viewing platform would be constructed. This platform would be approximately 10'x10', and accommodate up to 12 persons. It would be located immediately inside the park entrance, situated on pilings over a wetland area. The approach ramp to the platform would be located on a previously disturbed area of roadbed riprap and would not encroach further into wetland areas. Pilings would be of untreated wood or inert synthetic materials, or be treated with a non-toxic wood preservative. Construction activities involving pile drivers or similar equipment would temporarily affect an area of less than one acre and alter natural wetland function by increasing water turbidity and disturbing substrates, possibly disrupting or displacing plant and invertebrate life. These impacts would be limited to the duration of construction, not exceeding 3 months.

Changes caused by the placement of the platform itself may include shade produced by the structure, which could lower water temperatures or block light to aquatic vegetation. Changes to water temperature would be dependant on the amount of sunshine, and limited to the active growing season. Since the structure would be small and shade an area of 100 square feet or less, no or very little measurable change to the wetland ecosystem function is expected. Wetland displacement by pilings would not likely to exceed six square feet, resulting in an insignificant loss of wetland area. The wetland viewing platform would have minor overall impacts on wetland area, function, and structure, as changes, both temporary or permanent, would affect less than 5 acres.

NPS activities that have the potential for adverse impacts on wetlands are discussed under the *preferred alternative.*

Cumulative Impacts

Past, current and future impacts to wetlands are discussed in the *no-action alternative.* Cumulatively, these other actions would have moderate impacts on wetlands. The additional contribution of minor impacts from this alternative results in a continued moderate rating for overall cumulative impacts to wetlands.

Conclusion

Alternative A would have minor impacts to wetlands, as little additional wetland area would be affected. The level of impacts to wetlands anticipated from this alternative would not result in an impairment of KEFJ resources that fulfill specific purposes identified in the establishing legislation or are key to the natural integrity of this park.

Air Quality and Visibility

Analysis of Impact

The designation of management zones would protect air quality and visibility from high levels of impact in the majority of the study area. Emissions associated with motor vehicles, power tools, woodstoves, and campfires would originate predominantly in the Visitor Facilities Zone which comprises less than 1% of the study area. The application of the new management zones and carrying capacity framework would be the same as described under *Soils* in the *preferred alternative.*

Under alternative A, two new trails would be constructed. Trail construction would involve some use of two-stroke engines such as chainsaws, causing localized exhaust and odors. However, chainsaw use would be limited to removal of large trees and would be employed only brief periods of time, therefore, emissions affecting visibility and smell would not exceed 6 hours a day.

The parking area would not be expanded, thus the number of vehicles creating emissions would be limited by parking area size, as discussed under the *no-action alternative.* Wood burning firepit/fireplaces would be provided for visitors in the campground and picnic areas, also as discussed under the *no-action alternative.*

Under alternative A, winter snowmachine use would occur primarily on the road and parking area, resulting in a net decrease in winter emissions from current levels and a slight positive impact on air quality, as objectionable visible emissions and odors would be generally limited. In some weather conditions and depending on winds, exhaust may drift further, but would not be detectable in 50% of the study area, or last greater than 6 hours a day, due to short winter days. Additionally, snowmachine hydrocarbon emissions may decrease over the next decade as technology improves.
As in the *preferred alternative*, a snow coach would be implemented to provide winter access to the study area for recreation and winter educational programs.

Cumulative Impacts
Past, current and future impacts to air quality are discussed in the *no-action alternative.* Cumulatively, these other actions would have minor impacts on air quality and visibility. The additional contribution of minor impacts from this alternative results in a continued minor rating for overall cumulative impacts to air quality and visibility.

Conclusion
Alternative A would have minor positive impacts on air quality as visitation may increase but snowmachine use would be reduced. The level of impacts to air quality and visibility anticipated from this alternative would not result in an impairment of KEFJ resources that fulfill specific purposes identified in the establishing legislation or are key to the natural integrity of this park.

Soundscape

Analysis of Impact
The designation of management zones would protect the soundscape from high levels of impact in the majority of the study area. Desired soundscape conditions call for natural sounds to predominate, with few intrusions, in over 98% of the study area (Backcountry Primitive and Hiker zones). Noise would be expected more often in the Visitor Facilities and Pedestrian zones. The application of the new management zones and carrying capacity framework would be the same as described under *Soils* in the *preferred alternative.*

The non-motorized recreation focus of alternative A could attract increased visitation into naturally quiet areas, especially in winter, which could increase the number of human

voices and other noises audible in the backcountry. Implementing other actions in this alternative, including completing a new gathering pavilion, building a wetlands viewing platform, improving trails, providing overnight accommodations, and keeping the Nature Center open in winter could have impacts on the soundscape in the study area.

Power tools would be used to improve trails, install additional signs, and construct the wetlands viewing platform, causing noise intrusions to the soundscape, similar to those described under the *preferred alternative.*

With the addition of the wetlands viewing platform, there would be negligible additional noise intrusions from human voices. Natural sounds would predominate, as the platform is intended for quiet observation. Visitors would most likely park at the large parking area outside of the study area (but within walking distance) to visit the viewing platform, creating no additional vehicle related noise.

Under alternative A, winter motorized vehicle use would occur primarily on the road and parking lot. Although the noise could travel outside of the road corridor and be heard at distances of over a mile, the source of the high-intensity or objectionable noise would be concentrated around the road corridor, and usually would not total over 6 hours due to short winter days. With the popularity of snowmachining increasing, snowmachine use could be expected to increase over the next decade. However, the intensity of snowmachine noise may correspondingly decrease over the next decade as snowmachine technology improves and quieter machines are used. Overall noise levels, even within the concentrated use areas could be reduced from current levels.

Implementation of a snow coach is also planned, as described under the *preferred alternative.*

Marked ski routes would provide winter ski opportunities and would require motorized grooming. Noise associated with grooming would correspond with snow fall. Noise from grooming would be of short duration, not exceeding three hours a day and limited to less than a mile from the trails.

Staffing the Nature Center for winter operation would provide services for visitors using the trails or participating in the additional educational and public programs offered. Snowshoeing and skiing programs, school and public programs including winter nature walks, and evening programs in the Nature Center would create minor intrusions in the soundscape, as sounds would either be confined within the building or intermittent and only audible near the group or activity.

The park currently offers overnight accommodations in winter for visitors in the study area. A public use cabin, available by reservation, is provided for visitors who travel to Exit Glacier and wish to spend the night. The trip from Seward attracts the hardiest and most dedicated outdoor visitors who have traditionally created no impact to the natural soundscape. The addition of yurts for overnight accommodations would not markedly increase noise intrusions. Noise from voices would be expected to be concentrated

around the yurts for brief periods, primarily during mornings and evenings while visitors are entering and leaving the area.

Cumulative Impacts
Past, current and future impacts to the soundscape are discussed in the *no-action alternative.* Cumulatively, these other actions would have minor impacts on soundscape. The additional contribution of minor impacts from this alternative results in a continued minor rating for overall cumulative impacts to soundscape.

Conclusion
Implementation of alternative A would result in minor impacts to the soundscape of the Exit Glacier area, as many of the impacts to the soundscape would be transient (seasonal) or limited to construction of discrete projects. The level of impacts to the soundscape from this alternative would not result in an impairment of KEFJ resources that fulfill specific purposes identified in the establishing legislation or are key to the natural integrity of this park.

Vegetation

Analysis of Impact
The designation of management zones would protect vegetation from high levels of impact in the majority of the study area. Impacts to vegetation would be greatest in the Hiker, Pedestrian, and Visitor Facilities zones, which comprise approximately 8% of the study area, where visitation and development would be highest. The rest of the Exit Glacier area would receive few impacts to vegetation. The application of the new management zones and carrying capacity framework would be the same as described under *Soils* in the *preferred alternative.*

Under alternative A, the construction of a spur trail to the glacier, a wetland viewing platform, and the potential for introduction of exotic plant species could impact the native vegetation. Approximately 1.4 acre (0.5 ha) of previously undisturbed lands would be altered in this alternative in order to accommodate these actions.

The spur trail to the glacier would extend from the existing Harding Icefield Trail to the glacier following current social trails. Similarly, the Exit Creek Trail would be constructed by developing the existing social trail along Exit Creek. Construction activities would primarily involve further brushing to make the route more visible with little removal of woody shrubs. Trees would be removed only when necessary for trail access or for safety reasons. The trail would be located in the alder-willow scrub plant community. Impacts to vegetation during the construction phase of this trail would be measurable and outside of natural variability for more than one growing season, although the trail footprint could be altered for many years or permanently.

Impacts to vegetation from use of the proposed new trails are described under the *preferred alternative.* The trails would be maintained in such a way as to reduce impacts to vegetation as described under the *preferred alternative.*

Under alternative A, a wetland viewing platform would be constructed. This platform would be approximately 10'x10', and would be located immediately inside the park entrance, situated on pilings over a wetland area. The approach ramp to the platform would be located on an unvegetated area of roadbed or over riprap and would not impact vegetation. Construction activities involving pile drivers or similar equipment may impact adjacent herbaceous plants, such as fireweed and grasses, although this type of vegetation would also likely rebound quickly and not be impacted longer than one or two growing seasons, resulting in no measurable impacts to plant populations. Changes caused by the placement of the platform itself may include shade produced by the structure, which could lower water temperatures or block light to aquatic vegetation. Since the structure would be small and shade an area of 100 square feet or less, no or very little measurable change to the wetland vegetation would be expected.

Increased recreational opportunities and attractions, such as the wetland viewing platform, could result in small overall increased visitation in the study area. Increased trampling of soils on the outwash plain, as well as increased off-trail use may occur. Trampling could compact fragile developing soils and delay or prevent normal plant succession, as described under the *no-action alternative.*

The actions discussed above have the potential to impact vegetation indirectly through the introduction and spread of exotic plant species in the study area, as described under the *preferred alternative.*

Cumulative Impacts

Past, current and future impacts to vegetation are discussed in the *no-action alternative.* Cumulatively, these other actions would have major impacts on vegetation. The additional contribution of minor impacts from this alternative results in a continued major rating for overall cumulative impacts to vegetation.

Conclusion

The combined impacts of the actions in this alternative would be minor as no actions having long-term measurable impacts are planned, trail maintenance would continue, and exotic species would not be allowed to spread unchecked. The level of impacts to vegetation from this alternative would not result in an impairment of KEFJ resources that fulfill specific purposes identified in the establishing legislation or are key to the natural integrity of this park.

Wildlife

Analysis of Impact

The designation of management zones would result in little impact on wildlife in the study area. Disturbance of wildlife and impacts on wildlife habitat would be greatest in the Visitor Facilities, Pedestrian, and Hiker zones, which comprise approximately 8% of the study area, where the majority and visitation and development would occur. The application of the new management zones and carrying capacity framework would be the same as described under *Soils* in the *preferred alternative.*

Under alternative A there are number of proposed actions which may have an effect on wildlife species in the Exit Glacier area. For the purpose of this analysis similar actions have been grouped under the following headings: new trails, winter visitation, winter use of motorized vehicles, and new facilities.

New Trails

A new Exit Creek Trail, a spur trail from the Harding Icefield Trail to the glacier, and winter ski routes along Exit Creek and Paradise Creek are proposed under this alternative. Impacts to wildlife from the Exit Creek Trail and ski routes could result from behavioral responses to approaching hikers and from habitat alterations, habitat fragmentation and habitat loss due to trail construction. The spur trail would not be expected to have any measurable impact on wildlife.

Behavioral responses of wildlife species to trail construction, trail maintenance, and hikers are described under the *preferred alternative.*

Research has focused on the effects of hiking and recreational trails on bird populations, where effects of disturbance may be subtle, such as changes in diversity, nesting success, or distribution. Recreational trails have been shown to adversely affect both the numbers and breeding success of some bird species using habitats adjacent to trails, although it is not clear whether those effects were due primarily to the edge effect of the trail or to human disturbance (Miller et al. 1998). The Exit Creek Trail would direct visitors into riparian habitats along Exit Creek, possibly disturbing songbirds during the breeding season. It is assumed that use of this new trail may be extensive enough to result in measurable changes in diversity, nesting success and distribution of resident bird species immediately adjacent to the new trail. However, these changes are not expected to impact diversity or populations of songbirds in the Exit Glacier area as a whole.

Habitat loss from construction of the Exit Creek Trail would reduce available nesting habitat for riparian nesting songbirds in the Exit Glacier area by less than 5%. Breeding songbirds utilizing this habitat type may experience a corresponding 5% decrease in populations. This decrease, however, is not outside the expected range of natural variation for bird populations. Only negligible habitat loss due to the proposed winter ski routes and the spur trail is expected.

The proposed new trails may also allow for the establishment or encroachment of non-resident species such as corvids along trail corridors. This would be of greatest concern along the proposed Exit Creek Trail, with impacts described under the *preferred alternative.*

During winter, animals can experience an energy deficit, as more energy is used to survive than is replenished, as described under the *preferred alternative.*

Winter Visitation

Actions in this alternative intended to facilitate winter visitation to the Exit Glacier area, developing winter interpretive and school programs, and providing for more overnight

accommodations, could impact wildlife, particularly moose, mountain goats, wolverines, lynx, and wolves.

Overwintering moose rely on early successional willow stands below Exit Glacier for critical winter forage (see impacts described under the *preferred alternative*). Under this alternative, winter visitation would rise from a total of about 560 people to almost a 1,100 people, an average use level of about 65 people per week assuming a 17 week season. Given this level of human use, though moose may be temporarily disturbed by skiers and other recreationists, the frequency and duration of disturbance is unlikely to be sufficient to impact species population numbers or in other ways cause changes that are outside the range of natural variation.

The above mentioned increase in human activity during winter may impact wolves, wolverine, and lynx, all species which have large home range requirements and a low tolerance for human disturbance (Zielinski 1995). Impacts to winter carnivores are described under the preferred alternative.

Winter Use of Motorized Vehicles
Reduced motorized winter use would likely have a positive effect on wildlife by limiting human activity, such as snowmachining, in much of the Exit Glacier area during winter. Even with motorized vehicle use occurring primarily on the road and parking lot, impacts to wildlife, particularly moose, wolves, wolverines, and lynx, from motorized use could still occur. See the preferred alternative for a discussion on impacts of repeated snowmachine use on wildlife behavior and levels of physiological stress.

New Facilities
Construction of trails and a wetlands viewing platform would be expected to have negligible impacts on wildlife in the Exit Glacier area. Displacement and avoidance of this site could occur during construction and subsequent use, but these facilities would not be constructed in an area considered important wildlife habitat.

Cumulative Impacts
Past, current and future impacts to wildlife are discussed in the *no-action alternative.* Cumulatively, these other actions would have major impacts on wildlife. The additional contribution of minor impacts from this alternative results in a continued major rating for overall cumulative impacts to wildlife.

Conclusion
Overall, the proposed actions in alternative A would have a minor impact on wildlife in the Exit Glacier area, though the cumulative impacts from previous development within the park coupled with the proposed actions may have moderate impacts on some species such as wolves, lynx, and wolverine. Of the proposed actions, new trails and actions designed to promote increased winter visitation would be those most likely to impact wildlife by spatially and temporally altering human intrusions on wildlife. The positive impacts of the proposed reduction of motorized vehicles in winter, however, may provide a counter balance to negative impacts arising from other actions. The level of impacts to wildlife from this alternative would not result in an impairment of KEFJ resources that

fulfill specific purposes identified in the establishing legislation or are key to the natural integrity of this park.

Visitor Experience

The application of the new management zones and carrying capacity framework under alternative A ultimately require standards be established that would maintain a high quality visitor experience. Attributes of the visitor experience that would be protected include solitude in the Backcountry Primitive and Backcountry Semi-Primitive Zones, well maintained trails and moderate potential for solitude in the Hiker zone, ability to view the glacier without being crowded in the Pedestrian zone, and availability of information and other visitor services in the Visitor Facilities Zone. The application of the new management zones and carrying capacity framework would be the same as described under *Soils* in the *preferred alternative*.

Analysis of Impact

Visitation
Curriculum based education programs for students would be provided during the early spring and late fall. Although the exact impact is difficult to predict, if we assume a 30 person class daily for two months each spring and two months each fall, annual visitation increases by about 3660.

In the winter, the temporary overnight accommodations offered through a concessionaire in addition to the existing public use cabin could attract additional visitors to the area. There are numerous variables to consider in analyzing the impact of this action, and many of these variables are unknown. The scope of this concession operation would average approximately 10 overnight visitors at one time due to facility limitations (water, restroom facilities, etc.) and limited demand. The season would generally run from December 1 to April 1, as limited by adequate snow cover. Most use would be on weekends as the market would consist of Alaskan residents out for weekend recreation. Thus, 10 overnight visitors per weekend for 16 weekends could result in an additional 160 visitors as a result of this action. While this is a rough estimate, it does provide an idea of the magnitude of the impact that could result from this action.

Winter activities would be scheduled for the public and for school groups at the Exit Glacier Nature Center, which could result in increased numbers of winter visitors. Based on demand, activities would be scheduled as often as every day or just once a week. These actions could result in 250 to 500 additional winter visitors, based on an estimate of weekly programs with 15 to 30 attendees each over a 17 week season from December 1 to March 31. For analysis purposes, the high estimate of 500 additional visitors is used.

In winter, motorized vehicle use would occur primarily on the entrance road and parking lot. A large number of the motorized users that go to Exit Glacier to ride their snowmachines on the outwash plain and open stream beds would instead find other unrestricted areas in which to ride outside of the study area. However, those winter

visitors who have the goal of seeing the glacier, or are out for an easy ride with family or novice riders would likely still ride their machines to the parking lot and then travel on foot to the glacier. The anticipated annual changes in winter visitation as a result of this management action are about 200 fewer snowmachiners and 50 additional non-motorized users from the current annual totals of 465 and 95 respectively. Reducing the number of snowmachiners in the Backcountry Semi-primitive zone to meet desired conditions of the zone would decrease the number of snowmachiners by approximately another half. Thus, on a nice winter weekend day with good snow conditions the average number of snowmachiners expected in the Exit Glacier area would be approximately 5 to 15.

The paved trail to the glacier would be groomed for winter non-motorized recreation. Maintaining this short section of trail would not attract additional visitors to the glacier, but only make traveling on this trail easier for visitors who were coming anyway. The marking but not grooming of ski routes in the study area would not by itself attract a significant number of additional winter visitors. However, when looking at this action combined with the other actions that promote non-motorized use, the overall effect could be an attraction of additional skiers and other non-motorized visitors. The numbers of additional visitors are captured in the analyses of the other winter actions.

The implementation of this alternative would result in a minor impact to total annual visitation at Exit Glacier. The actions associated with this alternative would result in a 2.8% increase in summer visitation (assuming a current summer visitation of 125,000 people and an additional 3,600 visitors as a result of this alternative) and a 91% increase in winter visitation (assuming a current winter visitation of 560 people and an additional 510 visitors as a result of this alternative), for an increase in total annual visitation of 3.3%. These changes do not represent a detectable shift in the ratio of summer to winter visitation, since even with the expected increases, winter visitation could still represent less than 1% of the annual total. There is also no anticipated shift in the daily or hourly distribution of use as a result of the actions listed above. There may be a detectable change in the distribution of visitation in the spring and fall as a result of curriculum based education programs for students depending on when these programs are offered.

Visitor Profile

Curriculum based education programs for students would be provided during the early spring and late fall. The *Visitation* analysis above predicts an additional 3600 visitors as a result of this action. Most of these visitors would be students, and thus their average age would be markedly lower than that of the average visitor, which is 33.5 (Swanson et al. 2003). Also, most of these school groups would be from Southcentral Alaska, thus the distribution of where they are from would be markedly different than that of the average visitor, of which 76% are United States residents from outside Alaska (Swanson et al. 2003). The length of stay for these additional visitors would be similar to that of the average visitor, according the park interpretive staff.

In the winter, the temporary overnight accommodations offered through a concessionaire in addition to the existing public use cabin could attract additional visitors to the area. Although there is no data on the demographics of current winter visitors, the additional

visitors that would go to Exit Glacier as a result of this action would likely be of similar age and come from the same general areas as the current average winter visitor. However, while most current winter visitation is day use, encouraging overnight use could lengthen the average stay for winter visitors. Compared to the profile of the average summer or annual visitor, the additional visitors would more likely be southcentral Alaska residents and their length of stay could be measurably longer, but there would not be a marked difference in average age.

Although the anticipated decrease in snowmachine use and increase in the number non-motorized users (see *Visitation* analysis above) would reduce the motorized-to-non-motorized use ratio, not enough is known about the demographics of winter visitors to assess any potential impacts to visitor profile. However, less than one percent of total annual visitors would be affected by this action (see *Visitation* analysis above).

Winter activities would be scheduled for the public and for school groups at the Exit Glacier Nature Center, which would result in increased numbers of winter visitors, visitors as discussed in the *preferred alternative.*

The marking, but not grooming, of ski routes in the study area would not attract a significant number of additional winter visitors (see *Visitation* analysis above) and thus would not have a significant impact on the average visitor profile. However, when combining this action with the other actions that promote non-motorized use, the overall effect could be an attraction of additional skiers and other non-motorized visitors. The impacts of these additional visitors to the average visitor profile are captured in the analysis of the other winter actions above.

The implementation of this alternative would result in negligible impacts to the annual average visitor profile at Exit Glacier due to the small numbers of visitors involved.

Visitor Access

The following minor changes or additions to existing infrastructure could increase visitor access: improvement of the existing social trails along the north side of Exit Creek and the addition of a spur trail from the Harding Icefield Trail to allow access for ice climbing on the glacier. While unofficial social trails exist in both of these areas, official routes would be designated and would provide increased access to currently inaccessible areas. These actions would not have a measurable impact on the number of visitors, thus less than 25% of the total number of visitors would be affected by these actions.

In winter, the entire area would be accessible, due to snow cover, for non-motorized recreation; trails and marked routes would not be relatively as important for providing access as they would be in the summer. The marked ski routes in the study area would provide additional access to areas that are already accessible as well as opening up new areas that are currently inaccessible. South of the entrance road, the current and abandoned stream channels of Exit and Paradise Creeks provide easy non-motorized access in the winter, and any new routes would improve access in those areas by providing connecting trails through areas of dense vegetation. Natural breaks in the

dense vegetation are often difficult to find without local knowledge or trail marking. The area north of the entrance road receives little or no current winter use due to thick vegetation. Any new winter routes in that area would create access where none currently exists. As noted in the *Visitation* analysis above, these actions would not have a significant impact on the number of visitors, thus less than 25% of the total number of visitors would be affected by these actions.

The implementation of this alternative would result in moderate impact to off-road visitor access as a result of adding new routes and trails to areas that are currently not accessible to visitors. These new trails would not be high use trails and thus would impact fewer than 25% of the visitors to the Exit Glacier area.

Visitor Activities

Curriculum based education programs for students would be provided during the early spring and late fall The *Visitation* analysis above predicts an additional 3600 visitors as a result of this action. In addition to participating in the critical activity of walking up to and viewing Exit Glacier, most of these additional visitors would also be participating the non-critical activity of participating in guided walks or hikes.

The installation of new exhibits and signs may slightly increase the percentage of visitors engaging in the non-critical activity of reading educational displays and materials. However, many of those visitors would probably be the same 44% (Swanson et al. 2003) who read the existing materials. Thus the relative distribution of visitor participation would not change. As such, any change would not be statistically significant.

In the winter, the temporary overnight accommodations offered through a concessionaire, in addition to the existing public use cabin, could attract additional visitors to the area. This action could measurably increase the proportion of overnight winter visitors adding to both the critical activity of viewing the glacier and the non-critical activities of camping overnight, skiing, snowshoeing, or snowmachining.

The implementation of this alternative would allow snowmachine activity primarily on the road and parking lot. As a result, a number of the motorized users that go to Exit Glacier to ride their machines in the open areas of the outwash plain and floodplains may forgo the trip to the study area. However, those winter visitors who have the goal of seeing the glacier would likely still ride their machines to the parking lot and then travel on foot to the glacier. As described in the *Visitation* analysis above, the anticipated change as a result of this management action could be about 200 fewer snowmachiners each winter. Recreational snowmachining, for purposes other than viewing the glacier, is considered a non-critical activity. An estimat of approximately 50% of the current snowmachiners in the Exit Glacier study area (233 of 465) are there primarily to ride and not to see the glacier. Thus 42% of winter visitors currently partake in this activity, and that proportion would be expected to drop to less than 20% as a result of this action.

Winter activities would be scheduled for the public and for school groups at the Exit Glacier Nature Center. This would have an impact on the number of visitors (see

analysis of *Visitation* above) and could cause a measurable change in the distribution of winter visitor activities. The additional visitors that would go to Exit Glacier as a result of this action would generally participate in viewing Exit Glacier and taking guided walks. These estimated 500 additional visitors (see analysis of *Visitation* above) would not cause a change of more than five percentage points in the proportion of visitors partaking in these activities over the entire year. However, although there is very little data on winter visitor activities, 500 additional winter visitors could almost double the current winter visitation, and thus the proportion of winter visitors partaking in these activities could change by more than 20 percentage points since no formal winter interpretive programs currently exist at Exit Glacier.

The marking, but not grooming, of ski routes in the study area would not attract a significant number of additional winter visitors. However, when combining this action with the other actions that promote non-motorized use, the overall effect could be an attraction of additional skiers and other non-motorized visitors. The activities of additional visitors are captured in the analysis of the other winter actions.

The implementation of this alternative would result in negligible impacts to visitor activities throughout the year as a whole.

Crowding

Curriculum based education programs for students would be provided during the early spring and late fall. Assuming a 30 person class daily for two months each spring and two months each fall, annual visitation could increase by about 3660. Because this action would be limited to the shoulder seasons when visitation is relatively low, the additional visitors would have limited impact on the average daily peak visitation for the summer season. However, when the shoulder season months of May, September and October are analyzed separately, the average daily peak visitation may be impacted to a statistically significant level by the additional visitors, especially since they would be arriving in groups of up to 30 people at one time.

Based on this analysis, the actions associated with this alternative would have a negligible impact on crowding in the Exit Glacier area during the summer season. However, when the shoulder season months of May, September and October are analyzed separately, the average daily peak visitation may be measurably impacted by the additional visitors associated with formal education programs since they would be arriving in groups of up to 30 people at one time. Crowding during the winter season was not identified to be an issue requiring analysis.

Cumulative Impacts

Past, current and future impacts to visitor experience are discussed in the *no-action alternative.* Cumulatively, these other actions would have major impacts on visitor experience. The additional contribution of minor impacts from this alternative results in a continued major rating for overall cumulative impacts to visitor experience.

Conclusion

The impact of alternative A on visitor experience would be minor when averaged over the entire year. The key factors involved are the addition of expanded environmental education programs in the spring and fall, reducing where snowmachine activity is allowed, the implementation of a new winter interpretive program, and the potential addition of a concessionaire-operated yurt system in the winter. The majority of summer visitors would experience little change to their experience at Exit Glacier. The most notable impacts would be to spring, fall and winter visitors. The impacts to Visitor Experience are summarized below. The breakdown of impacts by sub-category and season are as follows:

	Annual average	
Sub-category	Impact Level	Impact Rating
Visitation	Minor	0
Visitor Profile	Negligible	0
Access	Moderate	2
Visitor Activities	Negligible	0
Crowding	Negligible	0
Total Impact Rating		2

The impacts to visitor experience that are described here are difficult to classify as either positive or negative as discussed under the *preferred alternative.*

Socioeconomic Environment

Analysis of Impact

The designation of management zones would not appreciably impact socioeconomics of the local area. Key developments which would have socioeconomic impact are analyzed below.

Increasing shoulder season use through formal education programs, including day camps, teacher workshops, and similar programs, could increase ancillary economic expenditures by these groups. It could also increase government employment during this period, with subsequent expenditures of salary in the local economy.

Though the exact economic impact is difficult to predict, if we assume 500 additional winter visitors and an ancillary per student expenditure of $20, the gross increase in the local economy is about $10,000. Two additional seasonal interpretive employees working for 6 months annually and one additional permanent employee would contribute approximately another $152,300 in federal expenditures to the local economy annually. This impact would be year round and long term.

Construction of a wetland viewing platform, gathering pavilion, paving of the main trail, improving signing, and developing a new Exit Creek Trail would provide additional activities and access opportunities to the visitors, but would not significantly impact the socioeconomic environment. None of these improvements would directly result in a measurable increase or decrease in either visitation or duration of visits. Thus, their

impact on the local economy would be limited to expenditures related to their construction and maintenance. These improvements should result in capital expenditures of approximately $115,200.

These enhancements would improve access to the area, especially to those visitors with disabilities, and could thus improve quality of life through recreational opportunity for them. These improvements alone, however, would not cause a measurable change in the overall quality of life in the local community.

The above impacts of these improvements would be year round and long term.

A new commercial operation proposed under this alternative is concessionaire provided overnight accommodations, possibly in the form of yurts or similar temporary structures. This proposal would provide the opportunity for a new business or expansion of an existing business. This could increase winter employment, expenditures, tax base, and related economic benefits; however, the scale of such impacts would be relatively small in the overall economy given the limited demand for such activity in the local and regional markets. It is assumed that if demand were great, the private sector would have attempted to develop it already, and it has not. A government owned Public Use Cabin at Exit Glacier is currently rented during the winter but demand is generally very low. Even when snow conditions are excellent for winter recreation, the cabin is only booked on some weekend nights and rarely on week nights. The long term viability of a commercial enterprise offering this service is questionable at best. If feasible, however, it may increase the desirability of Exit Glacier as winter recreation destination / experience in a regional tourism market by establishing it as a destination for day use nordic skiing, skijoring, snowshoeing, and winter educational programs, thus increasing overall winter tourism expenditures in the local economy.

This alternative proposes use of a snow coach for winter access by non-motorized recreationists and school groups. This proposal could provide the opportunity for a new business or expansion of an existing business, as discussed under the *preferred alternative.*

The duration of these impacts would be long term, but seasonal in nature, as these activities would only occur when adequate snow cover allows – generally late November through early April.

This alternative proposes restricting motorized winter recreation in the Visitor Facilities and Pedestrian zones. The main trail would be groomed for non-motorized use and other trails marked as routes but not formally groomed. Presently there is only one business, the US Army Seward Resort, providing commercial motorized access to the study area (see description of their operation under the *preferred alternative*). Motorized winter recreation would continue both in the study area, though in a limited fashion, and on adjacent lands, so local businesses deriving economic benefit from this activity would see little or no economic impact.

Visitors who desire the recreational experience of riding a snow machine to the face of Exit Glacier would likely view this action as having a negative impact on the recreational aspect of their quality of life. Other users who seek designation of non-motorized winter recreation areas for physical fitness, silence, or other reasons would likely report a noticeable positive impact on the recreational aspect of their quality of life because it could increase non-motorized winter recreational opportunity.

The duration of this impact would be long term, but seasonal in nature, as this activity would only occur when adequate snow cover allows – generally late November through early April. Economic impacts, positive or negative, would be limited to the local area.

Government sector expenditures in the local economy would increase by approximately $674,000 annually to fully implement the actions in this alternative. These expenditures for salaries, supplies, and materials, would create at least three new permanent year round positions, extend three positions from less than full time to full time, and create at least 6 seasonal positions. This would result in a minor positive economic impact which is local, year round, and long term.

Overall, the proposed actions in alternative A would have a minor impact on the socioeconomic environment. Changes would be seen in the retail sales and federal government sectors. Positive or negative impacts to the regional economy and overall area employment would be very limited in scale. Impacts to the recreational opportunities associated with quality of life would be both positive and negative, depending on the user group, but none would be of such magnitude that it would significantly change the overall quality of life for area residents.

Cumulative Impacts

Past, current and future impacts to the socioeconomic environment are discussed in the *no-action alternative.* The proposed actions under this alternative would generally contribute to further economic growth, though likely on a much smaller scale than the earlier development actions. Past, present, and foreseeable future actions increase economic activity through diversification of the economic base, especially in non-tourism related areas, thus minimizing the overall economic impact of any changes made at Exit Glacier in the foreseeable future. Cumulatively, these other actions would have minor impacts on the socioeconomic environment. The additional contribution of minor impacts from this alternative results in a continued minor rating for overall cumulative impacts to the socioeconomic environment.

Conclusion

Overall, the proposed actions in the alternative A would have a minor impact on the socioeconomic environment. Changes would be seen in the retail sales and federal government sectors. Positive or negative impacts to the regional economy and overall area employment would be very limited in scale. Impacts to the recreational opportunities associated with quality of life would be both positive and negative, depending on the user group, but none would be of such magnitude that it would significantly change the overall quality of life for area residents.

Safety

Analysis of Impact

Allocation of management zones may have impacts on safety, especially in the more primitive zones where higher recreation risks would be involved and fewer safety precautions would be permitted as prescribed by desired zone conditions. For example, structures, such as bridges for stream crossings, would not be allowed in the Backcountry Primitive Zone and safety signs would be minimal in the Hiker and Backcountry Semi-Primitive zones.

Under alternative A, motorized winter activities would have access to the paved road and the parking lot but closed in the remaining portion of the Visitor Facilities and Pedestrian zones. With such restrictions on motorized recreationists, visitor safety in the winter would increase. Eliminating motorized vehicles from the outwash plain would increase snowmachine safety since off-trail riding through areas of rough terrain would be reduced. However, in previous years, there have been very few injuries of snowmachiners related to rough terrain; therefore, eliminating off-road winter motorized use would improve safety only slightly. In addition, vegetation and topography generally restricts all users to the narrow path to the glacier terminus. Limited visibility and the difficulty in moving out of the path fast enough to avoid collisions is a safety concern alleviated by the designation of this route as non-motorized only.

Two new trails, each under one mile in length, are proposed under alternative A: a spur trail from the Harding Icefield Trail (HIT) to the glacier and the Exit Creek Trail. Terrain found on the spur trail would resemble that of the HIT. Experienced ice climbers would be using the spur trail to access the glacier, but other visitors may use it as well. The addition of this glacier access trail would bring more visitors in close proximity to the glacier, with potential risk from falling ice. The Exit Creek Trail would be similar to the Nature Trail, which is generally flat with low potential for injuries.

The potential for wildlife encounters would remain low under this alternative as only a few miles of social trails would be converted to official trails. In previous years, no injuries have been documented from wildlife encounters. Visitors are generally educated and aware of not disturbing wildlife. Wildlife is dispersed throughout the park and can avoid human contact, leaving low potential for such encounters.

Under this alternative, the risk of fecal coliform contamination in the water could increase, as described under the *preferred alternative.*

Cumulative Impacts

Past, current and future impacts to safety are discussed in the *no-action alternative.* Cumulatively, these other actions would have minor impacts on safety. The additional contribution of negligible impacts from this alternative results in a continued minor rating for overall cumulative impacts to safety.

Conclusion
Actions in alternative A would have a negligible impact on visitor safety. Injury rates would not change substantially from previous years. Potential for increases in injuries would be from providing increased access to the glacier via the spur trail.

IMPACTS OF ALTERNATIVE B

Soils

Analysis of Impact
The designation of management zones would protect soils from high levels of impact in the majority of the study area. Almost 85% of the study area would be zoned as Backcountry Semi-Primitive and Backcountry Primitive, thus expected to receive little visitation as no trails would be present. Approximately 13% of the area would be zoned Hiker and Pedestrian, where most visitors would spend time, resulting in the greatest impacts to soils. However, the application of the new management zones and carrying capacity framework under alternative B ultimately require resource protection standards be established to insure that desired resource conditions are met. Once developed, these standards would serve as clearly defined triggers and would provide a more systematic approach for implementing management actions to reduce or eliminate impacts than would occur under the no-action alternative. This would likely produce future long-term beneficial effects on soils.

The construction of a gravel base for 10 to 20 site RV campground and paved access loop road would have localized effects on soils. Increased foot and vehicle traffic in areas adjacent to the gravel RV pad could compact and/or churn soils adjacent to the pad's footprint. Soil porosity could decrease and water could pond on flat or depressed areas. The disturbed soils on the margins of the pad and access road would be more easily eroded and increased sediment from winnowing of fines could be carried into nearby streams. The total impact expected would be approximately 3 acres (1.2 ha). These impacts may measurably change the impacted area's overall biological productivity as much of the area would be paved and a large proportion of the deciduous forest type would be impacted.

The expansion of the existing tent campground would create 9 to 12 new walk-in tent sites and be accessed by a new loop to the west between the river and the existing road. Expansion of parking and loop access to accommodate campground expansion would have localized effects on soils. Foot traffic would compact and churn soils on and adjacent to the campsite. Soil porosity could decrease and water could pond on flat or depressed areas. Once soil porosity is decreased and soils become saturated, runoff and water percolating through the soil may carry sediment fines to adjacent streams. The total impact expected would be approximately 1.5 acres (0.6 ha). These impacts may measurably change the impacted area's overall biological productivity as a large proportion of the tall scrub habitat type would be impacted.

Impacts to soils from the construction of a bike path are described under the *preferred alternative.*

The effects of construction of a 0.3 mile long paved section of trail on the southern end of the main trail from the parking lot to the glacier to improve handicap access to the edge of the outwash plain could result in impacts to soils along the margins of the trail tread. A paved trail would tend to collect rainwater that could sheet and flow onto adjacent soils potentially increasing rates of erosion in areas where rainwater sheeting occurs. Trail users stepping off of the trail tread as necessary for passing, taking pictures, resting, etc. may cause soil compaction and/or churning beyond actual trail tread. Compacted soils lose porosity that could cause rainwater to flow on and erode surface soils. Impacts along the margins would be limited to an average of 0.75 ft (0.225 m) out from the trail's edge. Given that the new trail paving would be approximately 0.3 miles (0.5 km) long and 8 ft (2.4 m) wide, the total impact expected would be 0.3 acre (0.1 ha). The impact would not likely result in measurable changes in the impacted area's overall biological productivity.

The construction of a rustic, year-round 12 to 15 person (approximately 2,500 square feet) hostel-type lodge to the north of the north of the existing parking lot would have localized effects on soils. Increased foot traffic in the area of the lodge could compact and/or churn soils on and adjacent to the lodge footprint. Soil porosity could decrease and water could saturate soils, pond on flat or depressed areas, or remove fines from the soil. The total impact expected would be approximately 0.75 acre (0.3 ha). These impacts may measurably change the impacted area's overall biological productivity as much of the area would be covered by non-native building materials.

The construction of a new 0.75 mile long trail paralleling the north side of Exit Creek would be constructed. This trail would run from the vehicle bridge past the campground and connect to the eastern-most section of the Nature Trail. Existing social trails would be widened to 36" to 48". Soil impacts would be localized and include compaction and/or churning. Trail users stepping off of the path as necessary for passing, taking pictures, resting, etc. will cause compaction beyond actual trail tread. Once soil porosity is decreased, water may collect on the surface of the saturated trail tread and flow down trail causing increased erosion leading to damage to the trail bed and removal of fines. Impacts would be limited to 0.75 ft (0.225 m) out from the trail's edge. Given that the trail would be approximately 0.75 miles (1.2 km) long and 3 ft (0.9 m) wide, the total impact expected would be 0.5 acre (0.2 ha). These impacts would not measurably change the impacted area's overall biological productivity.

The construction of a 2 mile long Forest Loop Trail through the lowland forest areas located north of the road and accessible from the parking lot or the trailhead would cause soil impacts. The cutting and filling needed to construct the trail could result in increased erosion. Soil impacts would be localized and include compaction and/or churning. Trail users stepping off of the path as necessary for passing, taking pictures, resting, etc. would cause compaction beyond actual trail tread. Impacts would be limited to 0.75 ft (0.225 m) out from the trail's edge. Given that the trail would be approximately 2 miles (3.2 km)

long and 3 ft (0.9 m) wide, the total impact expected would be 1 acre (0.4 ha). These impacts would not measurably change the impacted area's overall biological productivity.

The construction of a 1.25 mile-long trail leading to Goat Ridge would provide hiker access to the ridgeline paralleling the northern boundary of the study area from the Forest Loop Trail. Impacts to soils would be similar to those described for the Forest Loop Trail, however, this trail would be steep and would pass through a variety of soil types, some of which are very susceptible to erosion. Impacts would be limited to 0.75 ft (0.225 m) out from the trail's edge. Given that the trail would be approximately 1.25 miles (2 km) long and 3 ft (0.9 m) wide, the total impact expected would be 0.6 acre (0.2 ha). These impacts would not measurably change the impacted area's overall biological productivity.

Impacts to soils from the construction of the Paradise Valley Trail are described under the *preferred alternative*. However, under this alternative, the trail would be approximately 2.75 miles (4.4 km) long and 3 ft (0.9 m) wide, with a total impact expected to be 1.3 acres (0.5 ha).

The construction of a new trailhead and gravel parking area on the entrance road about 0.5 miles east of the main parking lot would provide access to the 2.75 mile-long Paradise Valley Trail. This action could result in impacts to the soils along the margins of the parking area. The cutting and filling needed to construct the parking area could result in increased erosion. Compaction of soils and reduced permeability could result in increased ponding of surface water accompanying rainfall events that could lead to winnowing of fines from soils adjacent to the parking area. The fines could increase sedimentation to adjacent streams and potentially result in a change of biological productivity in the impacted area. The total impact expected would be approximately 0.1 acre (0.04 ha).

Two existing social trails used by ice climbers to access the glacier would become official spur trails providing additional access to Exit Glacier. Both trails would originate from the Harding Icefield Trail, be approximately 0.25 miles long each, and would depart the Icefield Trail at 0.9 miles and 1.2 miles up trail. These trails are expected to receive relatively light use and impacts along the margins are expected to be localized and limited to an average of 0.75 ft (0.225 m) out from the trail's edge. Although future use of these trails is believed to be low, impacts to the trail and margins could result from compaction and/or churning when trail users step off of the trails as necessary for passing, taking pictures, resting, etc. Given that the trails together would be approximately 0.5 miles (0.8 km) long and each 3 ft (0.9 m) wide, the total impact expected would be 0.2 acre (0.08 ha). The impact would not likely result in measurable changes in the impacted area's overall biological productivity.

Minor changes or additions to existing infrastructure (as described in Chapter 2: Alternatives, Including the Proposed Action) would result in negligible impacts to less than half an acre of soils.

Cumulative Impacts
Past, current and future impacts to soils are discussed in the *no-action alternative.* The actions associated with the implementation of this alternative would add an estimated 11.75 acres (4.7 ha) of impacted soils to the existing 30 acres (12 ha) that are already impacted. Cumulatively, these other actions would have moderate impacts on soils. The additional contribution of moderate impacts from this alternative results in a continued moderate rating for overall cumulative impacts to soils.

Conclusion
The overall impact on soils as a result of implementing this alternative would be moderate The total estimated area of soils that would likely be measurably impacted would be 11.75 acres (4.7 ha), and on about half of this area there would likely be impact that would measurably change the impacted area's overall biological productivity. Most of the impact would be associated with the construction of new routes, trails, infrastructure, and the normal impact from trampling that typically occurs along margins of trails. The level of impacts to soils anticipated from this alternative would not result in an impairment of KEFJ resources that fulfill specific purposes identified in the establishing legislation or are key to the natural integrity of this park.

Water Quality

Analysis of Impact
The designation of management zones would protect water quality from high levels of impact in the majority of the study area. The majority of the bodies of water in the Exit Glacier area would occur in the Backcountry Primitive Zone and Backcountry Semi-Primitive Zone where visitation would be low. The greatest impacts to water quality would occur in the Hiker Zone along Harding Icefield Trail streams and Paradise Creek. The application of the new management zones and carrying capacity framework would be the same as described under *Soils* in the *preferred alternative.*

Under alternative B, several new hiking trails would be built, bringing more visitors in contact with surface water sources. With the exception of the Exit Creek Trail, the new trails would be considerably distant from sanitary facilities. Increased availability of maintained trails, coupled with no available restrooms would increase this percentage, resulting in primarily summer seasonal changes in water quality from unconfined human waste entering streams that may be used for drinking water or recreation.

Increased visitor use from improved recreational opportunities such as new trails and RV camping could also bring increased vehicle traffic and increased possibilities of pollutants from airborne exhaust particulates, oil and gasoline runoff entering surface and ground waters adjacent to roads and parking areas. Construction of a bike path is planned which could be expected to slightly reduce vehicular traffic and associated pollutants, as discussed in the *preferred alternative.*

Winter use of snowmachines along the road and parking lot may concentrate hydrocarbon pollution in waters directly adjacent to these areas, as discussed under the *no-action alternative.*

Cumulative Impacts
Past, current and future impacts to water quality are discussed in the *no-action alternative.* Cumulatively, these other actions would have minor impacts on water quality. The additional contribution of minor impacts from this alternative results in a continued minor rating for overall cumulative impacts to water quality.

Conclusion
Under the alternative B, minor impacts to water quality would be expected. Although detectable changes in water quality may occur with increases in visitor use, changes are not expected to approach DEC water quality acceptable limits as current levels of visitor use and past increases have not resulted in any detectable changes in water quality. The level of impacts to water quality anticipated from this alternative would not result in an impairment of KEFJ resources that fulfill specific purposes identified in the establishing legislation or are key to the natural integrity of this park.

Floodplains

Analysis of Impact
The application of management zones would have little additional impact to floodplains in the study area. The high visitor use areas at Exit Glacier have historically been located within the floodplain, as this is the most accessible part of the park. Designating these areas as the Visitor Facilities and Pedestrian Zones would not change floodplain structure or processes.

Under alternative B, constructing a bike path, hiking trails, RV and tent campgrounds, and a hostel in a floodplain are proposed.

The hiking trails, although maintained, would be constructed to follow natural geographical contours. No new berming, ditching, diverting stream channels, or otherwise altering the natural floodplain hydrology is expected. The bike path would be constructed parallel to an existing road over an existing levee. Because of these considerations, no changes are to the floodplain are expected from the trails or bike path.

Actions to protect infrastructure, especially in the Visitor Facilities and Pedestrian zones, are also discussed in the *preferred alternative.*

NPS activities that have the potential to have adverse impacts on floodplains are discussed under the *preferred alternative.* Construction of a hostel would not be an "excepted" action under NPS Director's Order 77-2. Fill, such as gravel, would need to be added to elevate the foundation site and drainage systems would be installed as needed. These actions could cause long term and possibly permanent changes to an area of less than five acres by altering natural flow patterns.

If the addition of a hostel is eventually implemented, a Floodplain SOF must be prepared, separate from this document, stating there is no practical alternative for locating the facility in a floodplain and justifying the use of the floodplain. The SOF would clearly describe all alternative locations for the hostel and why those sites were rejected as well as proposed mitigation measures.

Cumulative Impacts
Past, current and future impacts to floodplains are discussed in the *no-action alternative.* Cumulatively, these other actions would have moderate impacts on floodplains. The additional contribution of moderate impacts from this alternative results in a continued moderate rating for overall cumulative impacts to floodplains.

Conclusion
Under alternative B, there would be moderate impacts on floodplain resources or function. The level of impacts to floodplains anticipated from this alternative would not result in an impairment of KEFJ resources that fulfill specific purposes identified in the establishing legislation or are key to the natural integrity of this park.

Wetlands

Analysis of Impact
The designation of management zones would protect the majority of wetlands in the study area from high levels of impact. The majority of wetlands at Exit Glacier would be located in the Backcountry Semi-Primitive Zone where many visitors would not be expected. There might be some impacts to the small percentage of wetlands that occur in the Visitor Facilities Zone. The application of the new management zones and carrying capacity framework would be the same as described under *Soils* in the *preferred alternative.*

Under alternative B, a bike path adjacent to Exit Glacier road would be developed, as discussed under the *preferred alternative.* Other planned actions in the study area such as additional hiking trails, structures, and camping areas would not be constructed in wetlands. Additional NPS activities that have the potential for adverse impacts on wetlands are discussed under the *preferred alternative.*

Cumulative Impacts
Past, current and future impacts to wetlands are discussed in the *no-action alternative.* Cumulatively, these other actions would have moderate impacts on wetlands. The additional contribution of minor impacts from this alternative results in a continued moderate rating for overall cumulative impacts to wetlands.

Conclusion
Alternative B would have minor impacts to wetlands, as little additional wetland area would be affected. The level of impacts to wetlands anticipated from this alternative would not result in an impairment of KEFJ resources that fulfill specific purposes identified in the establishing legislation or are key to the natural integrity of this park.

Air Quality and Visibility

Analysis of Impact

The designation of management zones would protect air quality and visibility from high levels of impact in the majority of the study area. Emissions associated with motor vehicles, power tools, burning wood would originate predominantly in the Visitor Facilities Zone which comprises 2% of the study area. The application of the new management zones and carrying capacity framework would be the same as described under *Soils* in the *preferred alternative*.

Under alternative B, proposed actions would increase vehicle access to the study area and new amenities would encourage increased visitation, such as an RV campground and lodging.

Construction of proposed trails would involve some use of two-stroke engines, such as chainsaws, causing localized exhaust and odors. However, chainsaw use would be limited to removal of large trees and would be employed for only brief periods of time, therefore, emissions affecting visibility and smell would not exceed 6 hours a day for the extent of the project, not likely over four months.

A new parking area would accommodate up to 20 more vehicles, increasing emissions beyond current levels. Additionally, up to 20 RV/car campsites would be added, further increasing emissions. These emissions may result in changes in air quality, predominantly exhaust odors that may be detected up to 12 hours a day, encompassing times of most visitor activity. These changes would likely be concentrated around the parking area and RV campground.

In past instances when the existing parking lot filled to capacity, no detectable changes in air quality via visibility were noted, although odors were noticeable in the immediate vicinity (Tetreau 2003). With increased amenities, visitation would increase. In addition to the proposed new parking spaces, the parking area may also be filled to capacity more frequently than in the past, further adding to vehicular emissions during summer months that would likely be detectable up to 12 hours a day, but concentrated around the parking area. Exhaust odors may be objectionable to individuals in these instances.

Diesel-powered heavy equipment would be utilized to excavate the foundation for the proposed hostel-style lodging. Exhaust and odors around the construction site would be expected for up to 12 hours a day, but would be limited to the duration of the excavation, one month or less. The remainder of the construction project would not require use of heavy equipment.

A snow coach may be implemented to provide winter access to the study area as discussed in the *preferred alternative*. Winter snowmachine use in the study area would continue, with impacts similar to those in the *no-action alternative*.

Also in the winter, the fireplace in the picnic area would be used as a wood-burning warming hut for winter visitors, having affects similar to those of the *no-action alternative.*

Cumulative Impacts
Past, current and future impacts to air quality are discussed in the *no-action alternative.* Cumulatively, these other actions would have minor impacts on air quality and visibility. The additional contribution of moderate impacts from this alternative results in a moderate rating for overall cumulative impacts to air quality and visibility.

Conclusion
Alternative B would have moderate negative impacts, as vehicles and their associated emissions in the study area would increase. The level of impacts to air quality and visibility anticipated from this alternative would not result in an impairment of KEFJ resources that fulfill specific purposes identified in the establishing legislation or are key to the natural integrity of this park.

Soundscape

Analysis of Impact
The designation of management zones would protect the soundscape from high levels of impact in the majority of the study area. Desired soundscape conditions call for natural sounds to predominate, with few intrusions, in almost 96% of the study area (Backcountry Primitive, Backcountry Semi-Primitive and Hiker zones). Noise would be expected more often in the Pedestrian Zone. The application of the new management zones and carrying capacity framework would be the same as described under *Soils* in the *preferred alternative.*

Alternative B promotes increasing the infrastructure of the Exit Glacier area to accommodate large numbers of visitors and offer recreational activities year-round. Access would be greatly increased in winter and summer for both motorized and non-motorized use.

A year round hostel style lodge is planned. The construction of this facility could exceed one season and noise from this work generated by power tools may be audible at distances exceeding one mile, although the high intensity noises would be concentrated around the building site and limited to normal work hours, e.g., between 8:00am and 5:00pm. High intensity noise from heavy excavating equipment may total up to six hours daily, and be audible up to a mile away, but would not continue for more than 2 weeks.

Electrical power to the hostel may be supplied by a generator. If a diesel-powered generator is used, changes to the soundscape would be similar to those described in the *no-action alternative.*

More overnight visitors would be accommodated with the addition of an RV campground and an enlarged tent campground. These changes would increase the number of noise

intrusions from vehicles, campers, generators, and human voices. Intrusions could likely equal or exceed natural sounds in these areas during daylight hours primarily during the summer season, possibly exceeding 4 months. Sounds would be concentrated around these areas and would not be audible at distances exceeding one mile.

Power and hand tools would be used to construct the proposed bike path, causing noise intrusions. However, noise generated from construction would be limited to the duration of construction. Construction noises from bike path segments in wooded areas may be muffled by dense vegetation or partially masked by flowing water sounds. Since power tools would not be used continuously throughout the day, power tool noise is anticipated to total up to six hours during path construction, which would last one season or four months.

Snowmachine noise impacts would be similar to the *no-action alternative*. Also, implementation of a snow coach to provide winter access for visitors is also planned, as outlined in the *preferred alternative*.

New hiking trails would disperse visitors throughout the study area, reduce congestion on present trails, and reduce the concentration of sounds in the current limited areas of use. These trails would bring more visitors into naturally quiet areas, which could increase the number of noise intrusions in the backcountry. The sound of human voices and other intrusions to these areas could increase in both summer and winter. Some of these trails are located primarily within densely vegetated alder thickets and forests, often near rushing streams. The dense vegetation and the sound of flowing water would muffle or mask noise intrusions. These physical factors combined with expected low use would minimize changes in the soundscape.

The summer bicycle path and the Forest Loop Trail would be utilized as winter ski trails and would require motorized grooming, as discussed in the *preferred alternative*.

Although there would be hikers in the summer months and skiers/snowshoers on trails in the winter months, natural sounds would likely predominate, as visitors would be dispersed throughout the study area. Intrusions would be transient, as hikers/skiers pass through areas fairly quickly and do not produce noise on a continual basis. Intrusions would be limited to a season, not readily audible at distances exceeding one mile, and when combined, would not average more than six total hours per day in any season.

Power and hand tools used to construct these trails would cause some noise intrusions. However, because power tools would not be used continuously throughout the day, noise would not likely exceed six total hours daily during trail construction, which is anticipated to last one season or four months.

The focus on winter use of groomed trails and overnight accommodations in this alternative could create round the clock intrusions of human voices and other man-made sounds. These intrusions would likely be brief, intermittent and not readily audible at distances exceeding one mile when the facilities are in use.

Cumulative Impacts
Past, current and future impacts to the soundscape are discussed in the *no-action alternative.* Cumulatively, these other actions would have minor impacts on soundscape. The additional contribution of moderate impacts from this alternative results in a continued moderate rating for overall cumulative impacts to soundscape.

Conclusion
Implementation of alternative B would result in moderate impacts to the soundscape of the Exit Glacier area. Although some of the impacts to the soundscape are transient (seasonal) or limited to construction of discrete projects, actions such as adding year-round overnight facilities would create additional long-term changes to the soundscape. The level of impacts to the soundscape from this alternative would not result in an impairment of KEFJ resources that fulfill specific purposes identified in the establishing legislation or are key to the natural integrity of this park.

Vegetation

Analysis of Impact
The designation of management zones would protect vegetation from high levels of impact in the majority of the study area. Impacts to vegetation would be greatest in the Hiker, Pedestrian, and Visitor Facilities zones, which comprise approximately 15% of the study area, where visitation and development would be highest. The rest of the Exit Glacier area would receive few impacts to vegetation. The application of the new management zones and carrying capacity framework would be the same as described under *Soils* in the *preferred alternative.*

Under alternative B, several actions that may impact vegetation are planned. These actions include the construction of three new hiking trails, the construction of a bicycle path, an RV campground, an expanded tent campground, and a hostel-style lodge. The actual use of the trails, bike path and overnight accommodations, increased visitation, and the potential for introduction of exotic plant species could also impact vegetation. Previously undisturbed lands that would be altered in this alternative in order to accommodate these actions would be approximately 11.75 acres (4.7 ha).

Two spur trails to the glacier would extend from the existing Harding Icefield Trail following current social trails. Impacts to vegetation would be similar to those described for the spur trail under *alternative A.*

Construction of new trails would have several impacts on vegetation. Due to the steep and rustic nature of the Goat Ridge Trail, construction activities would primarily involve brush removal and pruning of woody shrubs. Trees would be removed only when necessary for trail access or for safety reasons. Although the Forest Loop and Paradise Valley trails would be less challenging, similar conservative construction practices would be employed. Impacts to vegetation as a result of constructing these trails would be measurable and outside of natural variability, although the trail footprints could be altered for many years, or permanently.

The 0.1 acre trailhead for the Paradise Valley and Unnamed Peak trails would be denuded of vegetation and surfaces would be hardened. Changes would be apparent for many generations and possibly permanently, due to compaction of soils.

Use of the proposed new hiking trails could impact vegetation in several ways, as described under the *preferred alternative*. The proposed trails would primarily traverse alder-willow scrub, conifer, and hardwood forests through heavily-vegetated areas. Portions of the Goat Ridge Trail would be located in more sensitive alpine areas. The potential for these impacts to occur on the Goat Ridge Trail, although present, are low as intensive trail use would not be anticipated due to the rugged character of the trail. Such impact would be more likely to occur on the other two trails, especially on the Forest Loop Trail which would receive higher visitation. These activities could cause localized changes that would be measurable and outside of the natural variability for more than one growing season as there would be a net loss of native vegetation, and similar impacts would recur repeatedly. However, species would not be at risk of being extirpated from the study area.

Although the potential exists for the above impacts to occur, intensive trail use and associated impacts are not anticipated to be large due to the rustic nature of the Paradise Valley and Goat Ridge trails and the difficulty in accessing them. Natural succession would not likely to be disrupted, therefore, not outside of natural variability for more than one growing season. Additionally, it is expected that hikers attracted to these areas would tend to be experienced and self-sufficient. These individuals would likely be familiar and compliant with "Leave No Trace" concepts. Given these assumptions, the potential for the types of impacts described above would be further reduced.

A bike path would be located primarily on the shoulder of the existing road on currently unvegetated, compacted gravel surfaces. Impacts to vegetation would be similar to those described under the *preferred alternative*.

Trails would be maintained in such a way as to reduce impacts to vegetation, as described under the *preferred alternative*. In addition, the *no-action alternative* describes impacts to vegetation in areas where backcountry camping is frequent.

Increased recreational opportunities such as new hiking trails and the bike path, combined with additional camping and lodging amenities, would result in overall increased visitation in the study area. Impacts to vegetation from use of the existing trails (see the *no-action alternative*) could be somewhat reduced with the addition of new trails as described under the preferred alternative.

Areas of vegetation would be permanently removed for construction of the hostel and RV and tent campgrounds and would unlikely be restored to pre-disturbance states. Approximately 3 acres (1.2 ha) of vegetation would be removed to accommodate the RV campground and the associated access road. Although revegetation and landscaping efforts would replace some of the plants, the footprint of the facilities would be denuded for many generations and possibly permanently due to compactions of soils. Similarly,

the addition of up to 12 new tent campsites would remove approximately 1.5 acres (0.6 ha) with similar implications. Approximately 0.75 acres (0.3 ha) would be cleared of vegetation to accommodate construction of the hostel. Vegetation would be permanently removed from the approximately 2500 square foot footprint of the hostel. Additional vegetation would be lost to access roads and parking areas associated with the lodging. Revegetation and landscaping projects would also be employed to replace some of the plants but areas of denudation would remain permanently.

Under alternative B, off-road use of motorized vehicles in winter would continue. Impacts to vegetation associated with off-road activities such as breaking of branches from woody plants, compacting vegetation under snow, or damaging vegetation with inadequate snowcover would continue, causing measurable adverse impacts. This action would not likely extirpate species and, though impacts would be recurring, vegetation would rebound within one growing season; therefore, long-term characteristics of the vegetative community would remain stable.

Increased vehicular traffic resulting in increased levels of vehicle emissions could also affect air quality, which in turn may be toxic to vegetation, particularly some lichen species which are especially sensitive to air pollutants (Furbish et al. 2000). Although data is not available on current impacts from visitor use, if visitation increases, impacts to air quality may be expected, possibly leading to decline in numbers or death of sensitive plants, thus lasting more than one growing season.

The actions discussed above, trail construction, trail use, and increased amenities have the potential to impact vegetation indirectly through the introduction and spread of exotic plant species in the study area, particularly along the road, bike path, and adjacent to visitor services. Indirect impacts of a bike and hiking trails to vegetation would include an increased possibility of introduction of exotic plants via seeds which may be carried by boots, tire treads, or other equipment. Any fill materials, such as gravel, that may be used for construction may contain seeds of exotic plant species.

The potential for introduction and/or spread of exotic species can be expected to increase with increased visitation. Although large numbers of visitors would not be expected on the Paradise Valley and Goat Ridge trails, and potential for introduction of exotic species in these areas would be low, threats of introduced species from increased vehicle traffic, RV camping, Forest Loop Trail use, and bike path use would remain a concern for possible negative impacts on native vegetation. If unchecked, exotic species introduced via the above actions may have long term adverse impacts on the native vegetation, lasting many generations and affecting plant populations by competing with or displacing native species. However, exotic plant control would be implemented as a mitigation measure, with few expected negative impacts to native vegetation.

Cumulative Impacts

Past, current and future impacts to vegetation are discussed in the *no-action alternative.* Cumulatively, these other actions would have major impacts on vegetation. The

additional contribution of moderate impacts from this alternative results in a continued major rating for overall cumulative impacts to vegetation.

Conclusion
The combined impacts of the proposed actions in alternative B would be moderate. Although areas of vegetation would be permanently removed, there would be potential for spread of exotic plants via road and trail vectors, and vegetation trampling may lead to habitat type changes, trail maintenance and exotic species control programs would be implemented to prevent or mitigate further adverse effects. The level of impacts to vegetation from this alternative would not result in an impairment of KEFJ resources that fulfill specific purposes identified in the establishing legislation or are key to the natural integrity of this park.

Wildlife

Analysis of Impact
The designation of management zones would result in little impact on wildlife in the study area. Disturbance of wildlife and impacts on wildlife habitat would be greatest in the Visitor Facilities, Pedestrian, and Hiker zones, which comprise approximately 15% of the study area, where the majority and visitation and development would occur. The application of the new management zones and carrying capacity framework would be the same as described under *Soils* in the *preferred alternative.*

Under alternative B there are a number of proposed actions which may impact wildlife species in the Exit Glacier area. For the purpose of this analysis similar actions have been grouped under the following headings: new trails, overnight accommodations, winter visitation, winter use of motorized vehicles, and new facilities.

New Trails
Five new trails would be constructed under the this alternative, a bike path from the bridge to the Exit Glacier parking lot, the Forest Loop Trail, the Exit Creek Trail, the Goat Ridge Trail, and the Paradise Valley Trail, and winter ski routes along Exit Creek, Paradise Creek, and the Forest Loop Trail. Impacts to wildlife from these new hiking and skiing trails would be expected. Impacts would arise primarily from behavioral responses to approaching hikers and from habitat alterations, habitat fragmentation, and habitat loss due to trail construction.

Behavioral responses of wildlife species to trail construction, trail maintenance, and hikers are described under the *preferred alternative.*

Encounters between humans and bears could be expected to increase with an expanded trail system. The trail system in this alternative would more than triple the existing trail system (from 3.5 to 11.5 miles). Impacts to wildlife are described under the *preferred alternative.*

The Goat Ridge Trail traverses breeding and foraging areas for mountain goats. Mountain goats are sensitive to human disturbance (Cote and Bianchet 2003). Mountain goat presence at Exit Glacier has decreased in recent years, possibly due to human disturbance along the Harding Icefield Trail (Tetreau 1989). This trail would introduce an estimated 5,000 hikers into an area of goat habitat currently free of human activity (see Analysis of Impacts on Visitation for this Alternative). Human disturbance of goats along this trail could result in a permanent, measurable change in goat numbers in the Exit Glacier area. This change is likely to be outside the range of natural variation.

The Exit Creek Trail and the bike path would direct visitors into riparian habitats along Exit Creek and the Resurrection River, possibly disturbing songbirds during the breeding season. Impacts from the Exit Creek Trail are described under *alternative A* and from the bike path under the *preferred alternative.*

The proposed new trails may also allow for the establishment or encroachment of non-resident species such as corvids along trail corridors. This would be of greatest concern along the proposed bike path, with impacts described under the *preferred alternative.*

During winter, animals can experience an energy deficit, as more energy is used to survive than is replenished, as described under the *preferred alternative.*

Habitat loss from construction of the Exit Creek Trail and bike path would reduce available nesting habitat for riparian nesting songbirds in the Exit Glacier area by less than 5%. Breeding songbirds utilizing this habitat type may experience a corresponding 5% decrease in populations. This decrease, however, is not outside the expected range of natural variation for bird populations. Other trails proposed in this alternative should not result in habitat damage or loss, though the proposed Paradise Valley Trail could increase human presence in important brown bear habitat on the adjacent Chugach National Forest (see discussion below in the *Cumulative Impacts* section).

Overnight Accommodations

The proposed lodge, RV campground, and tent campground expansion would increase the availability of overnight accommodations at Exit Glacier by one order of magnitude over present conditions. This increase could have serious implications for wildlife species by altering the temporal pattern of visitation and increasing the amount of food and garbage available to wildlife. Temporally increasing visitation could also lead to more interactions between bears and people. This, in turn, would result in displacing bears from foraging areas and could lead to more bear – human conflicts.

A lodge, an RV campground, and an expanded tent campground would generate garbage and food waste, increasing the risk that bears and other wildlife species could become food conditioned. Food conditioned bears can become very aggressive towards humans and destructive to property. Food conditioned bears would have to be removed by park management either through destruction or relocation of the animal. Under current conditions bears in the Exit Glacier area rarely exhibit food conditioned behavior. Park records document less than one food related incident involving bears annually. The

threefold proposed increase in overnight accommodations could increase the number of these incidents. However, implementation of best management practices (e.g., bear-resistant garbage cans and food storage areas) would ensure that the number of such incidents would not increase to a level that would have long-term impacts on bear behavior or populations.

Increasing the number of humans present 24 hours a day in the developed portions of the Exit Glacier area in both summer and winter could lead to further avoidance of the Exit Glacier area or interfere with movement along the Resurrection River Valley by species sensitive to human presence, such as wolves, lynx and wolverines. Current surveys show that these species travel through or utilize the Exit Glacier area infrequently and only during periods when human activity is low such as at night or in winter (Martin 2003). Changes in the hours of visitation are likely to result in corresponding changes in the activity patterns, distribution and occurrence of these species. These changes would be long term and would affect more than one generation.

Winter Visitation

Actions in alternative B intended to facilitate winter visitation to the Exit Glacier area, grooming the bike path for winter use, developing winter interpretive and school programs, operating a lodge, and running a snowcoach to transport winter visitors to the park, could increase visitation as much as 620% and would be likely to impact wildlife, particularly moose, mountain goats, wolverines, lynx, and wolves.

Overwintering moose rely on early successional willow stands below Exit Glacier for critical winter forage (see impacts described under the *preferred alternative*). The frequency and duration of disturbance to moose at Exit Glacier is expected to be sufficient to impact behavior on a daily and perhaps even hourly basis during periods of high use with some individual moose possibly being displaced permanently from the developed high use areas (i.e., most of theVisitor Facilities and Pedestrian zones). However, as evidenced by moose living in the middle of urban areas (Anchorage), it is unlikely winter moose habitat would be rendered nonfunctional, nor would the moose population as a whole be extirpated from the Exit Glacier area.

The above mentioned increase in human activity during winter may also impact wolves, wolverine, and lynx, all species which have large home range requirements and a low tolerance for human disturbance (Zielinski 1995). Impacts to winter carnivores are described under the *preferred alternative*.

Winter Use of Motorized Vehicles

Even with motorized vehicles occurring predominantly on the road corridor and multi-use trails, impacts to wildlife, particularly moose, wolves, wolverines, and lynx, from motorized use could occur. See the *preferred alternative* for a discussion of impacts of repeated snowmachine use on wildlife behavior and levels of physiological stress. Snowmachine use in this alternative would be concentrated in and adjacent to preferred winter foraging areas for moose. As snowmachine use increases at Exit Glacier, moose could be subject to nearly continual disturbance during periods of high use (daylight hours on good weather days). As a result, some individuals may avoid habitat near areas

of snowmachine use entirely. Individuals remaining may be displaced from browsing or resting frequently enough to produce an energy deficit sufficient to affect reproduction or survival outside the range of natural variability.

New Facilities

The construction of a lodge, RV campground, and expanding the tent camping area at Exit Glacier would decrease habitat availability for wildlife species utilizing alder/willow and cottonwood/alder habitats by approximately 10%. These facilities, coupled with the proposed trail additions would likely impact to some extent almost 100% of all mature cottonwood/alder forests present in the Exit Glacier area. Species which utilize these habitats include moose, warblers, thrushes, ptarmigan, snowshoe hare, lynx, and marten. Concentrating human use in these habitats during construction and subsequent visitor use could permanently displace these species from this habitat type, but it's unlikely that habitat would be rendered nonfunctional, nor would any species' population as a whole would be extirpated from the Exit Glacier area as there would remain areas that humans do not concentrate in.

Cumulative Impacts

Past, current and future impacts to wildlife are discussed in the *no-action alternative*. Cumulatively, these other actions would have major impacts on wildlife. The additional contribution of moderate impacts from this alternative results in a continued major rating for overall cumulative impacts to wildlife.

Conclusion

Overall, the proposed actions in the Alternative B would have a moderate impact on wildlife in the Exit Glacier area. Of the proposed actions, new trails, the lodge and RV campground, and actions designed to promote increased winter visitation would be those most likely to impact wildlife by spatially and temporally altering human intrusions on wildlife. Species most likely to be impacted by the proposed actions include moose, brown bear, wolves, wolverine, lynx, and nesting songbirds. The level of impacts to wildlife from this alternative would not result in an impairment of KEFJ resources that fulfill specific purposes identified in the establishing legislation or are key to the natural integrity of this park. The above analysis indicates that a permanent exclusion of species could occur.

Visitor Experience

The application of the new management zones and carrying capacity framework under alternative B ultimately require standards be established that would maintain a high quality visitor experience. Attributes of the visitor experience that would be protected include solitude in the Backcountry Primitive and Backcountry Semi-Primitive Zones, well maintained trails and moderate potential for solitude in the Hiker zone, ability to view the glacier without being crowded in the Pedestrian zone, and availability of information and other visitor services in the Visitor Facilities Zone. Once developed, standards would serve as clearly defined triggers for implementing management actions to reduce or eliminate impacts and would provide a more systematic approach than would

occur under the no-action alternative. This would likely produce future long-term beneficial effects.

Analysis of Impact

Visitation

The construction of a bike path to the Exit Glacier parking lot could result in an increase in the number of visitors accessing the area by non-motorized means, provided that the path continues outside the park to the Seward Highway. The impacts of this action would be similar to that of the *preferred alternative*.

The bike path would be groomed and designated for non-motorized use in the winter. Having a designated and groomed non-motorized route to the glacier in the winter would likely result in a substantial increase in the number of skiers and other non-motorized users, as described in the *preferred alternative*. In addition, the Forest Loop trail would be groomed and designated for non-motorized use. This system of groomed, non-motorized ski trails would likely result in a 100% increase in winter non-motorized use, resulting in an additional 100 winter visitors.

The construction of a new backcountry trail into Paradise Valley would be an additional attraction for hikers seeking additional activities to visiting the glacier. In this alternative a footbridge would be constructed across Exit Creek as part of this trail, which would provide easy access to hikers of all skill levels. The trail itself would be similar in construction to the Harding Icefield Trail. Connecting the trail to the alpine trail at Caines Head State Recreation Area would likely attract additional hikers who would visit the area primarily to hike this trail. This trail would receive less use than the Harding Icefield Trail since it follows the lowlands through the study area and does not offer spectacular views. If the trail were extended beyond the study area boundary and tied into the Caines Head trail system, it would still receive limited use due to the long length of the route. Based on current use of the Harding Icefield Trail (7,300 visitors per year, averaged for 2000 to 2002), an estimate of potential use of the Paradise Valley Trail would be approximately 3,500 visitors per year. Assuming that 50% of those visitors would come to the Exit Glacier area because of the trail, there would be an additional 1,750 visitors per year distributed throughout the summer season as a result of this action.

The addition of an RV campground on the north side of the entrance road would increase the number of overnight visitors; however, many RV campers would probably be visiting Exit Glacier anyway. Thus, the total number of additional new visitors as a result of this action would likely be less than the total anticipated use of the RV campground. Assuming a maximum of 20 sites, with room for one RV per site and two people per RV, and a season of use from June 1 to August 31, there would be the potential for 3,680 additional overnight visitors. Assuming that 10% of these visitors would come to Exit Glacier just because of the RV campground, there would be an additional 368 visitors per year during the summer season as a result of this action. The hourly distribution of visitor use would likely be affected by the additional 3,680 overnight visitors, creating

markedly more nighttime use of the area than the current overnight use of approximately 1,250 to 4125.

The expansion of the existing tent campground would increase the number of overnight visitors; however, many of tent campers would probably be visiting Exit Glacier anyway. Thus, the total number of additional new visitors as a result of this action would be less than the total anticipated use of the expanded tent campground. Assuming a maximum of 12 new sites, with room on average for two tents per site and two people per tent, with a season of use from May 15 to September 30, there would be the potential for 6,576 additional overnight visitors. However, the existing tent campground, which also has 12 sites, currently receives between 1,250 (based on morning tent counts between 1999 and 2002) and 4,125 (based on 2001 general visitor survey) visitors per year. The existing tent campground does not reach capacity most of the time. Assuming maximum use of the campground for impact analysis purposes, there would be the potential for 9,576 additional overnight visitors using the expanded tent campground (6,576 in the new sites, and approximately 3,000 more campers filling the existing sites to capacity). Assuming that 10% of the campers would come to the Exit Glacier area just because of the tent campground, there would be an additional 957 visitors per year during the summer season as a result of this action. The hourly distribution of visitor use would be affected by the potential addition of 9,576 overnight visitors, creating markedly more nighttime use of the area than the current overnight use of approximately 1,250 to 4,125.

The addition of a rustic hostel-type lodge would increase the number of overnight visitors; however, many of these visitors would most likely be visiting Exit Glacier anyway. Thus, the total number of additional new visitors as a result of this action would be less than the total anticipated use of the lodge. Assuming a maximum capacity of 15 persons, and a summer use season from May 15 to September 30, there would be the potential for 2,055 additional overnight visitors during the summer season. Assuming that 10% of the lodge guests would come to the Exit Glacier area just because of the lodge, there would likely be an additional 205 visitors per year during the summer season as a result of this action. The hourly distribution of visitor use would be affected by the potential addition of 2,055 overnight visitors, creating markedly more nighttime use of the area than the current overnight use of approximately 1,250 to 4,125.
The lodge would operate year-round, although it would probably be closed for short periods in the shoulder seasons when travel to the glacier is difficult due to partial snow cover on Exit Glacier Road. Assuming a maximum capacity of 15 persons, and a winter use season from December 1 to March 31, there would be the potential for 1,815 additional overnight visitors during the winter season. In the winter most of those visitors would come primarily because of the lodge due to the difficulty in accessing the area. Assuming that 90% of these visitors would come because of the lodge, there would be an additional 1,634 visitors per year during the winter season as a result of this action. The hourly distribution of visitor use would likely be affected by the potential addition of 1,815 overnight visitors, creating markedly more nighttime use of the area than the current overnight winter use of approximately 50 visitors per year (based on winter public use cabin data from 1999 to 2002).

In addition to the lodge, winter overnight facilities would be available in a second NPS public use cabin, in concessionaire-operated yurts, and in the expanded tent campground. Assuming a winter use season from December 1 to March 31, a maximum public use cabin capacity of six people per night, and an approximate capacity of ten persons per night in the yurts, there would be the potential for 1,936 overnight visitors during the winter season. The tent campground currently receives a negligible amount of winter use, and would be expected to receive similar use in the future if other overnight facilities would be available. In the winter most of those visitors would be attracted by these overnight facilities and would not have visited the area otherwise. Assuming that 90% would come because of the facilities, there would be an additional 1,742 visitors per year during the winter season as a result of this action. The hourly distribution of visitor use would be affected by the potential addition of 1,936 overnight visitors, creating markedly more nighttime use of the area than the current overnight winter use of approximately 50 visitors per year (based on winter public use cabin data from 1999 to 2002).

The construction of the Forest Loop trail north of the entrance road would result in some additional visitors who come to the area specifically to hike, run, or exercise on this trail. The trail, when considered in combination with the Exit Creek and Paradise Valley trails, would potentially attract local residents searching for trail running opportunities and thus would visit the area specifically to use the trails. Other trail users would be visiting the area primarily to see the glacier and thus would not be considered additional visitors as result of this action. Based on best professional judgment, there could be an additional 300 visitors per year during the summer season as a result of this action.

The construction of the Goat Ridge Trail would attract additional hikers as this trail would serve primarily as an alternate route to the existing Harding Icefield Trail. While many visitors using this trail would have visited the area anyway, there are some who may stay overnight or return on another day just to hike this trail, thus they would count as additional visitors as a result of this action. This trail would receive slightly less use than the Harding Icefield Trail since it would be longer, steeper, and generally more difficult, although it would offer spectacular views of the glacier and ice field. Based on current use of the Harding Icefield Trail (7,300 visitors per year, averaged for 2000 to 2002), a best professional estimate of potential use of the Goat Ridge Trail would be approximately 5,000 visitors per year. Assuming that 50% of those visitors would come because of the trail, there could be an additional 2,500 visitors per year distributed throughout the summer season as a result of this action.

Currently, the evenings are generally quiet at Exit Glacier and some solitude can be found. With the large increase in overnight visitation that would occur under this alternative, the quiet evening experience would change. While tourism activities are currently concentrated primarily around mid-day, these activities would become spread throughout all hours of the day.

The NPS would implement actions to encourage winter visitation and activities, as described in the *preferred alternative*.

The implementation of this alternative would result in moderate impacts to total annual visitation at Exit Glacier. The actions associated with this alternative would result in a 5.1% increase in summer visitation (assuming a current summer visitation of 125,000 people and an additional 6,455 visitors as a result of this alternative) and a 620% increase in winter visitation (assuming a current winter visitation of 560 people and an additional 3,476 visitors as a result of this alternative), for an increase in total annual visitation of 7.9%. These changes also represent a detectable shift in the ratio of summer to winter visitation and hourly visitor distribution. Winter visitation currently represents approximately 0.6% of the summer total (averaged for 1999 to 2001). Under this alternative, winter visitation would likely grow to 3.1% of the summer total. The hourly visitation throughout the day would change greatly as overnight use would have the capacity to increase to 19,000 from the current level of approximately 1,250 to 4,125.

Visitor Profile

The construction of a bike path to the Exit Glacier parking lot would result in an increase in the number of visitors accessing the area by non-motorized means, provided that the path continues outside the park to the Seward Highway. Visitors accessing Exit Glacier via non-motorized modes of travel would be younger than the average visitor (based on a comparison with data from a 1991 U. S. Consumer Products Safety Commission report on Bicycle Injury and Exposure. A higher percentage of local visitors would use this path as a venue for exercise, and the average length of stay for visitors on the path would be slightly longer as a result of travel time within the study area. An additional 375 visitors per year fitting this profile would be expected during the summer season with the implementation of this action.

The construction of a new backcountry trail into Paradise Valley would attract primarily experienced backcountry hikers. These visitors would be more similar to Harding Icefield Trail hikers than to the average visitor, thus would have a different age distribution and would stay longer than the average visitor (Swanson et al. 2003). Where visitors come from would not be affected by this action, based on a comparison of Harding Icefield Trail hikers with the average Exit Glacier visitor (Swanson et al. 2003). The additional 1,750 visitors resulting from this action (see *Visitation* analysis above) would represent approximately 1.3% percent of total visitation.

The addition of an RV campground would likely attract older visitors who are not from local communities and they would stay substantially longer than the average visitor. However, most of the visitors who would use the RV campground would likely be a subset of people who would be visiting Exit Glacier anyway. According to the *Visitation* analysis above, there would likely be an additional 368 visitors per year during the summer season as a result of this action.

The expansion of the existing tent campground would likely result in visitation of additional campers of average age, whose visits would be generally be longer than average, and are less likely to be from local communities (based on analysis of data from the 2001 General Visitor Survey). According to the *Visitation* analysis above, it is estimated that there would be an additional 957 visitors per year during the summer season as a result of this action.

The addition of a rustic hostel-type lodge would likely result in visitation of additional people of average age, whose visits would generally be longer than average, and are less likely to be from local communities. According to the *Visitation* analysis above, there would likely be an additional 205 visitors per year during the summer season as a result of this action. During the winter season, the additional visitors who would use the lodge facility would share these same characteristics. There would potentially be an additional 1,634 visitors per year during the winter season as a result of this action.

In winter, a second NPS public use cabin and concessionaire-operated yurts would likely result in visitation of additional recreationists of average age, whose visits would generally be longer than average, and are less likely to be from local communities. According to the visitation analysis above, there would potentially be an additional 1,742 visitors per year during the winter season as a result of this action.

The construction of the Forest Loop Trail north of the entrance road would probably attract additional local residents who would generally be of average age and whose stays would likely be of average length. Most of the visitors who would hike the trail would probably be of average age. However, there would likely be an additional 300 visitors per year during the summer season (see *Visitation* analysis above) who would primarily be young to middle-aged, local residents using the trail specifically for exercise or evening walks. Thus, the length of their visit would be close to the average of approximately two hours (Swanson et al. 2003).

The construction of the Goat Ridge Trail would result in visitation of additional hikers who are more like the average Harding Icefield Trail hiker, whose stays are of longer duration, than the average general visitor to Exit Glacier. There would be no expected difference in age or the place of residence of the Goat Ridge Trail hikers. There would be approximately 2,500 additional visitors per year during the summer season as a result of this action.

The following minor changes or additions to existing infrastructure may cause a slight increase in the length of stay for the average visitor: construction of a trailhead for the Paradise Valley Trail, minor improvements or changes to existing trails, construction of a gathering pavilion near the Nature Center, construction of a viewing platform with a spotting scope near the Harding Icefield trail junction, and the addition of telephone and local electrical services. Additional facilities and services may result in some visitors staying longer than the current average, but the change would not be detectable or significant.

The NPS would implement actions to encourage winter visitation and activities, emphasizing non-motorized activities within the study area, which would result in increased numbers of winter visitors, as outlined in the *preferred alternative*. There would be approximately 500 additional visitors per year during the winter season as a result of this action.

The implementation of this alternative would result in minor impacts to the annual average visitor profile at Exit Glacier. The minor impact to annual average visitor profile would be the result of longer visits by the additional visitors that would be expected under this alternative. Almost all of the actions, specifically new hiking trails and expanded overnight facilities, would have an effect on visitor profile that would tend to result in longer than average visits. While the ages of many of the additional visitors would be more centrally distributed around the mean, it is unlikely that the difference would be statistically significant. The actions would continue the transformation of Exit Glacier from an area enjoyed by local residents to an attraction dominated by non-local visitors. .In the winter, the additional visitors would stay longer, primarily as a result of greatly expanded overnight facilities, and these facilities would tend to attract visitors from outside the local communities.

Visitor Access

The construction of a bike path to the Exit Glacier parking lot would increase summer access to the Exit Glacier area. These statistics are itemized in the *preferred alternative.*

The construction of a new backcountry trail into Paradise Valley and a new trail along the north side of Exit Creek would provide new summer access to areas currently inaccessible by official trails or routes. Based on the *Visitation* analysis above, this would likely increase visitation to the Exit Glacier area by approximately 1%. This route may be marked in the winter but would not be groomed or otherwise maintained, thus there would be no impact to winter access.

The construction of the Forest Loop Trail north of the entrance road would provide new summer and winter access to an area that is not currently accessible by official trails or routes. Based on the *Visitation* analysis above, this would likely increase visitation to the Exit Glacier area by less than 1% in the summer and by 2.5% in the winter.

The construction of the Goat Ridge Trail would provide new summer access to an area that is not currently accessible by official trails or routes. Based on the *Visitation* analysis above, this would increase visitation to the Exit Glacier area by approximately 2% in the summer.

The conversion of two existing social trails into official trails for accessing the glacier along the Harding Icefield trail would provide new summer access to an area that is not currently accessible by official trails or routes. Based on the *Visitation* analysis above, this would have a negligible effect on visitation to the Exit Glacier area.

The implementation of this alternative would result in a moderate impact to off-road visitor access as a result of adding new routes and trails to areas that are currently not accessible to visitors. These new trails would increase visitation to the Exit Glacier area by less than 10% in summer and winter.

Visitor Activities

The construction of a bike path to the Exit Glacier parking lot would increase the number of pedestrians and cyclists visiting the study area in the summer and non-motorized visitors in the winter. As determined in the *Visitation* analysis above, this would likely result in an additional 375 pedestrians and cyclists in the summer and 100 non-motorized users in the winter.

The construction of a new backcountry trail into Paradise Valley would increase the number of visitors hiking and camping. As determined in the *Visitation* analysis above, 3,500 visitors per year would be expected to use this trail during the summer, 1,750 of which would be additional visitors to the area. An estimation of less than 50% of the new hikers would camp overnight, resulting in a maximum of 1,750 campers. This prediction is based on the following premises: very few (less than 0.1%) visitors currently camp in the backcountry of the study area; most visitors taking overnight hikes on this trail would travel beyond the study area boundary into the upper Paradise Creek drainages before camping for the night.

The addition of an RV campground on the north side of the entrance road and the expansion of the tent campground would increase the number of overnight campers. Many of these visitors would also participate in other non-critical activities to fill their additional time at Exit Glacier, such as hiking, bird watching, attending interpretive programs, etc. A greater number of overnight visitors would lead to an increase in the percentage of visitors participating in many activities other than viewing the glacier. According to the *Visitation* analysis, there would be the potential for 3,680 additional overnight visitors during the summer season in the RV campground and 9,576 additional overnight visitors in the tent campground during the summer season as a result of this action. Overnight camping currently represents approximately 1% of total Exit Glacier visitation, and under this alternative it could increase to approximately 12%.

The addition of a rustic hostel-type lodge would not only increase the number of overnight visitors, who would participate in many non-critical activities as described for the RV and tent campgrounds, but there could be new non-critical activities that are not currently available and are specific to the lodge operation. According to the *Visitation* analysis above, there would be the potential for 2,055 additional overnight visitors during the summer season and 1,815 additional overnight visitors during the winter season as a result of this action. This action is not expected to have a measurable impact on critical activities, as the additional lodge-based visitors would be similar to current visitors in their desire to view the glacier.

In addition to the lodge and the tent campground, winter overnight facilities would be available in a second NPS public use cabin and in concessionaire-operated yurts. This would create the potential for 1,936 additional overnight visitors per year during the winter season. As with the other overnight visitors described above, these visitors would participate in a wide range of non-critical activities as a result of their extended visit to the area. This action is not expected to have a measurable impact on critical activities, as

the additional visitors would be similar to current visitors in their desire to view the glacier.

The construction of a new trail along the north side of Exit Creek, the Forest Loop Trail, and the Goat Ridge Trail would all increase the number of visitors participating in non-critical activities such as hiking, wildlife viewing, viewing wildflowers, exercising, etc. The Goat Ridge Trail would receive approximately 5,000 summer visitors per year according to the *Visitation* analysis above. The *Visitation* analysis focused on additional visitors who would come to the area as a result of specific actions, such as the presence of a trail or other facility. According to that analysis, the Exit Creek Trail would draw a negligible number of new visitors, however, existing visitors would use the trail. The same would be true of the Forest Loop Trail. These two trails would be used primarily by visitors staying in the RV campground, tent campground and lodge, plus some use by day-use visitors. For analysis purposes, if all of the visitors using the overnight facilities were to use these two trails, the result would be the potential for 15,300 additional summer visitors hiking on trails not directly associated with viewing the glacier.

The NPS would implement actions to encourage winter visitation and activities. This would have an impact on the number of visitors (see analysis of *Visitation* above) and would cause a measurable change in the distribution of winter visitor activities. There are currently no winter interpretive activities or programs at Exit Glacier. The additional visitors that would come as a result from this action would participate in the critical activity of viewing Exit Glacier and non-critical activities including taking guided walks, viewing wildlife, skiing, snowshoeing, going to the ranger station and viewing geological features. There would be an estimated 500 additional winter visitors resulting from this action (see analysis of *Visitation* above).

The implementation of this alternative would result in major impacts to visitor activities throughout the year as a whole. While the proportion of visitors participating in viewing Exit Glacier or walking up to and/or touching the glacier would not change, there would be large changes in the proportion of visitors participating in other activities. The number of summer overnight visitors would potentially increase by approximately 17,000. Campers currently make up 1 to 3% of summer visitors, and under this alternative they would potentially represent 14 to 16% of all summer visitors. Hiking on trails other than those leading to the glacier is the other activity that would be significantly impacted. The addition of new hiking trails would potentially add up to 25,000 visitors participating in that activity. These types of hikers currently make up 5 to 15% of summer visitors (based on the current use of the Harding Icefield Trail and Nature Trail), and under this alternative they would potentially represent 24 to 34% of all summer visitors. In the winter, camping and participating in education and interpretive programs would be the two main non-critical activities that would be significantly impacted. Campers and public use cabin users currently make up 8% of winter visitors, and under this alternative they would potentially represent 93% of all winter visitors. Currently there are no winter interpretive or education programs at Exit Glacier, and under this alternative new programs would be implemented that would bring in approximately 500 students and other visitors.

Crowding

Based on this analysis, the actions associated with this alternative would have a minor impact on crowding in the Exit Glacier area during the summer season. As discussed under the *Visitation* analysis above, the implementation of this alternative would likely result in a 5.1% increase in total summer visitation, and this use would be distributed throughout the summer season. None of the actions would result in significant spikes in visitation that would affect daily peak numbers; rather the most notable increases in visitation would be from overnight visitors, which would not affect daily peak numbers. As noted in the discussion of *Visitor Profile* above, the average length of stay for the average visitor would increase markedly as a result of additional hiking trails and overnight facilities. More hiking trails would result in more visitors staying throughout the day, which would add to the number of visitors present during the daily peak.

Cumulative Impacts

Past, current and future impacts to visitor experience are discussed in the *no-action alternative.* Cumulatively, these other actions would have major impacts on visitor experience. The actions associated with this alternative would add significantly to the cumulative impacts to the visitor experience in the summer season, and the moderate impacts that would be incurred would be magnified as a result of cumulative effects. Therefore, the additional contribution of moderate impacts from this alternative results in a continued major rating for overall cumulative impacts to visitor experience.

Conclusion

The impact of alternative B on visitor experience would be moderate when averaged over the entire year. The impacts to Visitor Experience are summarized below. The breakdown of impacts by sub-category and season are as follows:

	Annual average	
Sub-category	Impact Level	Impact Rating
Visitation	Moderate	1
Visitor Profile	Minor	0
Access	Moderate	2
Visitor Activities	Major	2
Crowding	Minor	1
Total Impact Rating		6

Socioeconomic Environment

Analysis of Impact

The designation of management zones would not appreciably impact socioeconomics of the local area. Key developments which would have socioeconomic impact are analyzed below.

The trail building effort in this alternative would dramatically increase hiking opportunities in the Exit Glacier area. This action is likely to increase visitation by less than 10% annually and increase the average duration of each visit. More hiking / biking

opportunities, and longer trails, would generally increase the duration of visitation of some visitors. Increasing the duration of visitation results in increased expenditures in the local economy, as extra time spent here results in extra meals purchased, extra nights in motels, etc.

The development of a bike path may allow for new or expanded business opportunities for rentals and shuttle service, as described under the *preferred alternative.*

Construction of new trails and significant improvement of existing trails would result in increased government expenditures in the local economy for labor, supplies, and material. These expenditures would likely be high for brief periods during initial construction, with smaller annual expenditures for routine maintenance. Construction costs for trail related actions taken under this alternative are estimated to be at least $379,500, virtually all of which would be spent in the local economy for labor, supplies, and materials. This impact would be local and short term.

These enhancements would improve access to the area, especially to those visitors with disabilities, and would thus improve quality of life through recreational opportunity for them. These improvements alone, however, would not cause a measurable change in the overall quality of life in the local community.

This alternative markedly increases overnight use of the area through development of a lodge, RV campground, and expansion of the existing tent campground.

Development of a small lodge represents a new business opportunity that does not currently exist. A concession contract would be let for multi-year operation of the business. Under this type of arrangement, the government receives a franchise fee as a term of the contract. Economic benefits of this action include expenditures for initial construction of the facility, estimated at $600,000, plus ongoing employment opportunity for one or more persons year round, and collection of borough sales tax.

If this lodge is viewed as competition for existing similar facilities outside the park and that any customers it attracts are business lost for another existing operation, then it may result in reduced employment and revenue to these operators, negating the economic benefits outside the initial construction costs.

The same is true of a new RV campground. This campground would likely be government operated, and increased staffing required to manage and maintain it would represent increased employment opportunity and government salary expended in the local economy. This staffing requirement is reflected in the overall staffing estimate below. Conversely, however, if it takes business away from existing private and municipal campgrounds in Seward and the surrounding area, it represents a potential loss of employment there, as well as a loss of income and tax base in those areas. Initial construction costs of the RV campground are estimated at $1,000,000, which would be a temporary positive impact to the local suppliers and labor market.

Expansion of the existing tent campground, including construction of two new toilets and an additional cook shelter, would result in direct construction related expenditures in the local economy for supplies, material, and labor. This is a temporary impact, estimated at $36,000. Some additional annual management and maintenance costs would be associated with this action, but due to the nature of the action (walk in campgrounds require very little upkeep), this on-going impact would be negligible. The addition of 9-12 additional tent sites is likely to have no impact on existing tent campgrounds in the private sector or the municipal campgrounds of Seward.

The duration of the above impacts would be long term. The impacts of the lodge development would by year round but RV and tent campground impacts would be seasonal in nature, as this activity would occur when primarily during the high visitation season, from May through October annually.

An additional proposed winter commercial operation proposed under this alternative is concessionaire provided overnight accommodations, at the lodge discussed above and / or in yurts or similar temporary structures. Impacts are similar to those described under *alternative A*. Additionally, it is assumed that if demand were great, the private sector would have attempted to develop a lodge already, and it has not.

This alternative proposes use of a snow coach for winter access by non-motorized recreationists and school groups. This proposal could provide the opportunity for a new business or expansion of an existing business, as discussed under the *preferred alternative.*

This alternative would likely increase overall use of the area in winter for education programs. This proposal may provide slightly increased winter employment of National Park Service staff leading education programs, and some ancillary expenditures in the local economy, such as food and beverages of groups visiting the area.

Some current winter recreational users of the Exit Glacier Road corridor would likely characterize a snow coach service as a noticeable negative impact on their quality of life due to increased crowds and the introduction of a large, slow motorized vehicle competing for time and space on the road with existing skiers, mushers, snowmachiners, and skijorers. Others may see it as a positive impact because it expands educational opportunities and expands the potential for non-motorized recreation in the area directly around Exit Glacier.

This alternative proposes designating specific areas for motorized and non-motorized winter use, with grooming and marking of trails as needed. The main trail would be groomed for non-motorized use and other trails marked as routes but not formally groomed. Motorized use would occur primarily on the Exit Creek Trail, Paradise Valley Trail, and the outwash plain in addition to the road and parking area. Presently there is only one business, the US Army Seward Resort, providing commercial motorized access to the study area (see description of their operation under the *preferred alternative*). Motorized winter recreation would continue both in the study area, and on adjacent lands,

so local businesses deriving economic benefit from this activity would see little or no economic impact.

The duration of this impact would be long term, but seasonal in nature, as this activity would only occur when adequate snow cover allows – generally late November through early April. Economic impacts, positive or negative, would be limited to the local area. Implementing and managing the actions under this alternative would require an increase in park staffing levels and expenditures for supplies and materials. When fully implemented, annual expenditures into the local economy for salaries, supplies, and materials are estimated to be approximately $996,100 in 2003 dollars. This creates a minor but positive economic impact through increased annual expenditures in the government sector which is local, year round, and long term.

Overall, the proposed actions in alternative B would have a minor impact on the socioeconomic environment. Changes would be seen in the retail sales and federal government sectors. Positive or negative impacts to the regional economy and overall area employment would be very limited in scale. Impacts to the recreational opportunities associated with quality of life would be both positive and negative, depending on the user group, but none will be of such magnitude that it would significantly change the overall quality of life for area residents.

Cumulative Impacts

Past, current and future impacts to the socioeconomic environment are discussed in the *no-action alternative.* The proposed actions under this alternative would generally contribute to further economic growth, though likely on a much smaller scale than the earlier development actions. Cumulatively, these other actions would have minor impacts on the socioeconomic environment. The additional contribution of minor impacts from this alternative results in a continued minor rating for overall cumulative impacts to the socioeconomic environment.

Conclusion

Overall, the proposed actions in alternative B would have a minor impact on the socioeconomic environment. Positive or negative impacts to the regional economy and overall area employment would be very limited in scale. Impacts to the recreational opportunities associated with quality of life would be both positive and negative, depending on the user group, but none would be of such magnitude that it would significantly change the overall quality of life for area residents.

Safety

Analysis of Impact

Allocation of management zones may have impacts on safety, especially in the more primitive zones where higher recreation risks would be involved and fewer safety precautions would be permitted as prescribed by desired zone conditions. For example, structures, such as bridges for stream crossings, would not be allowed in the Backcountry

Primitive Zone and safety signs would be minimal in the Hiker and Backcountry Semi-Primitive zones.

Under alternative B, visitors engaging in non-motorized winter activities would have access to designated trails. The bike path and Forest Loop Trail would be groomed for skiers, skijorers, and dogmushers. Motorized and non-motorized recreationists would both be allowed to access the outwash plain, and the Paradise Valley and Exit Creek trails. If visitation increases, allowing motorized and non-motorized users to recreate in the same areas may lead to user conflicts with injuries (such as broken bones and concussions) to individuals and/or damage to personal property. Motorized recreationists would also have the option for riding on rough terrain where, although few, injuries have occurred in the past.

The new Paradise Valley, Goat Ridge, Forest Loop, and glacier spur trails would allow for visitors to more easily access steep terrain. The terrain for two of these trails would resemble that of the steep Harding Icefield Trail (HIT) where most of the current trail related injuries occur. Since the spur trail and the Goat Ridge Trail would resemble the HIT, it is assumed that the same types of injuries, such as sprains, cuts, hyperextension, and scrapes would occur. Adding several miles of new trails provides more access to steep terrain within the study area on which these types of injuries may occur. In addition, experienced ice climbers would be using the spur trail to access the glacier, but other visitors may use it as well. The addition of this glacier access trail would bring more visitors in close proximity to the glacier, with potential risk from falling ice causing injuries such as concussions.

Under the alternative B, visitors hiking on new trails may lead to an increase in wildlife encounters. In previous years no injuries in the Exit Glacier area have been documented from conflicts with wildlife such as moose or black bears (NPS 2002b). With the new trails, human-wildlife conflicts are expected to remain low, as visitors are generally educated and aware of not disturbing wildlife. Wildlife is dispersed throughout the park and can avoid human contact, leaving low potential for such encounters.
Under this alternative, the risk of fecal coliform contamination in the water could increase, as described under the *preferred alternative*.

Cumulative Impact
Past, current and future impacts to safety are discussed in the *no-action alternative.* Cumulatively, these other actions would have minor impacts on safety. The additional contribution of moderate impacts from this alternative results in a moderate rating for overall cumulative impacts to safety.

Conclusion
Under alternative B, visitor safety would be classified as a moderate impact. Multi-use trails in winter and several miles of new hiking trails pose potential for injuries to occur in the Exit Glacier area.

Consultation and Coordination

HISTORY OF PUBLIC INVOLVEMENT

Consultation and coordination among governmental agencies and the public were very important to the planning process for the *Exit Glacier Area Plan.* Interested citizens had several opportunities to share their views and concerns during this process. The scoping process was initiated on July 27, 2001 when the *Federal Register* (NPS 2001e) published a Notice of Intent to prepare an environmental impact statement (which has since been downgraded to an environmental assessment). Subsequent scoping efforts were guided by the Public Involvement Strategy for the Exit Glacier VERP Plan (NPS 2001f) and included presentations to local groups to inform them about the project, the distribution of newsletters with response forms soliciting public input, a web site with project information (at http://www.nps.gov/kefj/home.htm, then click the In Depth button), open interdisciplinary team meeting which the public could attend to listen to the planning process, and public meetings. The input was used to identify the issues to be addressed in the plan and environmental impact statement and to identify and help shape the desired future conditions and the alternatives.

The planning team distributed four newsletters and held meetings throughout the planning process. The newsletters and meetings offered opportunities for people at the local and the national levels to provide input into the plan. These forums were designed to allow for public expression and to foster dialogue between the planning team and the public and other agencies. A brief summary of these activities follows.

In addition, the planning team contacted the U.S. Fish and Wildlife Service and National Marine Fisheries in January 2003 to identify federal threatened and endangered species and critical habitat. None were identified for the study area (see Appendix B for correspondence).

Newsletters and Workbooks

During the planning process the team compiled a mailing list of over 400 names. The list included officials from state and other federal government agencies, state and federal legislators, Native Alaskan tribal governments, local and regional governments, businesses and organizations, and interested citizens. All the newsletters were also placed on the web site mentioned above.

Newsletter 1, published in the September 2001, introduced the planning process and identified the park's purposes and significance. The newsletter included a response form for people to express their thoughts and concerns about the material in the newsletter and on what issues the plan should address. Thirty individuals or organizations sent in comments which identified issues with access, levels and types of development, regulations, resource impacts, commercial operations, and interpretation/education.

Newsletter 2, published in February 2002, was a progress report, including maps and text on the park's existing conditions and trends. The newsletter described the study area, summarized ongoing natural resource inventories, and touched on existing visitor

activities. This newsletter also alerted the public to the upcoming workbook that would present the preliminary management alternatives. This newsletter did not include a response form.

Newsletter 3, published in May 2002, was a workbook that presented preliminary management alternatives for the Exit Glacier area and announced upcoming public meetings that would provide opportunities for dialog about the preliminary alternatives. Four management scenarios, and the no-action scenario, were described for summer and for winter along with descriptions of the five prescriptive management zones. Each scenario included an overview of a management concept, a map that zoned the study area, and a brief summary of key actions. A response form was included that asked readers what they liked or disliked about the scenarios and what, if anything, they would change. Twenty-five individuals or organizations sent in comments which identified their favorite and least favorite preliminary alternatives, and brought up concerns such as access for all user groups, preserving the opportunity to walk up to and touch the glacier, effects on wildlife from increasing visitor use, over-development and commercialization, maintaining the area as natural and quiet as possible, and public transportation.

Newsletter 4, published in September 2002 summarized the comments on the preliminary management alternatives that the planning team had received from several public meetings and from replies to the response form in newsletter 3. This newsletter also described the status of the planning effort and noted what would happen next in the planning process.

Public Meetings

The planning team held several meetings during the course of the planning process in the formats of meetings with local groups and meetings open to the public. The team met with local organizations to introduce the project and to identify their issues and concerns. Planning team members met with representatives from the following groups:

- City of Seward City Council on October 22, 2001 and on July 8, 2002
- Downtown Merchants Association on October 26, 2001
- EKPEAA Board of Directors on October 13, 2001
- Seward Chamber of Commerce on July 20, 2001
- Seward Rotary Club on November 13, 2001
- Alaska Wilderness Recreation Tourism Association on March 7, 2003

During the course of the planning process, the planning team also met several times with National Park Service staff to brief them about the *Exit Glacier Area Plan* and its status. Kenai Fjords National Park staff was briefed in May 2000 and May 2002. Staff from the Alaska Regional Office was briefed on September 5, 2002. This helped encourage effective intra-office communication and ensured that park employees were as informed as the general public.

Meetings open to the public were held after Newsletter 3 (the alternatives workbook) was distributed. An open house was held in Seward at the Kenai Fjords National Park Visitor Center on May 29, 2002. Sixteen people attended. The open house provided a variety of different ways for the interested public to learn about and comment on the Exit Glacier project. Descriptions of the alternatives were available and provided a variety of methods for people to comment. These methods include one-on-one discussions with park staff, small discussion groups, flip charts, maps to draw on, and scheduled presentations with large group discussions.

Two other public meeting were held in Soldotna on June 3, 2002 (0 people attended) and in Anchorage on June 6, 2002 (6 people attended). The format for these meeting consisted of speakers presenting different facets of the preliminary alternatives and how a plan would be implemented. These public meetings encouraged discussion and feedback.

Input received at these public meetings was similar to the written comments that were received in response to newsletter #3 (see description above). People voiced their preferences for specific alternatives or actions and brought up concerns or comments over specific issues.

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APPENDIX A: SUMMARY, EVALUATION AND FINDINGS ANILCA SECTION 810(a)

I. Introduction

This evaluation and finding was prepared to comply with Title VIII, Section 810 of the Alaska National Interest Lands Conservation Act (ANILCA). It evaluates the potential restrictions to subsistence uses, which could possibly result from the proposal to implement the preferred alternative in the Exit Glacier area of Kenai Fjords National Park near Seward, Alaska. The *Exit Glacier Area Plan* describes a range of alternatives for consideration.

II. Evaluation

Section 810(a) of ANILCA states:

"In determining whether to withdraw, reserve, lease, or otherwise permit the use, occupancy, or disposition of public lands under any provision of law authorizing such actions, the head of the Federal agency having primary jurisdiction over such lands or his designee shall evaluate the effect of such use, occupancy, or disposition on subsistence uses and needs, the availability of other lands for the purposes sought to be achieved, and other alternatives which would reduce or eliminate the use, occupancy, or disposition of public lands needed for subsistence purposes. No such withdrawal, reservation, lease, permit, or other use, occupancy or disposition of such lands which would significantly restrict subsistence uses shall be affected until the head of such Federal agency."

(1) gives notice to the appropriate State agency and the appropriate local committees and regional councils established pursuant to section 805;
(2) gives notice of, and holds, a hearing in the vicinity of the area involved; and
(3) determines that--
  (A) such a significant restriction of subsistence uses is necessary, consistent with sound management principles for the utilization of the public lands,
  (B) the proposed activity will involve the minimal amount of public lands necessary to accomplish the purposes of such use, occupancy, or other disposition, and
  (C) reasonable steps will be taken to minimize adverse impacts upon subsistence uses and resources resulting from such actions.

ANILCA created new units and additions to existing units of the national park system in Alaska. Kenai Fjords National Park, containing approximately five hundred and sixty-seven thousand acres of public lands, was created by ANILCA, section 201(5) for the following purposes:

> "The park shall be managed for the following purposes, among others: To maintain unimpaired the scenic and environmental integrity of the Harding Icefield, its outflowing glaciers, and coastal fjords and islands in their natural state; and to protect seals, sea lions, other marine mammals, and marine and other birds and to maintain their hauling and breeding areas in their natural state, free of human activity which is disruptive to their natural processes.

Section 201 (5) of ANILCA does not authorize subsistence use within Kenai Fjords National Park.

The potential for significant restriction must be evaluated for the proposed action's effect upon "...subsistence uses and needs, the availability of other lands for the purposes sought to be achieved and other alternatives which would reduce or eliminate the use." (Section 810(a), ANILCA).

III. Proposed Action on Federal Lands

The Alternatives, Including of the Preferred Alternative section of the *Exit Glacier Area Plan* describes in detail the alternatives for consideration. Following is a brief summary of each.

No-Action Alternative
This alternative provides a baseline for evaluating the changes and impacts of the action alternatives. Under this alternative, the Park Service would continue to manage the Exit Glacier area at Kenai Fjords National Park as it has in the past, relying on existing plans. The park staff would continue to respond to issues on a case-by-case basis. All existing visitor facilities would remain in place, with Exit Glacier itself as the primary visitor attraction. No new construction, other than that identified in the 1995 Development Concept Plan, would be authorized, nor would there be any changes made in the way Exit Glacier area is managed.

Preferred Alternative
The Preferred Alternative is the alternative the National Park Service proposes to implement for the Exit Glacier area of Kenai Fjords National Park over the next 20 years. The focus of this alternative would be to enhance the experience of viewing Exit Glacier, which is the main attraction of the area, and to provide for additional non-motorized recreational opportunities. In this alternative, park managers would follow all of the desired conditions described for the management zones earlier in this chapter plus several additional management actions described below. The Preferred Alternative maps show how the different management zones would be applied to the Exit Glacier area in summer and winter.

Alternative A
This alternative would focus on improving interpretation, education, and non-motorized recreation, but would rely more on increased staffing and program development than on physical development to do so. The goal of this concept is to transform Exit Glacier from a "photo-op" of the glacier to an education experience.

Alternative B
This alternative promotes increasing the infrastructure of the Exit Glacier area to accommodate a greater number of visitors and recreational activities year-round. Visitor demand and economic feasibility would determine if the major actions (e.g., RV campground, hostel, groomed trails in winter) would be implemented.

IV. Affected Environment

Kenai Fjords National Park was established by ANILCA in 1980. Located on the Kenai Peninsula in Game Management Unit 7, Kenai Fjords National Park contains impressive geologic features, scenery, wildlife and human history.

A summary of the affected environment pertinent to subsistence uses is presented here. For a comprehensive description, see the Affected Environment chapter of the *Exit Glacier Area Plan.* The following documents contain additional descriptions of the affected subsistence environment of the region:

- Kenai Fjords National Park Final General Management Plan, Alaska Regional Office, National Park Service, 1984
- Kenai Fjords National Park Final Environmental Impact Statement, Wilderness Recommendation, National Park Service, 1988.

Section 803 of ANILCA defines subsistence uses as "the customary and traditional uses by rural Alaska residents of wild, renewable resources for direct personal or family consumption as food, shelter, fuel, clothing, tools, or transportation; for the making and selling of handicraft articles out of non-edible by-products of fish and wildlife resources taken for personal or family consumption; for barter, or sharing for personal or family consumption; and for customary trade."

ANILCA and National Park Service regulations authorize subsistence use of resources in all Alaska national parks, monuments and preserves with the exception of Kenai Fjords National Park, Glacier Bay National Park, Katmai National Park, Klondike Gold Rush National Historical Park, "old" Mount McKinley National Park, and Sitka National Historical Park (Codified in 36 CFR part 13, Subparts A, B, and C). Consequently there are no Federal subsistence open seasons for wildlife harvest within Kenai Fjords National Park.

In accordance with Title VIII of ANILCA, subsistence uses are allowed on adjacent federal public lands within Kenai National Wildlife Refuge and Chugach National Forest. Federal regulations allow qualified rural residents to use fish and wildlife population for subsistence purposes on USDA National Forest and U.S. Fish and Wildlife Service lands. Regional subsistence activities that occur outside the park include hunting, fishing, trapping, berry picking and plant gathering. Black bear, moose, fish, furbearers, small mammals, waterfowl, berries, edible plants and wood constitute the major subsistence resources used by qualified rural residents.

V. Subsistence Uses and Needs Evaluation

Potential Impacts to Subsistence Users

To determine the potential impacts on existing subsistence activities for each alternative, three evaluation criteria were analyzed relative to existing subsistence resources which could be impacted.

1. the potential to reduce important subsistence fish and wildlife populations by (a) reductions in number, (b) redistribution of subsistence resources, or (c) habitat losses;

2. what affect the action might have on subsistence fisherman or hunter access;

3. the potential for the action to increase fisherman or hunter competition for subsistence resources.

1. *The potential to reduce populations*:
(a) Reduction in Numbers:
The No-Action Alternative, Alternative A, and the Preferred Alternative would not reduce populations. Alternative B would subject wildlife and habitats to potential impacts and disturbances caused by new construction and increased visitation. However the potential impacts would not be of a magnitude to significantly reduce wildlife populations or their habitats.

(b) Redistribution of Resources:
The alternatives are not expected to cause a significant disturbance to habitat thereby reducing certain subsistence wildlife resources.

(c) Habitat Loss:
The alternatives are not expected to significantly impact critical habitat for moose, furbearers, waterfowl and other subsistence resources.
These alternatives are not expected to manipulate subsistence habitats or result in any measurable reduction in or redistribution of wildlife or other subsistence resources. Provisions of ANILCA, Federal Subsistence Board, USDA Forest Service, Fish and Wildlife Service and NPS regulations provide the tools for adequate protection of fish and wildlife populations within region while ensuring a subsistence priority for local rural residents. In addition, the Federal managers may enact closures and/or restrictions if necessary to assure the continued viability of a particular fish or wildlife population.

2. *Restriction of Access:*
The alternatives are not expected to significantly change regional subsistence use patterns. Access for subsistence uses within National Forest Service and US Fish and Wildlife Service areas are granted pursuant to ANILCA, sections 811(a)(b) and 1110(a). ANILCA allows access within Kenai Fjords National Park by certain specified means for traditional activities.

3. *Increase in Competition*:
The alternatives are not expected to result in an increase in competition for subsistence resource on federal public lands, which are open to eligible subsistence users. Federal regulations and provisions of ANILCA mandate that if and when it is necessary to restrict taking of fish or wildlife subsistence users are given a priority over other user groups. Continued implementation of the ANILCA provisions should mitigate any increased competition from resource users other than subsistence users. Federal managers may enact restrictions if necessary to protect the continued viability of a particular fish or wildlife population.

VI. Availability of Other Lands
The availability of other lands outside or within the park has not been considered in the proposed actions. The alternatives are consistent with NPS mandates and the Kenai Fjords General Management Plan. Because the proposed actions occur on federal lands which are not available for subsistence use, they do not affect the availability of federal land for subsistence use. No major impact on subsistence use is expected under the proposed actions.

VII. Alternatives Considered
This evaluation has described and analyzed the alternatives of this EA with emphasis on the Preferred Alternative.

VIII. Findings
This analysis concludes that the proposed actions would not result in restriction of subsistence uses.

APPENDIX B: CONSULTATION WITH USFWS AND NMFS

United States Department of the Interior

NATIONAL PARK SERVICE
Kenai Fjords National Park
P.O. Box 1727
Seward, Alaska 99664

IN REPLY REFER TO:
L76

February 4, 2003

Ann Rappoport, Field Supervisor
US Fish and Wildlife Service
Ecological Services
605 W. 4th Avenue, Room G61
Anchorage, AK 99501

Dear Ms. Rapapport,

The National Park Service is preparing an Environmental Impact Statement (EIS) for the management of the Exit Glacier area at Kenai Fjords National Park. When the EIS is complete, it will guide resource protection, public use, and development in the Exit Glacier area for 15 to 20 years. As part of the planning process, I am requesting information on federally listed or candidate threatened or endangered plant and animal species that might occur in the project area. Please also provide mapped locations of known populations of these species and designated critical habitats, if any, for such species.

The project area covered by the EIS includes only the Exit Glacier area of Kenai Fjords National Park (see attached map). However, the planning team will also work with managing agencies for lands adjacent to the park (in particular, the US Forest Service) to arrive at cooperative strategies for better protecting park resources.

This letter will serve as a record that the National Park Service is initiating informal consultation with your agency pursuant to the requirements of the Endangered Species Act and National Park Service Management Policies. If you have any questions, please contact Eveline Martin, Interdisciplinary Team Leader/ Biologist at (907) 224-2114.

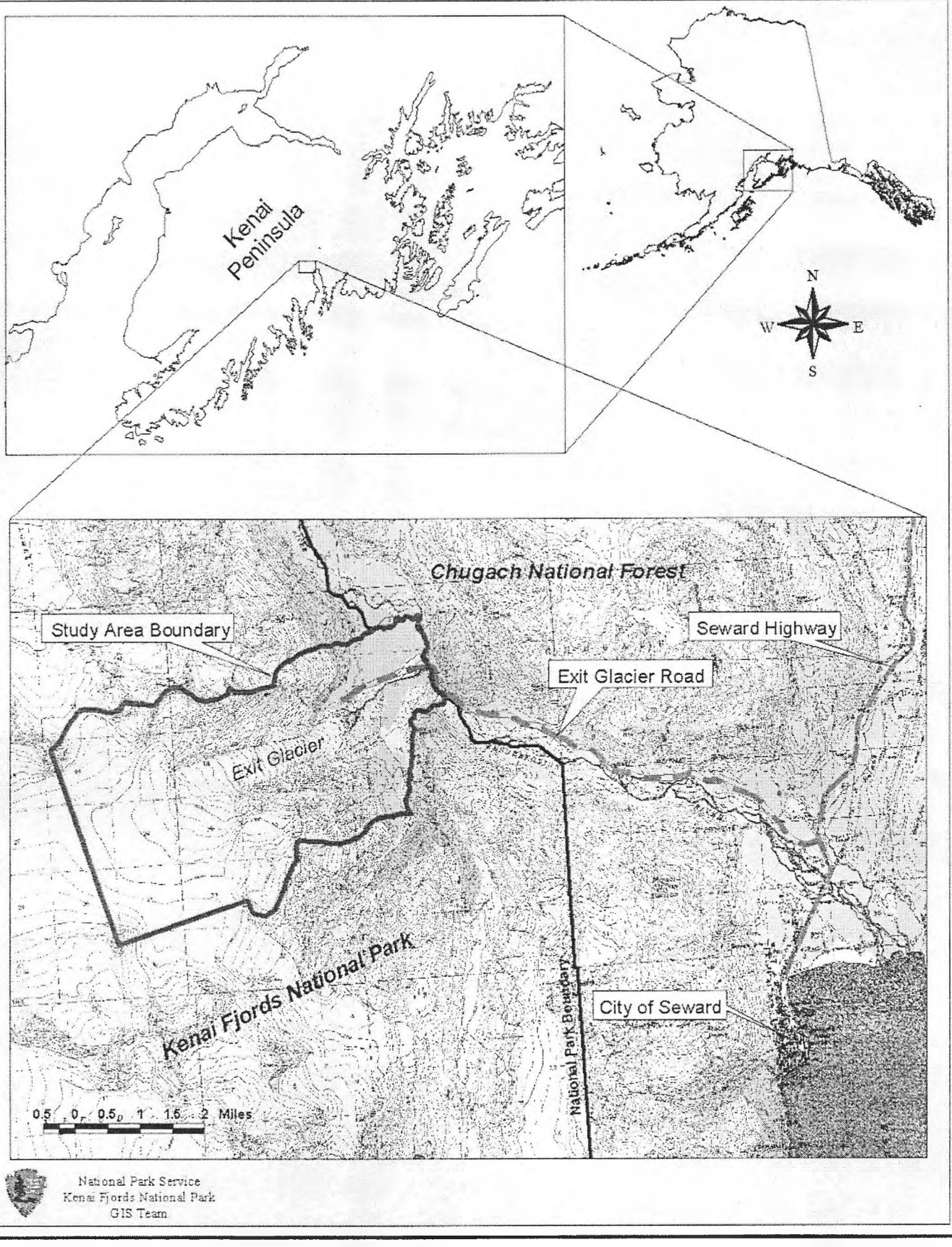
Sincerely,

Anne D. Castellina

Anne D. Castellina
Superintendent

Attachment

Exit Glacier VERP Project Study Area and Vicinity



National Park Service
Kenai Fjords National Park
GIS Team

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Anchorage Fish & Wildlife Field Office
605 West 4th Avenue, Room G-61
Anchorage, Alaska 99501-2249

Ms. Anne D. Castellina
Superintendent
Kenai Fjords National Park
P.O. Box 1727
Seward, AK 99664

Re: Endangered species information for Exit Glacier Management Plan (*Consultation # 2003-065*)

Dear Ms. Castellina:

This responds to your letter of February 4, 2003, received in our office on February 7, 2003, requesting information concerning federally protected species or critical habitat that may occur in the Exit Glacier area. We have reviewed the information you enclosed and are providing comments in accordance with the Endangered Species Act (16 U.S.C. 1531 *et seq.*) (Act).

Our records indicate no federally listed or proposed species, or designated or proposed critical habitat, within the area of the proposed project. Therefore, the requirements of section 7 of the Act have been satisfied, and no further consultation pursuant to the Endangered Species Act is required for this project at this time. This determination may be reconsidered if: (1) new information reveals project impacts that may affect listed species or critical habitat in a manner not previously considered; (2) this action is subsequently modified in a manner which was not considered in this assessment; or (3) a new species is listed or critical habitat is determined that may be affected by the identified action.

We have recently updated our compilation of threatened and endangered species fact sheets for Alaska. We are enclosing a copy of this document for your information and future reference.

This letter relates only to federally listed or proposed species and/or designated or proposed critical habitat under our jurisdiction. It does not address species under the jurisdiction of National Marine Fisheries Service, or other legislation or responsibilities under the Fish and Wildlife Coordination Act, Clean Water Act, National Environmental Policy Act, or Bald and Golden Eagle Protection Act.

Thank you for your partnership in maintaining rare species and healthy natural environments. Please do not hesitate to contact me at (907) 271-2780 if you have any further questions regarding our trust resources.

Sincerely,

Judy Jacobs
Endangered Species Biologist

Enclosure

T:\Judy\ section 7 letters\ ExitGlacierMgt.doc

United States Department of the Interior

NATIONAL PARK SERVICE
Kenai Fjords National Park
P.O. Box 1727
Seward, Alaska 99664

IN REPLY REFER TO:
L76

February 4, 2003

Matthew Eagleton
National Marine Fisheries Service
222 West 7TH Avenue, Box 43
Anchorage, Alaska 99513

Dear Mr. Eagleton:

The National Park Service is preparing an Environmental Impact Statement (EIS) for the management of the Exit Glacier area at Kenai Fjords National Park. When the EIS is complete, it will guide resource protection, public use, and development in the Exit Glacier area for 15 to 20 years. As part of the planning process, I am requesting information on federally listed or candidate threatened or endangered plant and animal species that might occur in the project area. Please also provide mapped locations of known populations of these species and designated critical habitats, if any, for such species.

The project area covered by the EIS includes only the Exit Glacier area of Kenai Fjords National Park (see attached map.) There are no federally managed fish species in the project area or affected by the management alternatives; therefore, there will be no direct or indirect effects on Essential Fish Habitat.

This letter will serve as a record that the National Park Service is initiating informal consultation with your agency. If you have any questions, please contact Eveline Martin, Interdisciplinary Team Leader/ Biologist, at (907) 224-2114.

Sincerely,

Anne D. Castellina

Anne D. Castellina
Superintendent

Attachment

"Brian K. Lance"
<brian.lance@noaa.gov>

02/12/2003 02:08 PM
YST

To: ami_wright@nps.gov
cc: Jeanne Hanson <Jeanne.Hanson@noaa.gov>
Subject: Exit Glacier EIS

Ami Wright
February 12, 2003

The NMFS has reviewed your letter regarding the EIS for management of the Exit Glacier area. There are no federally listed threatened or endangered species in the area over which NMFS has jurisdiction. The described action will have no impact and will not result in any adverse effect to EFH. No further EFH Assessment is required and NMFS does not offer any EFH Conservation Recommendations. Further EFH consultation is not necessary. NMFS has no objection to the project. Thank you for the opportunity to comment. Should you have questions, feel free to contact me.

Brian Lance
NMFS-Habitat Biologi

brian.lance.vcf