



Frontcountry Management Plan and Environmental Assessment

August 2024



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Purpose and Need

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CHAPTER 1: PURPOSE AND NEED

INTRODUCTION

The National Park Service (NPS) is proposing to implement a new frontcountry management plan (“the plan”) at Kenai Fjords National Park to address visitor use at the park’s most accessible and popular inland destination. Historically, the frontcountry area offered a unique opportunity to see and experience Exit Glacier up close. However, as Exit Glacier has retreated substantially due to a warming climate, a new plan is needed to adapt and diversify appropriate visitor opportunities in the frontcountry while stewarding park resources and guiding park management activities in this area until conditions change that warrant a reconsideration of the planning recommendations. The plan would provide quality visitor experiences while adaptively managing facilities and updating regulations affected by dynamic environmental conditions. The plan would enable the National Park Service to acknowledge, interpret, and respond to climate change effects on frontcountry resources, facilities, desired conditions, and visitor use. Finally, the plan considers partnering opportunities to benefit visitors, neighboring landowners and managers, communities, and the environment.

This frontcountry management plan/environmental assessment has been prepared in accordance with the National Environmental Policy Act of 1969 (NEPA), as amended, and regulations of the Council of Environmental Quality (40 CFR Part 1500) to assess whether the proposed plan is a major federal action that significantly affects the quality of the human environment. This environmental assessment evaluates potential environmental impacts of the plan alternatives and seeks input from the public, regulatory agencies, and other interested parties. After a public review of the environmental assessment, the National Park Service will consider public comments and conclude consultation with Alaska Native groups and agencies as required. If it is determined that the selected action alternative will not have significant impacts, the National Park Service will prepare a finding of no significant impact. The finding of no significant impact is the formal decision document for the plan and concludes the NEPA process. Once approved, this plan will supplement the guidance in the *General Management Plan for Kenai Fjords National Park* (NPS 1984) and replace the 2004 *Final Exit Glacier Area Plan/GMP Amendment* (NPS 2004).

BACKGROUND

Kenai Fjords National Park, established in 1980 through the Alaska National Interest Lands Conservation Act (ANILCA), is a 607,805-acre park in southcentral Alaska (figure 1) that is managed to conserve the scenic and environmental integrity of an interconnected icefield, glacier, and coastal fjord ecosystem. Park significance, or what is most important about the park’s natural and cultural resources and values (NPS 2013), is that the park:

1. protects the Harding Icefield and its outflowing glaciers, where the maritime climate and mountainous topography result in the formation and persistence of glacier ice
2. protects wild and scenic fjords that open to the Gulf of Alaska where rich currents meet glacial outwash to sustain an abundance of marine life

3. protects an outstanding example of a coastal mountain range with steep-sided fjords, drowned cirques, and jagged islands
4. protects a rich diversity of terrestrial and marine life in their natural state
5. provides opportunities to experience, understand, and appreciate the scenic and wild values of the Harding Icefield, outflowing glaciers, coastal fjords, and wildlife and to comprehend environmental change in a human context

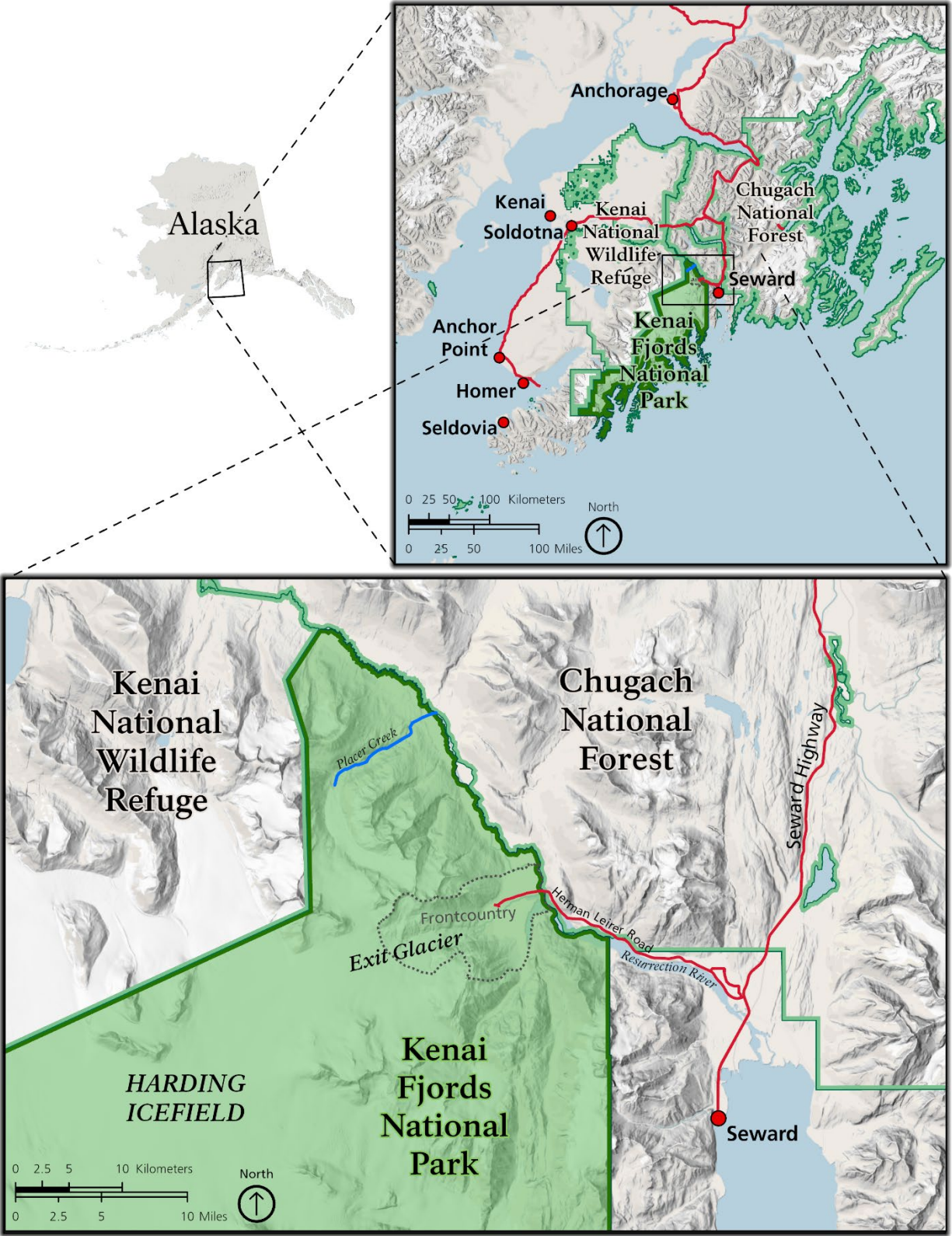


FIGURE 1. OVERVIEW OF THE LOCATIONS OF KENAI FJORDS NATIONAL PARK IN ALASKA (TOP) AND THE FRONTCOUNTRY AREA (BOTTOM)

PROJECT AREA

The project area (figure 2 and figure 3), referred to as the frontcountry area, is a 6,642-acre area accessible by road and accommodates the vast majority of the park's visitation. Visitors access the frontcountry area by traveling on the Herman Leirer Road (referred to colloquially as the Exit Glacier Road), a paved road that departs from mile 3.5 of the Seward Highway. The first 7 miles of the road are outside the park and project area but serve as the gateway to the park's frontcountry area, traversing private, Alaska Department of Natural Resources, and US Forest Service (USFS) lands before entering the park at the bridge over the Resurrection River. The road continues for another 1.5 miles to the parking area and park nature center.

The Resurrection River flanks the eastern boundary of park and frontcountry area, and the 300-square mile Harding Icefield rises above the frontcountry area to the west. The southern (or southeastern) boundary of the frontcountry area follows the lower reaches of Paradise Creek, and the high, steep ridgelines north of the road and Harding Icefield Trail create the boundary separating the frontcountry area from the neighboring valley to the north. While most of the icefield is excluded from the project area, Exit Glacier is a prominent feature in the frontcountry area, descending from the icefield to a wide river valley where the glacier's melt waters feed into Exit Creek and run down to a large outwash plain and valley floor.

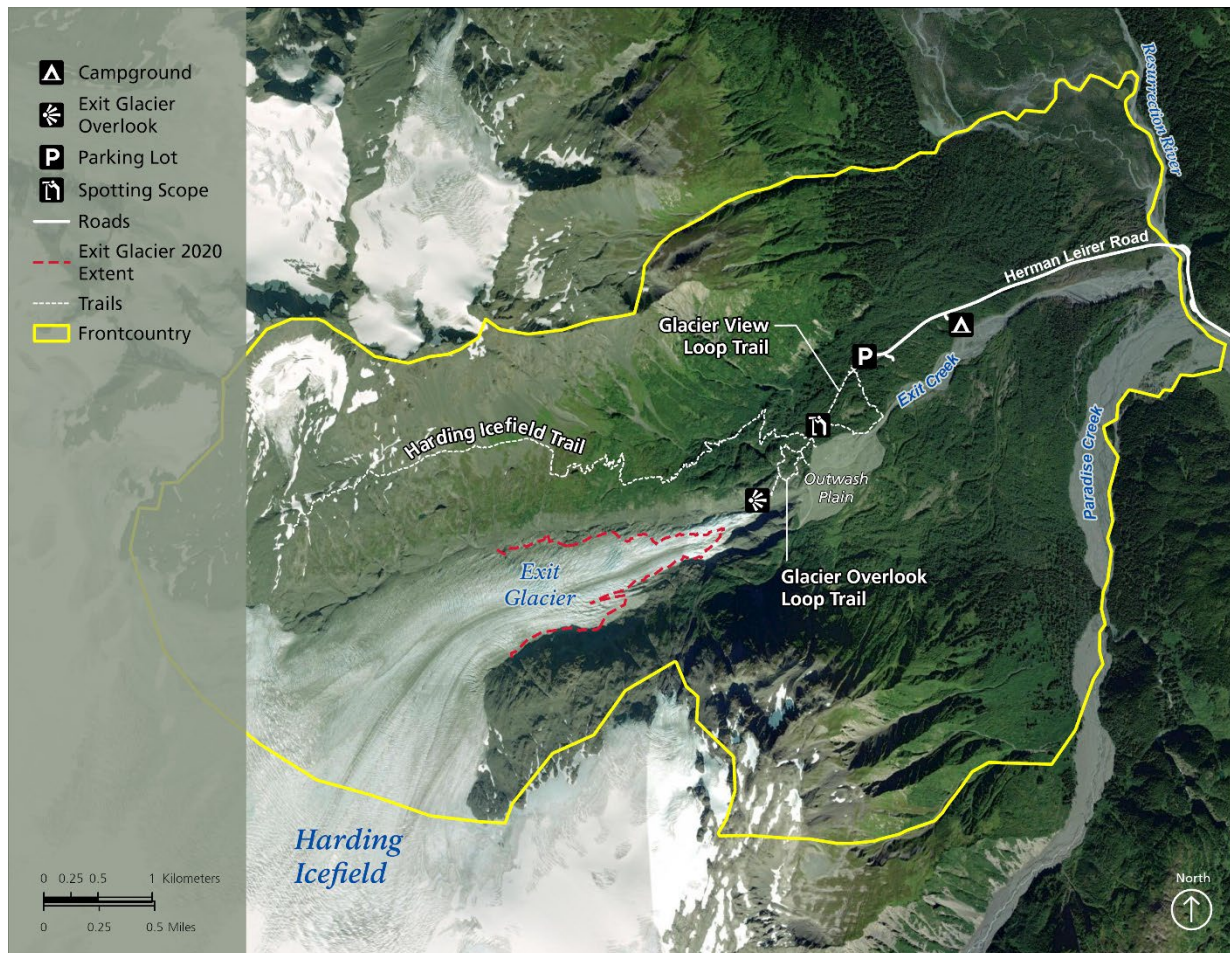


FIGURE 2. OVERVIEW OF THE KENAI FJORDS NATIONAL PARK FRONTCOUNTRY AREA

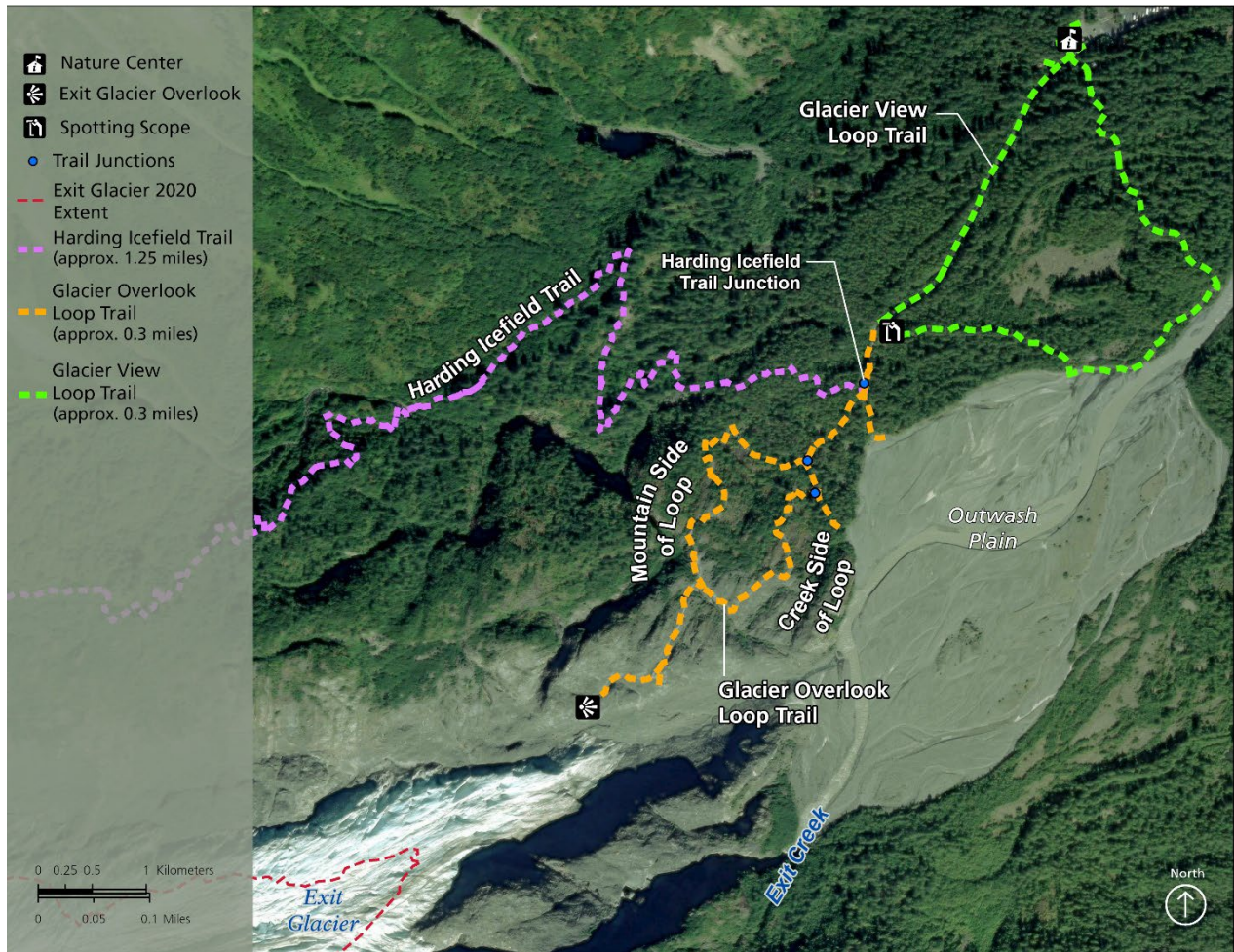


FIGURE 3. DETAILED VIEW OF KENAI FJORDS NATIONAL PARK FRONTCOUNTRY AREA TRAILS, SIGNS, AND VISITOR FACILITIES ACCESSED FROM THE NATURE CENTER

The National Park Service manages the 1.5-mile section of road starting inside the park boundary from where the road crosses the Resurrection River bridge to where it ends at the parking area. Before arriving in the parking area, visitors can access a 12-site tent-only campground from the road. From the parking area, visitors can explore a variety of trails, the nature center (a visitor center), and other features, such as the outwash plain, that dominate the valley floor. The Glacier View Loop Trail guides visitors across gentle terrain leading to the slightly more challenging terrain Glacier Overlook Loop Trail and the arduous Harding Icefield Trail. Many visitors come to the frontcountry expecting to touch the famous Exit Glacier (NPS 2004), but the glacier has experienced substantial melting due to a warming climate and retreated over 0.5 miles, such that the glacier is no longer easily or safely accessed from existing trails.

During snow-free times from approximately May through November, the State of Alaska maintains the 7 miles of the Herman Leirer Road, from the Seward Highway to the NPS boundary, as a public motor vehicle thoroughfare. Visitors use the Herman Leirer Road for walking, biking, jogging, walking pets, and starting backpacking trips during these months, sharing the road with motor vehicles. From approximately November through April, the

Herman Leirer Road is closed to regular vehicle traffic by the State of Alaska starting 1.3 miles from the Seward Highway. Snowmachines and commercial over-snow vehicles (snowcoaches and enclosed vehicles with snow tracks) use the road, as snow conditions accommodate those activities. Skiers, fat tire winter snow bikers, snowshoers, hikers, and dog mushers share the road with snowmachines and over-snow vehicles during the winter.

PURPOSE AND NEED

The purpose of this plan is to

- diversify visitor opportunities in the only area of the park accessible by road;
- manage resource impacts and safety concerns associated with increasing visitation;
- provide guidance for responsibly managing facilities and infrastructure impacted by rapidly changing conditions driven by climate change; and
- propose regulation changes necessary to address dynamic conditions while stewarding park resources.

The plan is needed because the frontcountry area's previous visitor use plan, the 2004 Final Exit Glacier Area Plan, emphasized opportunities for visitors to touch or be near the glacier; however, it is no longer possible for most visitors to approach the glacier easily and safely, as Exit Glacier has retreated 0.5 miles between 2003 and 2023. A new plan is also needed because increasing visitation to the frontcountry area is affecting visitor experience and the National Park Service's ability to achieve desired conditions identified in the 2004 Final Exit Glacier Management Plan. A new plan is needed to identify management responses to changing conditions due to climate change and geological events that are impacting visitor facilities, infrastructure, and recreational opportunities while addressing increasing visitation and reducing impacts on natural resources. Planning issues identified below elaborate on the needs that the proposed plan aims to address.

PLANNING ISSUES

Several planning issues drive the need for this plan. In 2018, park managers conducted a series of scenario planning workshops with park staff, associated Alaska Native Groups, and the public. Workshop participants discussed how Exit Glacier's rate of retreat and increasing frontcountry area visitation could plausibly result in multiple future planning scenarios with several visitor use, resource, and facility management issues that would need to be addressed in a focused frontcountry management planning effort (Kim et al. 2020). Additionally, the park conducted civic engagement efforts in January of 2022 to seek and consider public input regarding planning issues and opportunities (see chapter 4). These issues are summarized below.

Conditions Do Not Match Visitor Expectations

Since 2004, the National Park Service has focused on Exit Glacier as the focal feature for visitor experiences in the frontcountry area. Many visitors coming to the Kenai Fjords frontcountry area expect to see, approach, and potentially touch Exit Glacier. However,

substantial changes in its size and extent due to the glacier melting and retreating in a warming climate (figure 4 and figure 5) render Exit Glacier inaccessible to the average visitor, creating disappointment for many visitors. Furthermore, some adventurous visitors have attempted to approach the glacier without appropriate technical experience and gear, creating safety concerns.

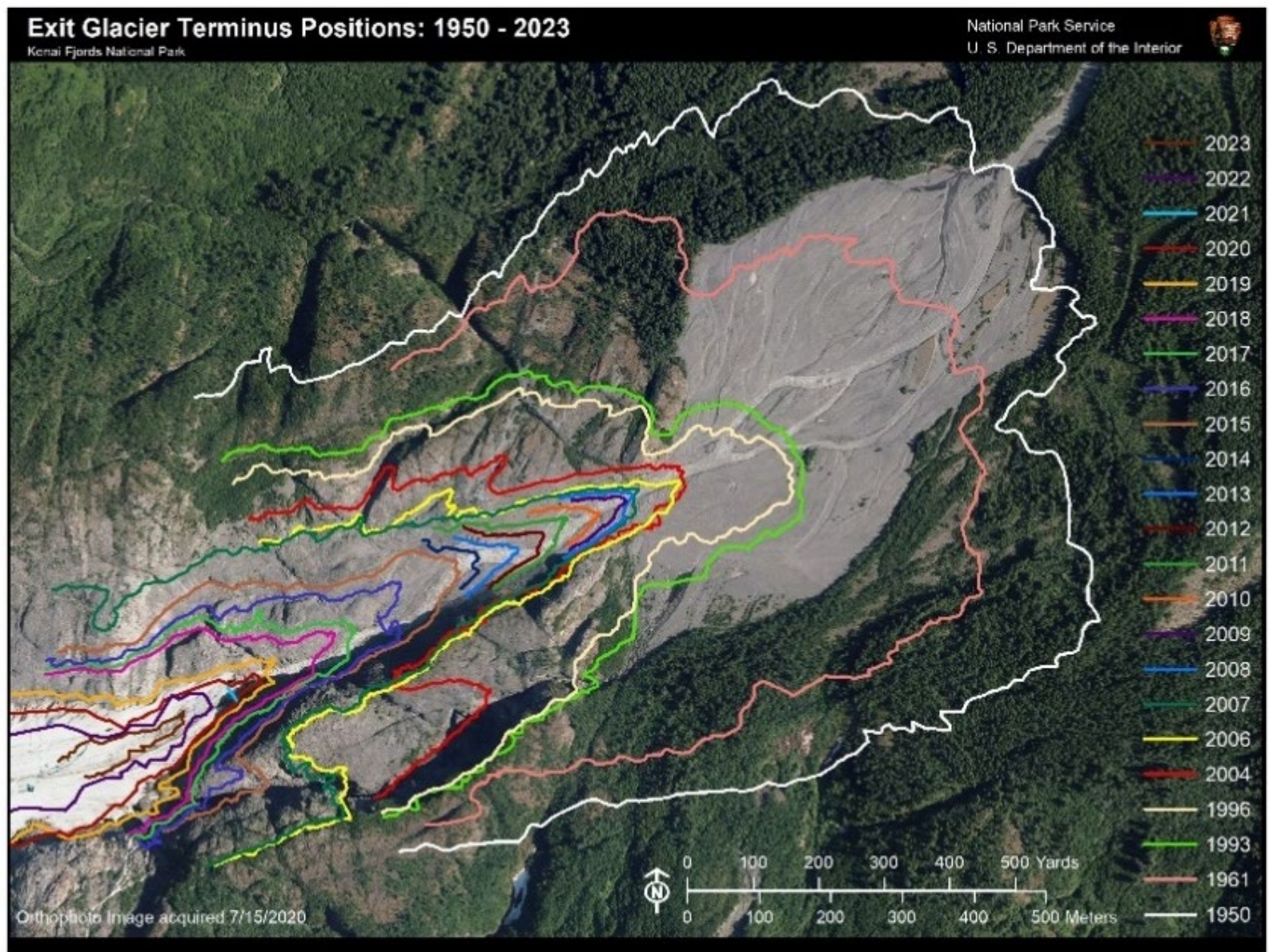


FIGURE 4. THE EXTENT OF EXIT GLACIER'S RETREAT BETWEEN 1950 AND 2023, INDICATED BY COLORED LINES (UNDERLYING SATELLITE IMAGE TAKEN IN 2020)



FIGURE 5. PAIRED PHOTOGRAPHS (TOP, 2004 AND 2010; BOTTOM, 2016 AND 2023) ILLUSTRATE HOW THE RETREAT OF EXIT GLACIER HAS CHANGED VISITOR EXPERIENCES IN THE FRONTCOUNTRY AREA (NPS PHOTOS/DEBORAH KURTZ)

Facility Vulnerability in a Dynamic Landscape

Frontcountry facilities are at risk of being, or have already been, damaged by erosion, flooding, and sediment deposition that naturally occur in this geologically dynamic landscape. Facilities in the frontcountry area include trails, signs, shelters, benches, viewing scopes, campsites, two vault toilets and one hand water pump serving the campground, buildings near the Exit Glacier outwash area, and transportation infrastructure. Sudden glacial outburst flooding events have eroded the Glacier View Loop Trail near Exit Creek on several occasions; as a result, park staff have had to rebuild the trail multiple times to continue to provide safe access to visitors. Other trails have been buried in feet of sediment released in sudden glacial outburst flooding events (figure 6). Prior to 2016, the park road was undermined by flooding on several occasions; in response, the road was elevated by 5 feet, and box culverts were installed to reduce flooding impacts and to prevent further undermining.



FIGURE 6. FRONTCOUNTRY TRAIL SIGN BURIED IN SEVERAL FEET OF GLACIAL TILL AND SEDIMENT AFTER A GLACIAL OUTBURST FLOODING EVENT IN 2022 (NPS PHOTO)

Increasing Visitor Use

Visitation to the Kenai Fjords frontcountry is increasing (figure 7). Visitors are coming to the frontcountry earlier in the summer, and visitation continues later into the fall as temperatures become milder in the “shoulder seasons” (spring and fall) due to climate change. The National Park Service typically staffs the nature center facility from Memorial Day weekend through Labor Day weekend, but cruise ships have extended their tour season beyond those holidays, bringing more visitors on buses to the frontcountry area when park staff presence is limited. Hiker use on the Harding Icefield Trail also appears to be increasing. Higher frequencies of visitor encounters along the more arduous and remote trail can decrease the quality of the visitor experience.

Increasing visitation has resulted in a corresponding increase in vehicle traffic, creating traffic congestion in the parking lot periodically. The current capacity of the parking lot is 75 passenger vehicle spaces, 24 longer recreational vehicle spaces, and 6 tour bus spaces. During peak visitation times in June, July, and August, the parking lot is typically full from 10:00 a.m. to 4:00 p.m. Roadside parking off pavement in brush-free areas along the park road due to the lack of available designated parking spaces creates unsafe traveling conditions for motorists, bicyclists, and pedestrians and can result in natural resource impacts (see next issue topic).

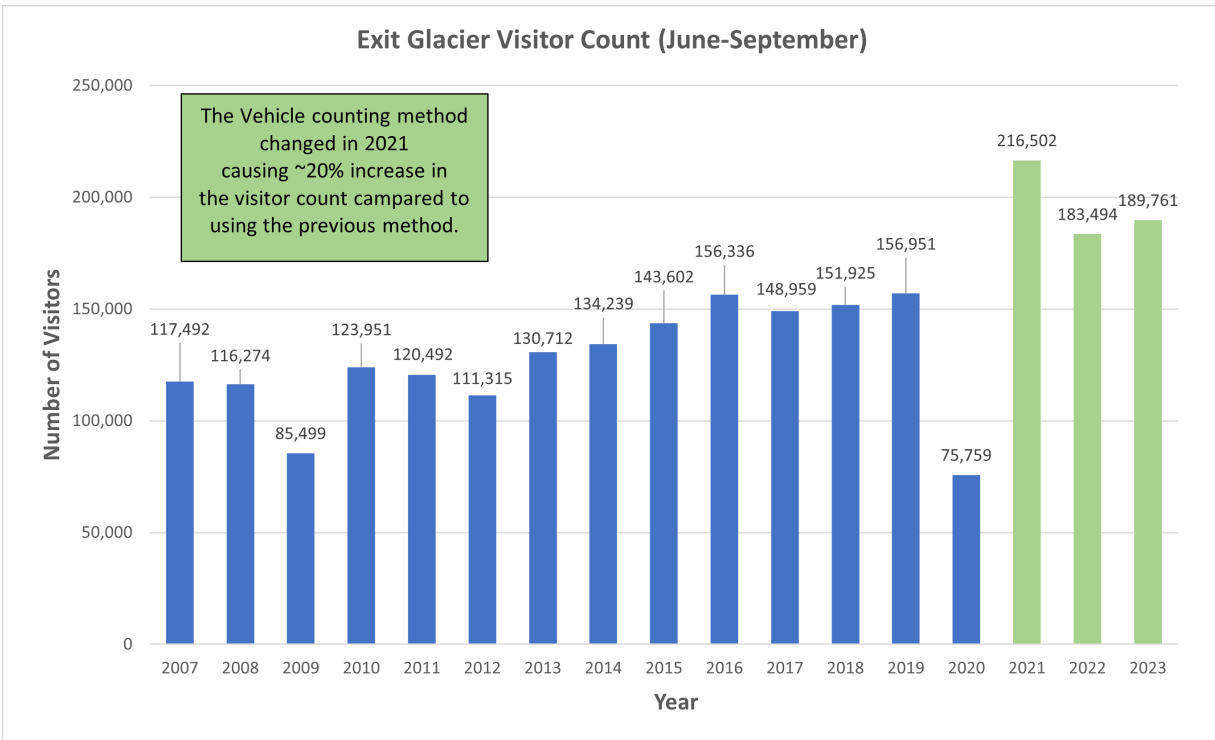


FIGURE 7. ESTIMATED ANNUAL VISITATION TO THE FRONTCOUNTRY AREA (ESTIMATES FOR 2021–2023 REFLECT CHANGES IN COUNTING METHODOLOGY)

Impacts on Natural Resources

Increased visitation during the typical summer season and now into the shoulder seasons (spring and fall) has the potential to impact natural resources in the frontcountry area. Social trails (undesignated side trails) created by visitors wanting to get closer to the glacier can result in soil compaction, vegetation trampling, and the introduction and establishment of invasive plants. Trash left behind on trails, along roads, and in parking areas can attract wildlife, including bears, and, therefore, increase the potential for human-wildlife encounters. Potential increases in winter recreation, especially noise from snowmachine use, may disturb wildlife.

Regulations Tied to Dynamic Conditions

Current enforcement of park regulations is directly affected by the extent of Exit Glacier. The current legal definition of the Exit Glacier Developed Area specifically references a circular area centered on the Exit Glacier terminus (end) position for its boundary (36 CFR 13.1318). As the glacier retreats, the circular area tied to the glacier terminus moves with it, creating a widening a gap between the circular area and the rest of the Exit Glacier Developed Area (figure 8). The Glacier Overlook Loop Trail traverses this gap, and it is unclear whether rules and regulations for the Exit Glacier Developed Area apply in this gap. Additionally, fat tire winter snow biking is currently only permitted on roads, but the public has expressed interest in allowing these bikes to access areas in the Exit Glacier Developed Area where snowmachines are allowed when there is adequate snow cover, which would require a change to existing regulations (currently within the Exit Glacier Developed Area, bikes are

only allowed on the park road and parking lots). Some existing regulations also focus on restricting access to areas and activities on Exit Glacier that are no longer applicable due to the recent changes in the glacier.

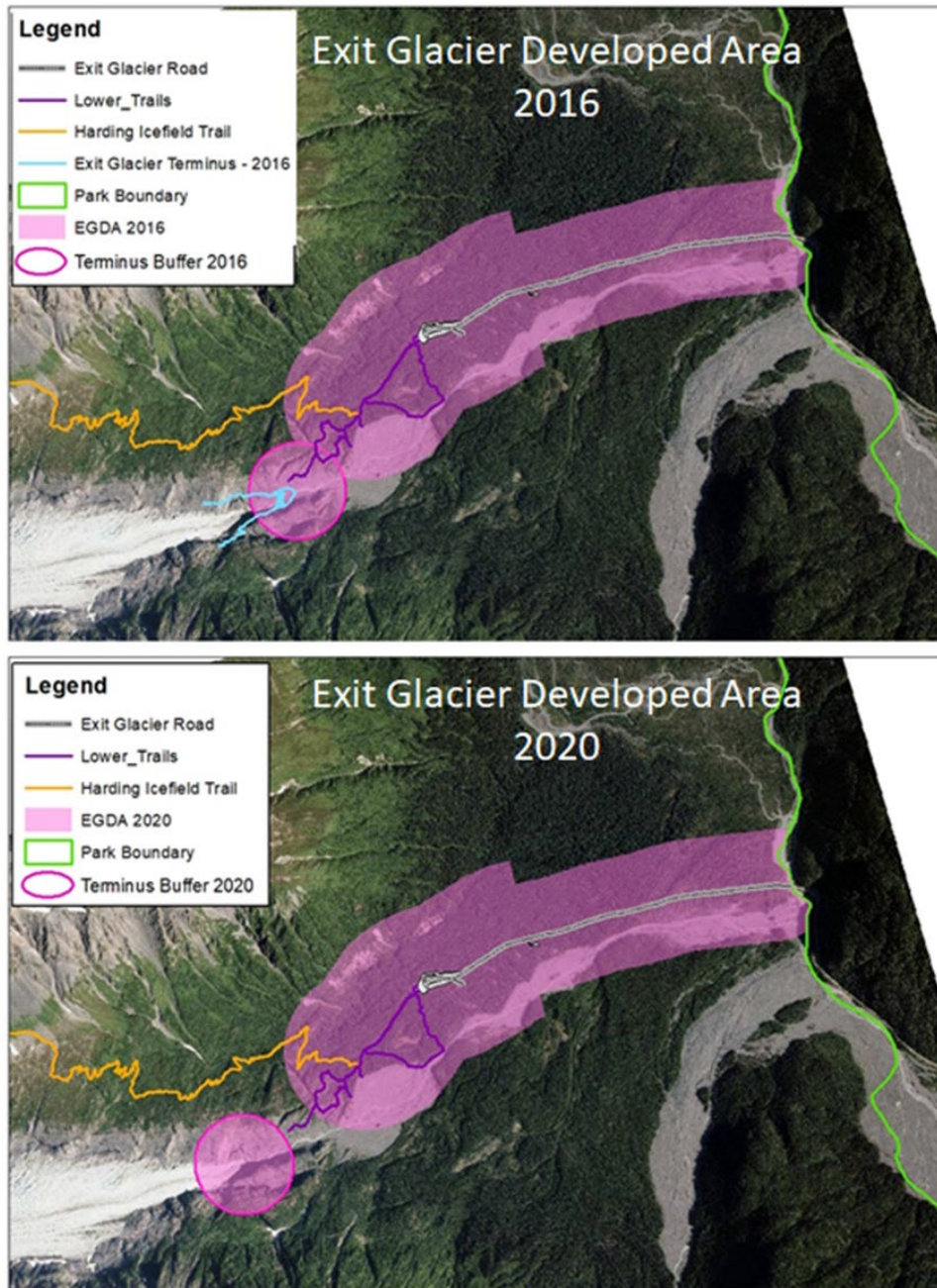


FIGURE 8. EXIT GLACIER DEVELOPED AREA, AS CURRENTLY LEGALLY DEFINED, IS BOUND ON THE WEST BY THE TERMINUS (END) OF EXIT GLACIER AND BY PERMANENT FEATURES SUCH AS THE ROAD AND PAVED TRAIL

Note: Beginning in 2017, the Exit Glacier Developed Area separated into two separate areas, as shown in the 2020 map (bottom photo), due to the retreat of the terminus of the glacier. The underlying aerial photo for both maps is from 2018 and Exit Glacier's extent for that year was drawn in for the 2016 map (top photo). Exit Glacier has retreated further since the 2020 image was taken, increasing the gap between the Exit Glacier Developed Area terminus boundary and the rest

of the developed area. To ensure rules and regulations are applied consistently throughout the developed area, the legal definition of the Exit Glacier Developed Area will need to be changed in the Code of Federal Regulations.

RELATIONSHIP TO OTHER PLANNING EFFORTS

This draft plan tiers from the broad direction of the park's 1984 general management plan (GMP) and foundation document (NPS 2013), that make up, in part, a dynamic portfolio of management plans that that guide decision making and satisfy law and policy as required by the National Parks and Recreation Act of 1978 (54 USC 100502). Alternative B of the frontcountry management plan (described in chapter 2) would supplement the 1984 general management plan and replace the *Final Exit Glacier Area Plan and GMP Amendment* (NPS 2004). Key planning considerations of the 1984 general management plan and 2004 Exit Glacier Area Plan that are relevant to this planning effort are described below.

1984 General Management Plan

The general management plan establishes the underlying management framework for the park, including regulatory guidance for the Exit Glacier area, and serves as the default guidance when and where specific guidance in more current plans is lacking. The general management plan identifies four broadly defined management zones in the park: Park Development Zone, Special Use Zone, Historic Zone, and Natural Zone. These GMP zoning designations serve as a foundation for park planning efforts, including in this proposed plan. The park is primarily in the Natural Zone, the default zoning designation that emphasizes conservation of natural resources and processes and accommodation of uses that do not adversely affect these resources and processes. Three small areas of the park's eastern fjords are designated as Development Zones, as are large portions of the frontcountry area.

2004 Final Exit Glacier Area Plan and General Management Plan Amendment

The 2004 *Final Exit Glacier Area Plan and GMP Amendment* ("Exit Glacier Area Plan") focuses on enhancing the experience of easily approaching Exit Glacier on foot and providing additional nonmotorized recreational opportunities. The 2004 Exit Glacier Area Plan established more specific zoning and management considerations for the Exit Glacier area, including different zoning schemes for the summer and winter. The 2004 Exit Glacier Area Plan focuses on five summer zones: the visitor facilities zone, pedestrian zone, hiker zone, backcountry semi-primitive zone, and backcountry primitive zone. Winter management actions in the 2004 Exit Glacier Area Plan only focus on the visitor facilities and pedestrian zones and deliberately do not address the other zones. These zones and their associated desired conditions served as the starting point for the proposed plan. The 2004 Exit Glacier Area Plan zones and management guidance would continue in alternative A (no-action alternative) under the direction of the 2004 Exit Glacier Area Plan (see chapter 2).

IMPACT TOPICS

To evaluate the potential effects of the alternatives, the planning team identified impact topics for detailed analysis. Impact topics are retained for detailed analysis if

- environmental impacts are central to the proposal or of critical importance,
- detailed analysis is necessary to make a reasoned choice between alternatives,
- impacts are a big point of contention among the public or other agencies, or
- potentially significant impacts on resources are associated with the issue.

Following is rationale for the selection of impact topics. In some cases, impact topics may not be directly relevant to current or proposed activities identified in the alternatives analyzed in the environmental assessment but were retained for analysis if relevant to potential future management strategies that may be triggered in response to environmental conditions.

Impact Topics Retained for Detailed Analysis

Effects on Soils

Frontcountry activities could increase the susceptibility of soil to be eroded or compacted, inhibiting its ability to support plant and animal life. Off-trail foot traffic in alpine areas can impact fragile soils during periods when the soils are saturated with water. Soil structure can be damaged by compaction or churning; disturbed soils can be easily eroded. The potential reconstruction or relocation of trails (e.g., in the event existing trails may become unsafe or impassible due to changing conditions) could have localized impacts on soils. On steep slopes, off-trail travel can lead to erosion, thus increasing sediment loads that could be carried downslope into streams.

Effects on Water Quality

With increasing visitation, human waste issues may increase on or near trails or where visitors park along the road shoulder when the parking lot is full, increasing the possibility of contaminants entering streams and groundwater.

Effects on Floodplains

Floodplains are further analyzed because existing infrastructure is located almost entirely in the floodplain. Potential responsive management actions, including trail reconstruction or relocation in the event existing trails, are impacted by flooding and could alter the natural hydrology of the area or negatively affect resources adjacent to the project area (e.g., flooding and silting).

Effects on Wetlands

The implementation of management strategies in response to changing conditions, including potential trail reconstruction or relocation near wetlands, could result in the disruption of wetland hydrology and ecology. Disturbances may include, but are not limited to, filling of low-lying areas with soils or aggregates and draining wet areas.

Effects on Air Quality

Vehicle emissions and the continued use of generators and other internal combustion engines in the project area may affect local air quality.

Effects on the Soundscape

Current visitor, administrative, and commercial services activities, including motorized activities, impact the natural soundscape. Disturbances to the natural quiet could occur during trail reconstruction or relocation, routine maintenance, and visitor use periods. New activities and the promotion of winter visitation could result in increased snowmachine traffic and human noise, which could elevate noise levels with potential impacts on the visitor experience and wildlife in the project area. Plowing or grooming of the road or trails in the winter could also create noise disturbances. Potential impacts on the natural soundscape from daytime noises will be analyzed for extent and prevalence.

Effects on Vegetation

Vegetation in areas of concentrated visitor use would continue to be impacted. Potential management responses to changing conditions that call for the reconstruction or relocation of trails could require vegetation removal in lowland forest, alder, wetland, and alpine habitats. Trail construction could also impact sensitive species, such as pale poppy (*Papaver alboroseum*) populations and spread invasive plants where soil may be disturbed. Plants colonizing near the terminal moraine in the outwash plain and alpine plants are susceptible to damage from trampling. Additionally, visitors can spread invasive plant seeds and propagules in terminal moraine areas and elsewhere in the frontcountry. Fill dirt brought in to raise the road or build berms to manage flooding impacts on frontcountry facilities and infrastructure could potentially introduce and spread invasive plants.

Effects on Wildlife

Potential impacts of accommodating increasing visitation include increased human-wildlife conflicts and permanently or temporarily displacing wildlife. Accommodating more visitors could increase the potential for wildlife to obtain human foods, increasing the risk of human-bear encounters and detrimental outcomes for bears that may become food conditioned (i.e., bears that learn to associate visitors with food rewards). Wildlife that may winter in the project area, such as moose, may be affected by noise and compacted trails created by snowmachine and other winter use activities. Other proposed activities could potentially alter wildlife behavior, including moose and mountain goat behavior and potentially displace wildlife from feeding, bedding, or calving areas. In the summer, breeding birds and their chicks could potentially be displaced and disturbed by increased human presence and dogs, especially if dogs are illegally off leash. Migrating wildlife, including birds, could be negatively affected by increased visitation and recreation in the spring and fall months, with the potential to displace these animals from feeding and resting in stopover habitats.

Effects on Visitor Experience

The plan proposes actions that could affect visitor experiences, including increasing winter recreation opportunities and the potential removal or addition of existing or

new/reconstructed hiking trails in response to changing conditions. Potential new or adapted trails established in response to changing conditions could affect the scenic integrity and scenic views; additionally, new or adapted trails could allow more visitors to access areas that currently receive very little use. Potential adaptive management and climate adaptation strategies that may result in decommissioning overnight camping accommodations could impact visitors. Winter uses include snowmachine use, cross-country skiing, fat tire winter snow biking, snowshoeing, skijoring, and mushing. The co-occurrence of different types and amounts of winter use in the same general area has the potential to result in visitor use conflicts. Similar conflicts associated with increasing summer visitation, such as increased parking lot congestion and bicyclists interacting with motorists on busy roads, could also occur.

Effects on Wilderness

While no lands were designated as wilderness in Kenai Fjords National Park under the enabling legislation (ANILCA, section 701), the 1984 general management plan included a wilderness suitability study, which determined that nearly 97% of the park's lands were suitable for wilderness designation, excluding the frontcountry developed area. Therefore, Kenai Fjords National Park is currently managing these eligible wilderness areas consistent with designated wilderness management strategies per agency policy. Alternative B management zones (see chapter 2 for details) would include the glacial mountain zone, which overlays eligible wilderness; therefore, the activities occurring in this zone may affect wilderness character.

Impact Topics Considered but Dismissed

Several potential impact topics were dismissed because they would not be affected or their potential for impacts would be negligible. These topics are summarized here.

Socioeconomic Environment: Actions proposed in the alternatives would not change local or regional land use; impacts on businesses and local economics would likely be minimal. Alternative B is not expected to have an impact on commercial services or socioeconomic conditions in the area, and a detailed socioeconomic analysis is not needed.

Geologic Resources: No actions proposed in the alternatives would impact the geological resources of the Exit Glacier area, including natural processes such as the retreat of Exit Glacier and shifting stream channels.

Cultural Resources: Because no cultural resources are currently known in the study area and the probability of their existence is low, this topic is dismissed from detailed analysis. However, any future undertakings—for example, the potential construction of hiking trails and other visitor use infrastructure in response to changing conditions—will undergo review according to section 106 of the National Historic Preservation Act, including consultation with Alaska Native groups, the Alaska State Historic Preservation Office, and other stakeholders.

Night Sky: Current or planned light output can be mitigated through shading. 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. During the season of highest visitor use, long summer daylight hours limit the need for artificial lighting. Wintertime lighting is limited to within occupied structures. Lights of snowmachines, skiers, mushers, and similar impacts are not permanent and are insignificant to the visual landscape.

Aircraft Overflights: The Federal Aviation Administration regulates the minimum altitude aircraft can fly, and flight tour operators have been asked to voluntarily stay away from Exit Glacier and fly over other glaciers not routinely visited. The National Park Service continues working with the Federal Aviation Administration, the US Forest Service, and pilots to minimize visual and auditory intrusions where possible. Although the noise could affect desired soundscape conditions, aircraft overflights will not be addressed in this plan.

Subsistence Activities: Kenai Fjords National Park (including the project area) is closed to subsistence uses, and (2) alternative B would not affect regional subsistence resources or activities outside the park. The potential for major subsistence restrictions does not exist. An 810 analysis of subsistence considerations is included in appendix E, as Kenai Fjords National Park is an ANILCA park.

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 identify and address any high and adverse human health or environmental effects of their actions on minorities and low-income populations and communities. No actions identified in the alternatives result in adverse impacts on minority or low-income populations or communities.

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.



Management Alternatives

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CHAPTER 2: MANAGEMENT ALTERNATIVES

INTRODUCTION

Alternatives describe different general visions for the future management of the project area. They allow managers, visitors, neighbors, and other stakeholders to consider different approaches to managing resources and visitor use. Alternatives must meet the overall purpose and need for the plan, be consistent with laws, regulations, policies, and guidance to be considered reasonable, and must be technically and economically feasible (40 CFR 1508.1 [z]). Alternatives are distinguished by differences in their approach to resolving the purpose and need for action and the environmental impacts of implementing them.

This chapter describes two alternatives for managing the frontcountry area of Kenai Fjords National Park: alternative A (no action) and alternative B (preferred alternative). The two alternatives are described below.

ALTERNATIVES

Alternative A: No Action

Under alternative A, NPS staff would continue managing Kenai Fjords National Park under the existing direction set forth in the 2004 *Final Exit Glacier Area Plan and GMP Amendment*, 1984 general management plan, and other existing relevant planning guidance, policies, regulations, and laws related to resource protection and visitor experience and use. The 2004 Exit Glacier Area Plan zones currently in use under alternative A are depicted in figure 9. Desired conditions descriptions for the existing zones are found in the 2004 Exit Glacier Area Plan (NPS 2004). The 2004 Exit Glacier Area Plan promoted visitor experiences focused on approaching and touching the glacier. Given the substantial changes to the frontcountry area since that plan was developed, this is no longer possible to do safely. Park staff could continue to use its website, on-site interpretive messaging, and other external outreach to manage visitors' expectations of seeing Exit Glacier.

Existing facilities, including the road, Resurrection River bridge, trails, signs, campsites, vault toilets, and potable water sources for the campground would require investments for ongoing maintenance and for repairing damages from changing conditions. Park managers would not have proactive guidance for how to adapt or respond to repeated or extensive damages from glacial outburst or flooding events to facilities, including the potential to move or decommission some assets. With the ongoing retreat of the glacier, inconsistencies in park regulations and their enforcement would continue, as one boundary of the Exit Glacier Developed Area tied to the Exit Glacier terminus would be moving up the hill in a separated polygon. As such, alternative A would not achieve the desired conditions established for the management zones as defined in the 2004 Exit Glacier Area Plan, nor would it achieve the purpose of the plan.

Public use of snowmachines would continue to be prohibited in the Exit Glacier Developed Area, except on the Exit Glacier Road, in parking areas, on a designated route through the Exit Glacier Campground to Exit Creek, and in Exit Creek (Outwash Plain). However,

bicycles (including nonmotorized fat tire winter snow bikes) would only be allowed on the Exit Glacier Road and parking areas.

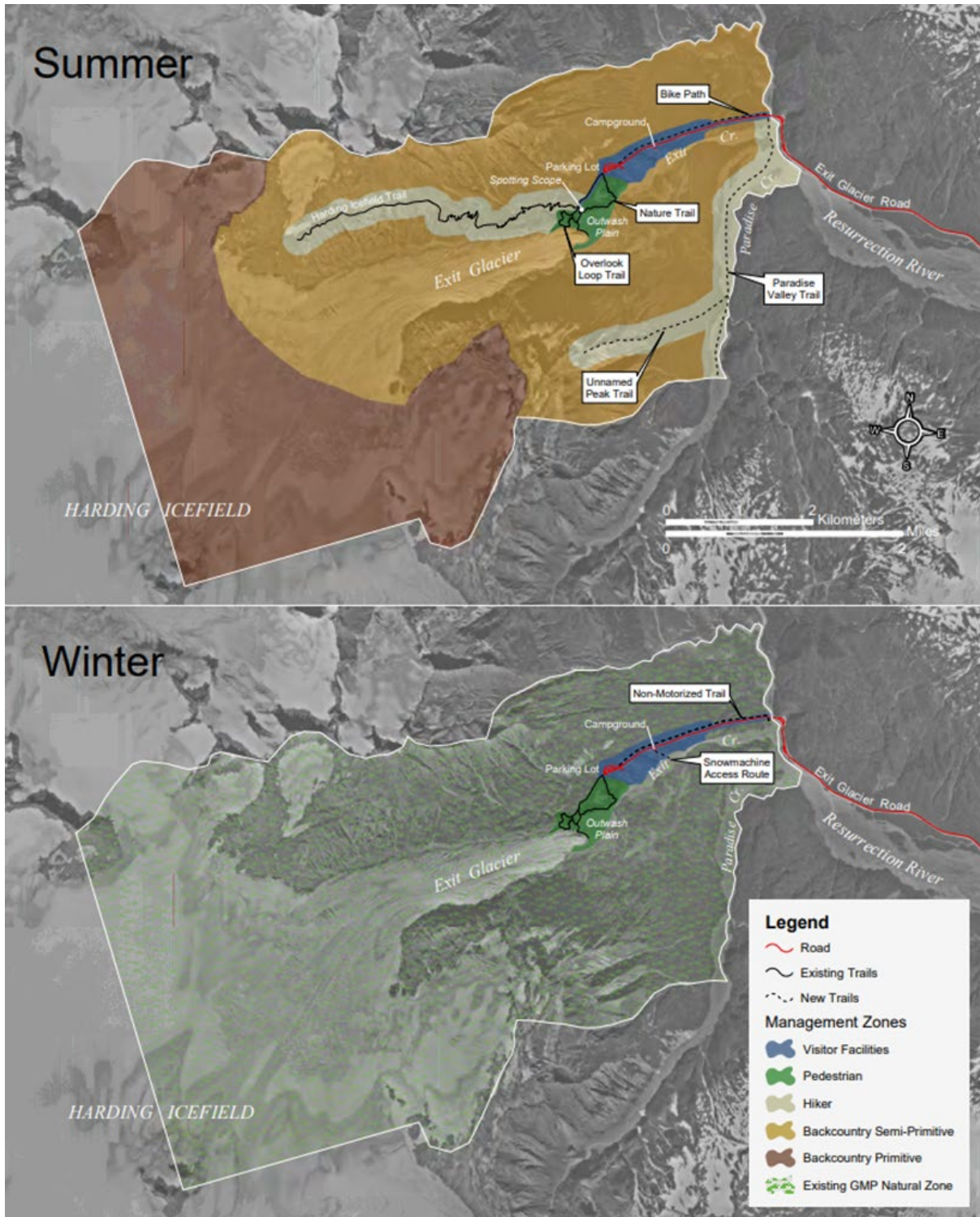


FIGURE 9. ALTERNATIVE A RETAINS SUMMER AND WINTER MANAGEMENT ZONING FOR THE FRONTCOUNTRY AREA FROM THE FINAL EXIT GLACIER AREA PLAN (NPS 2004)

Note: See the plan for detailed descriptions of the management zones and desired conditions.

Alternative B: Preferred Alternative

Under alternative B, the National Park Service proposes proactive strategies for managing visitor use and experiences and visitors' expectations, reducing impacts on natural resources, diversifying recreational opportunities, updating regulations, and managing frontcountry visitor use and facilities considering changing conditions. In summary, followed with additional detail below, alternative B proposes to do the following:

- Update the frontcountry area's zoning and desired conditions to address visitor use management objectives.
- Adapt visitor messaging, wayfinding, and interpretation to achieve the following:
 - Improve and expand trip planning messaging and outreach regarding parking and congestion considerations during peak visitation periods.
 - Update signage and expand interpretive programs to focus on other natural features and visitor experiences in the area while deemphasizing Exit Glacier.
 - Improve wayfinding and orientation to enhance visitors' safety and preparedness.
- Increase efforts to reduce human-wildlife conflicts and control invasive plant species.
- Diversify recreational opportunities through the promotion of authorized forms of winter use.
- Propose through the rule-making process changes to regulations that pertain to the Exit Glacier Developed Area to achieve the following:
 - Redefine the geographic extent of the Exit Glacier Developed Area, considering the rapidly changing environmental conditions.
 - Allow nonmotorized fat tire winter snow bikes in the same locations in the Exit Glacier Developed Area that snowmachines are allowed when snow conditions permit.
 - Rescind regulations that no longer apply due to the retreat of Exit Glacier.
 - Move some regulations into the annually updated Superintendent's Compendium to be able to address changing conditions in a timely fashion.
- Identify options and justifications for responding to changing conditions that may impact desired conditions, visitor use and experience, and frontcountry facilities.
- Establish indicators, thresholds, and visitor capacities to monitor and manage visitor use in the frontcountry.

Proposed Changes to Zoning and Desired Conditions

Under alternative B, the management zones created in the 2004 Exit Glacier Area Plan would be updated. Management zones enable the National Park Service to identify location-specific

desired conditions in those areas. Desired conditions are defined as statements of aspiration that describe resource conditions, visitor experiences and opportunities, and facilities and services for a particular area (IVUMC 2016).

The zones of the 2004 Exit Glacier Area Plan include two year-round zones (visitor facilities and pedestrian zones) and three summer-only zones (hiker, backcountry semi-primitive, and backcountry primitive zones), in addition to the GMP natural area zone figure 9. The retreat of Exit Glacier has rendered some of the central planning considerations of the 2004 plan's zoning scheme and desired conditions untenable, for example, that visitors can "easily approach a glacier on foot." This and other considerations spurred park managers to propose zoning changes under alternative B with updated management strategies to improve and diversify visitor experiences in the frontcountry.

Alternative B would establish consistent year-round zoning that would not change seasonally as it does under the 2004 Exit Glacier Area Plan. Proposed changes from the 2004 Exit Glacier Area Plan are as follows:

- The area in the backcountry primitive zone would be excluded from frontcountry planning and management. It would revert to a natural zone designation, as defined in the general management plan (NPS 1984). Therefore, the total area of the Exit Glacier area, as defined in the 2004 Exit Glacier Area Plan, would be reduced in the new zoning scheme proposed in alternative B.
- The names and general concepts of the visitor facilities zone, pedestrian zone, and hiker zone would be retained in the current proposal, but their boundaries and desired conditions would be modified.
- What was referred to in the 2004 Exit Glacier Area Plan as the "backcountry semi-primitive zone" would be divided into two new zones with new desired conditions: the glacial mountain zone in the western upland areas and the valley floor zone in the eastern lowland areas. Also, a former hiking zone corridor from the 2004 Exit Glacier Area Plan summer zoning scheme following the proposed Paradise Valley Trail and Unnamed Peak Trail would be absorbed into both zones (see "Actions Considered but Dismissed" for more details).

An overview and zoomed-in view of the new proposed zones for alternative B (preferred alternative) are shown in figure 10 and figure 11, respectively. Overviews of the proposed zones' desired conditions in alternative B are described below, while additional details regarding updated desired conditions for alternative B's proposed zones can be found in appendix B.

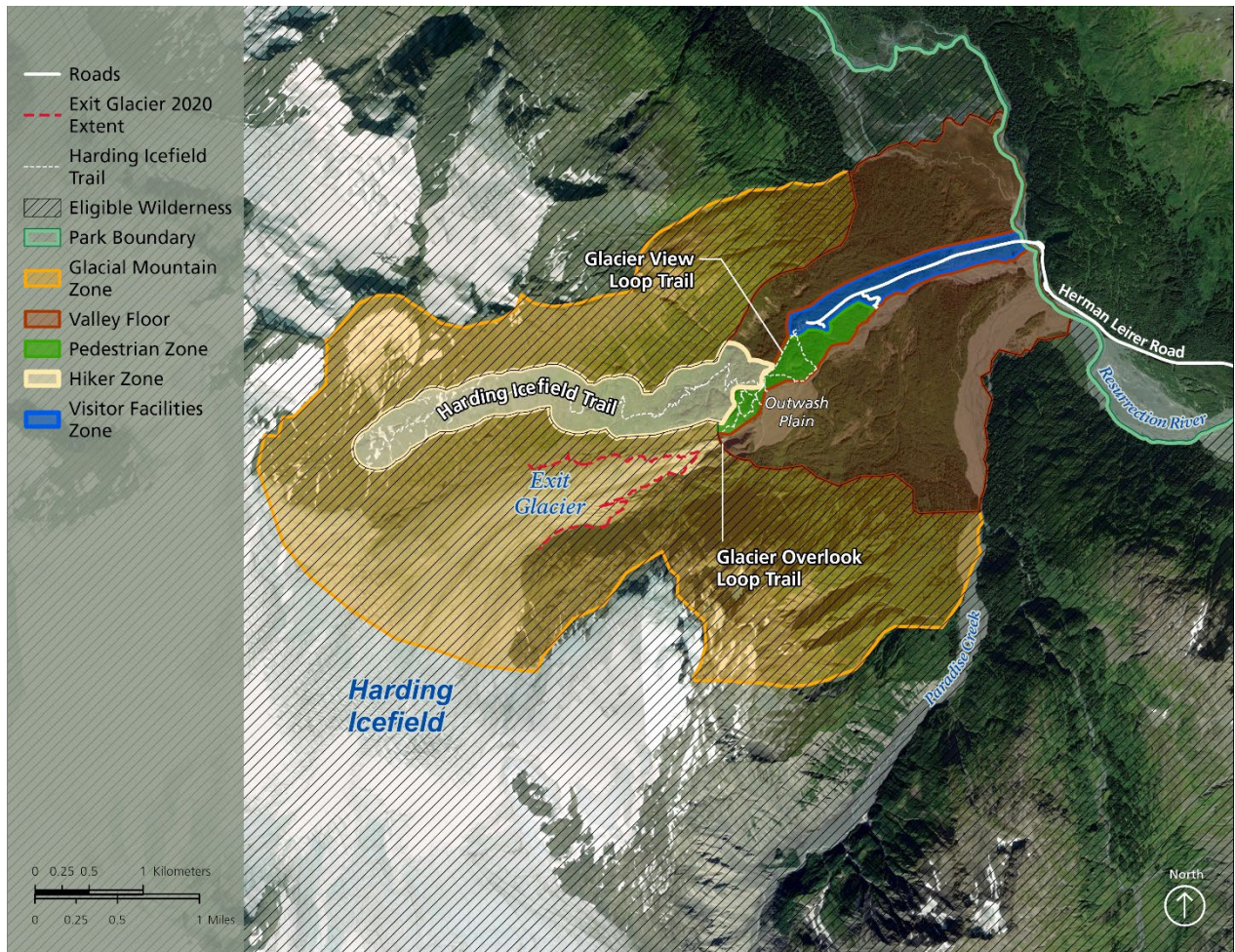


FIGURE 10. ALTERNATIVE B MANAGEMENT ZONES FOR THE FRONTCOUNTRY AREA; EXIT GLACIER RECEDED FURTHER SINCE THIS 2016 SATELLITE IMAGE

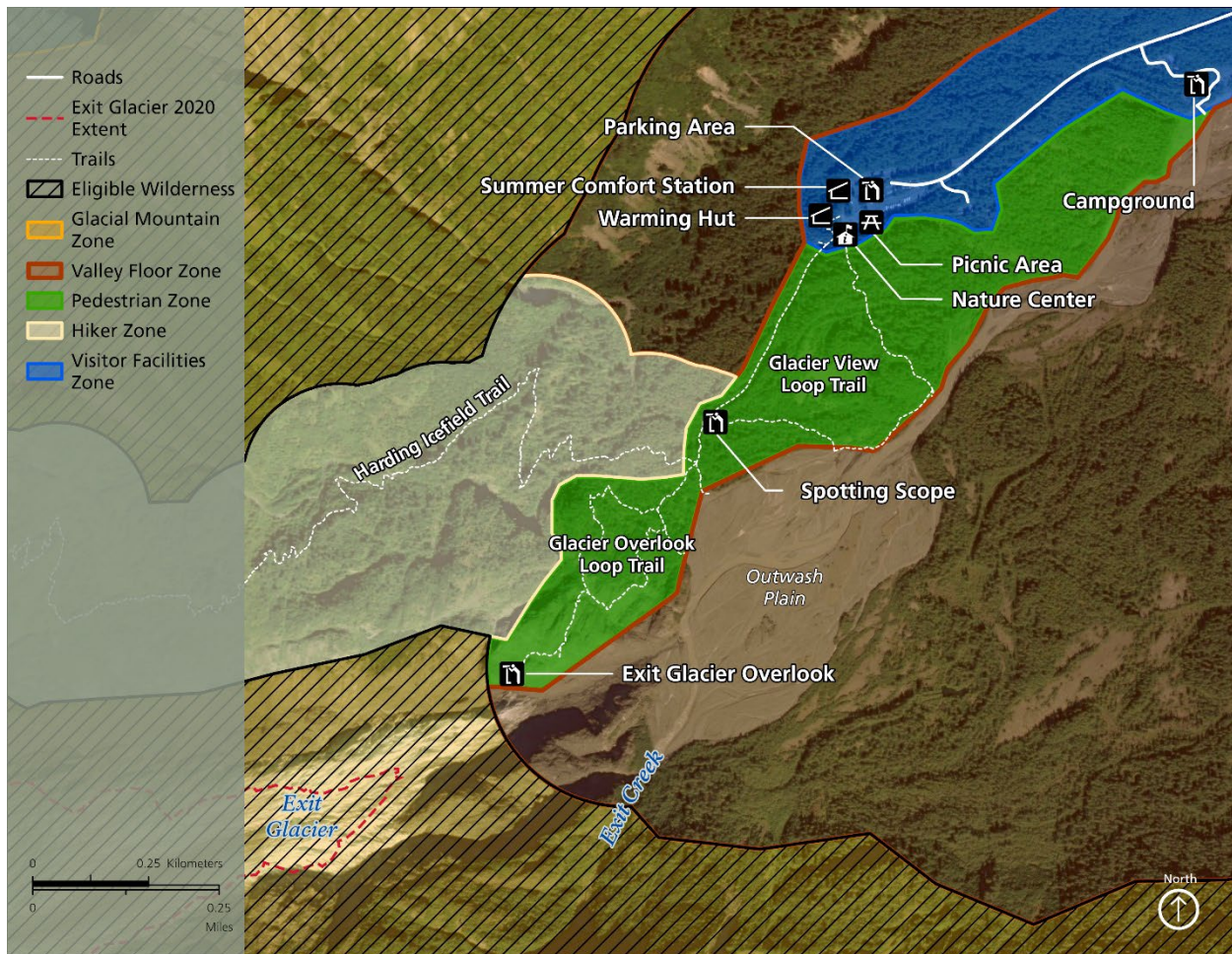


FIGURE 11. DETAILED VIEW OF UPDATED MANAGEMENT ZONES IDENTIFIED IN ALTERNATIVE B FOR THE FRONTCOUNTRY AREA; EXIT GLACIER RECEDED FURTHER SINCE THIS 2016 SATELLITE IMAGE

Desired Conditions for Proposed Management Zones under Alternative B

Under alternative B, the frontcountry area would include zones with more development (visitor facilities and pedestrian zones) and areas with little development and more immersion in the resource (hiker, glacial mountain, and valley floor zones). Desired conditions for each zone are summarized below. See appendix A for additional details and comparisons regarding desired conditions in each zone. Areawide desired conditions would apply to all zones of the frontcountry area.

Areawide Desired Conditions

The frontcountry would be a space where visitors could enter by road to learn about the park, experience its resources, and develop conservation ethics that enabled them to become the next generation of park stewards. The frontcountry would preserve experiences and values that inspire young minds and serve as a link between the past, present, and future of the park. Visitors could transition from the relative “hustle and bustle” of the more developed areas to the undeveloped areas, where they could experience more solitude and contemplative immersion in nature. While not all areas of the frontcountry would be free of

development, visitors to the Glacier View Loop Trail and Glacier Overlook Loop Trail of the frontcountry area would experience some sense of immersion in nature with opportunities for hiking and a limited degree of solitude. Most areas of the frontcountry would be free of signs of human disturbance, although they would still be relatively easy to access. Visitor presence in any area causes impacts, and some low-level impacts would be tolerated, as will concentrated developments near already-developed areas.

While Exit Glacier may continue to recede and lose prominence, evidence of glacial activity remains and would be interpreted for visitors. Visitors to the frontcountry would learn about climate change and how it impacts the park and its glaciers. Preserving wildlife and wildlife habitat, while also providing easy-to-access opportunities for visitors to view wildlife, would be central to the immersive quality of the frontcountry. Visitors who spend time in the frontcountry area could develop an appreciation for the challenges of recreating, even in a relatively accessible area of Alaska—for example, the risks from rapid weather changes; cold, wet weather; and wildlife, including bears and moose. This risk contributes to the richness of outdoor recreational experiences in the frontcountry.

Visitor Facilities Zone Desired Conditions

The visitor facilities zone would be the most developed of the five zones, where visitors arrive, get oriented, and interact with visitor facilities. In this zone, visitors would orient themselves to the landscape and transition from vehicle to foot travel. The experience in this zone would be highly social, with few opportunities for solitude. Infrastructure would blend in with and would not dominate the environment. The zone would provide basic visitor services expected at an NPS entrance area and basic infrastructure necessary to accommodate visitors arriving to the area. Visitors arriving by road often in a motorized vehicle would transition to walking, orient themselves at the nature center, and quickly immerse themselves in the natural world by moving out of this zone. This zone would have the highest level of NPS management presence. Interpretation would be provided through park staff and self-discovery via maps, signage, and educational media. This zone would offer a spectrum of visitor experiences and values, where typical activities include scenic driving, camping, orientation, learning, picnicking, and taking care of basic needs. Examples of amenities in the visitor facilities zone include the Herman Leirer Road, park entrance sign, campground, employee housing area, parking lot, nature center (including the park store), pavilion, restrooms, picnic area, pumphouse, and warming hut.

Pedestrian Zone

In the pedestrian zone, visitors would spend a few hours walking on well-developed trails, some of which are universally accessible and some of which are slightly steeper, and experience vistas, including distant views of the receding glacier and backcountry. This zone would introduce visitors to the experience of being “out in the park” and provide an entry to this beautiful area where social opportunities are plentiful. Some small visitor comforts and structures, such as benches and kiosks, would be available, although they would be fewer and less concentrated than in the visitor facilities zone. Opportunities for visitor education through signs and personal contact would be abundant. This zone would offer a spectrum of visitor experiences and values, where typical activities include walking, hiking, wildlife

viewing, photography, and other passive pursuits. Examples of amenities in the pedestrian zone would include the accessible Glacier View Loop Trail, the stone kiosk, the Glacier Overlook Loop Trail, and various trails leading to the outwash plain (see figures 2 and 11 for locations and names of trails).

Hiker Zone Desired Conditions

The hiker zone would provide a natural experience with moderate social experiences, increased opportunities for connection with nature, and few visitor comforts. The zone's maintained hiking trails would include the Harding Icefield Trail corridor, which allows visitor access to more remote locations. Trails are steep, narrow, and uneven in places and generally require visitors to be physically well-conditioned and well-prepared. Preservation of the natural systems would be a high priority, but some impacts from trail development and maintenance would be permissible. This zone would offer a spectrum of visitor experiences and values, where typical activities include hiking, wildlife viewing, photography, and enjoying the sounds of nature. Currently, only the Harding Icefield Trail exists in this zone. Should additional trails be constructed in other zones in the frontcountry, their corridors would be redesignated as hiker zone (note that this zone need not be contiguous). The zone is defined roughly by extending out 1/8 mile on either side of a given trail.

Glacial Mountain Zone Desired Conditions

The glacial mountain zone would offer a thoroughly natural experience in which visitors with the necessary training, expertise, and/or guidance would encounter the power and enormity of the landscape. This zone would encompass the current and former extent of Exit Glacier, giving visitors a sense of natural wonder and adventure in a place shaped by glacial and other geological forces. The zone would be intended to facilitate access to the glacier or to places from which the glacier has retreated. Some areas may need to be closed at times to protect public safety, and all areas, whether open or closed, would have the potential for hazardous conditions. Due to environmental hazards, such as avalanches, rockfalls, slippery snow and ice, washouts and flash floods, and crevasses, in this glaciated and mountainous terrain, visitors would have to be able to independently assess the risks of travel and assume those risks, even in areas that are not officially closed. Encounters between visitors would generally be low, and visitor comforts are not supported. This zone would offer a spectrum of visitor experiences and values, where typical activities include hiking, ice hiking, skiing, climbing, and mountaineering. Features in the glacial mountain zone would include Exit Glacier, the canyon formed by Exit Glacier and exposed as it retreats, the small cirque glacier above an emergency hut, and the mountain slopes and ridges north of the Herman Leirer Road, above the Harding Icefield Trail, and south of Exit Glacier.

Valley Floor Zone Desired Conditions

In the valley floor zone, visitors would witness the dynamic nature of the outwash plain. Geological processes are constantly at work, including substantial sediment aggradation and erosion. The topography of the outwash plain constantly changes as the river roams across the valley floor. The encounter rate between visitors would be low since visitors tend to be dispersed across this vast open area. Because this area is a vast open space, visitors would be able to see others using this zone at a distance. Visitors would not be restricted to trails and

would have to be self-reliant to safely enjoy free access across the landscape. Challenging conditions can prevail, so visitors would have to have sufficient experience to assess and assume the risks posed by environmental hazards, such as flash floods and braided stream dynamics. This zone would offer a spectrum of visitor experiences and values, where typical activities include hiking, packrafting, wildlife watching, snowshoeing, cross-country skiing, and snowmachine use (when snow conditions permit). This valley floor zone boundary would be defined by the entirety of the valley floor in the planning project area, including the outwash plain, that would not otherwise be assigned to the visitor facilities, pedestrian, or hiker zones. The zone would be bound by the Resurrection River to the east, Paradise Creek to the southeast and south, visitor facilities and pedestrian zone boundaries to the north, and the steep terrain to the west that rises off the valley floor.

Visitor Messaging, Wayfinding, and Interpretation

Under alternative B, park management would use the following strategies and associated actions to improve visitor messaging, wayfinding, and interpretation.

- Improve trip planning messaging and outreach to set appropriate expectations and promote safe experiences.
 - Update highway signage, the park website, waysides, and other public information to shift focus from Exit Glacier to other frontcountry resources and experiences.
 - Update proactive messaging on the park website during peak visitation periods when potential parking lot congestion is anticipated.
- Provide visitor wayfinding and orientation information so that visitors understand their location and the distances to destinations in the visitor facilities, pedestrian, and hiker zones.
 - Using the best available science and marketing practices, update park signage and educational materials on the need for visitors to be informed, prepared, and self-reliant when venturing beyond the visitor facilities and pedestrian zones.
 - Update and publish consistent names on park signs and publications for the Glacier View Loop Trail and Glacier Overlook Loop Trail to set appropriate expectations and improve visitor wayfinding. Change names that refer to views of the glacier to more generic terms to reset expectations (e.g., “Creekside Trail” instead of “Glacier View Loop Trail”).
 - Update signage at trailheads to accurately describe distances, elevation gain, substrate, and typical travel time.
- Update personal and nonpersonal interpretive services to educate visitors about landscape change and climate change.
 - Update waysides, interpretive displays, materials, and programs to expand focus beyond Exit Glacier onto the dynamic nature of the larger landscape. Continue

to interpret Exit Glacier, and add interpretation of other resources and topics related to the cultural and natural history of the frontcountry.

- Update nature center displays and exhibits to emphasize the scenic and educational values of a dynamic, changing landscape, as well as some of the dangers visitors may encounter in it.
 - Provide training to commercial operators to ensure that messaging about the park is consistent with an expanded focus on landscape change and not just Exit Glacier.
 - Expand the accessibility of ranger programs, including possible audio-described programs in the nature center.
 - Increase the use of unadvertised, short-term “pop-up programs” to engage with visitors in unique locations.
 - Expand the reach of NPS interpretation by pursuing partnerships with commercial services to provide NPS interpretive programming on a cost-recovery basis.
 - Continue to pursue partnership opportunities for youth educational programs with organizations in the greater area, including Kenai Peninsula cities and Anchorage.
 - Develop interpretive programs, products, and recordings for the nature center in multiple languages to reach more audiences.
- Consider integrating Alaska Native place names and Indigenous Knowledge into frontcountry features and interpretive messaging to reduce focus on “Exit Glacier.”
 - Consult with Alaska Native groups to determine their interest in collaborating on park interpretive programming to incorporate Indigenous Knowledge and perspectives on climate change, landscape change, and the cultural names and history of the frontcountry.

Natural Resource Management

Under alternative B, park management would increase efforts to decrease negative human-wildlife encounters and manage invasive plants. These strategies and associated actions include the following:

- Manage human-wildlife encounters
 - Develop and enhance educational materials about wildlife safety and food storage at targeted visitor use areas, including the park’s nature center, bike racks, trailheads, and along trails.

- Manage invasive plants species
 - Work with partners (e.g., Chugach National Forest, Kenai National Wildlife Refuge) and other groups to develop management strategies for controlling invasive plant populations near park boundaries. Continue to identify and treat known high-priority invasive plant populations while supporting early detection and rapid response to new populations.
 - Develop interpretive products and programming for visitors related to eliminating or minimizing the spread of invasive plants.

Recreational Opportunities

Under alternative B, park management would pursue strategies to increase the diversity of recreational opportunities in the frontcountry area. These strategies and associated actions include the following:

- Expand and promote visitor opportunities in the winter and shoulder seasons (spring, fall) to provide a greater diversity of activities in the visitor facilities, pedestrian, hiker, and valley floor zones.
 - Explore potential partnerships with local stakeholder groups to groom the NPS section of the access road from Resurrection River bridge (park boundary) to the nature center, extending cross-country ski, snowmobile, and fat tire winter snow bike opportunities in the winter.
 - Expand the promotion of winter recreation opportunities on the park website, in publications, and on social media.
 - Explore the potential to collaboratively promote public use, cabin-to-cabin winter adventures in cooperation with the Chugach National Forest and Kenai National Wildlife Refuge.
 - Partner with community groups to host organized events on the park access road during winter, spring, and fall when the gate is closed. These events could include cross-country ski races and similar events. These actions may require the additional plowing of the road and partnering to promote public events.
 - Through a rule-making process, allow nonmotorized fat tire winter snow bikes in areas determined appropriate by the superintendent (see “Proposed Regulatory Changes” below).

If budget and staffing shortfalls occur, park managers would continue to prioritize the management of summer operations.

Proposed Regulatory Changes

Under alternative B, the National Park Service proposes to initiate a rule-making process after the completion of this planning and compliance process by publishing the proposed changes in the *Federal Register*. The public would have an opportunity to comment via the regulations.gov website. A final rule incorporating substantive public comments would then

be published in the *Federal Register*, and the regulation would be implemented. Impacts associated with the proposed rule-making are analyzed in this environmental assessment as part of alternative B. Proposed rule-making changes under alternative B include the following:

- Redefine the current Exit Glacier Developed Area, as defined in 36 Code of Federal Regulations (CFR) Part 13 Subpart P for Kenai Fjords National Park. The updated definition of this “Developed Area” would be based on static, mapped landmarks for the purposes of delineating a single intact area instead of the current definition, which is spatially tied to a moving and retreating glacier terminus that has created a gap where enforcement of laws and regulations is uncertain.
- Allow for additional winter recreational opportunities. Currently, bikes are permitted only on the Exit Glacier Road and parking areas. The National Park Service proposes to update the Code of Federal Regulations to allow the use of nonmotorized fat tire winter snow bikes in the same areas in Exit Glacier Developed Area accessed by snowmachines. The regulations would allow the superintendent to decide when snow cover is adequate to allow this use without resource damage.
- Remove many of the Exit Glacier-specific and frontcountry regulations currently found in subpart P and place these directives into the Superintendent’s Compendium. Some regulations in 36 CFR Part 13 Subpart P that no longer apply to existing conditions would be removed completely. Moving certain regulations to the Superintendent’s Compendium, which is updated annually, and away from the Code of Federal Regulations, which may be revised every decade or two, enables park managers to proactively address the ever-changing conditions of the glacier- and stream-affected frontcountry area. Together, the Code of Federal Regulations and the Superintendent’s Compendium would regulate management of the frontcountry.

Management Responses to Changing Conditions

Under alternative B, the National Park Service proposes to implement **immediate, near-term potential, and long-term potential** management strategies for responding to future, changing conditions that may affect visitor use and experiences, facilities, and desired conditions. These potential future management strategies under alternative B are described in further detail below.

Conditions in the frontcountry area are changing and will continue to do so for the foreseeable future. Visitor use levels have increased over time and will likely continue to do so, and visitor use patterns and preferences will continue to evolve. The climate and physical geography of the frontcountry area are also changing, as evidenced by the rapid retreat of Exit Glacier and outburst flooding events on the outwash plain that are increasing in frequency. Social and fiscal conditions are also likely to change in the foreseeable future, potentially creating opportunities that may not currently be feasible. For example, new funding opportunities may arise, or partner agencies may undertake new initiatives that allow park managers to collaboratively engage in activities that are currently not viable.

The planning team considered conditions that are likely to occur and identified potential management strategies that may be used to ensure that desired conditions are achieved as conditions in the frontcountry change. This “if this, then that” form of planning is intrinsically imprecise due to the unpredictable nature of the future but is appropriate and responsible, particularly in the context of potential impacts of climate change on frontcountry visitor experiences and facilities. A linear “forecast planning” approach only applies to one predicted future and does not apply in these cases. Instead, a “scenario planning” approach, which contemplates multiple potential futures, allows park management to be flexible and nimble in the face of uncertainties (NPS 2021).

Management strategies currently in use may be used more frequently in response to changing conditions. Additionally, there are several straight-forward management strategies that could be implemented to address changing conditions without further planning or compliance due to inclusion in previous planning and compliance or coverage by a categorical exclusion under the National Environmental Policy Act. These strategies are collectively referred to as “immediate management strategies.”

Strategies that do not fit in the “immediate management strategies” category but are likely needed soon (approximately the next five years) in response to changing conditions are analyzed for their potential impacts pursuant to the National Environmental Policy Act (see chapter 3). These strategies are referred to as “near-term potential management strategies.”

“Long-term potential management strategies” are potential management strategies that may become necessary later (in more than five years) if immediate management strategies and near-term potential management strategies are unsuccessful at achieving desired conditions. These strategies are not very detailed and are not analyzed for their potential impacts pursuant to the National Environmental Policy Act in this environmental assessment. Instead, details of long-term management strategies would be developed at the time they are needed to ensure that the most effective approach is implemented, and the appropriate civic engagement and compliance would be completed before their implementation. Table 1 compares the three types of management strategies.

Table 1. Comparison of Types of Management Strategies in Terms of Likelihood of Immediate, Near-Term, or Long-Term Potential for Implementation and How Each Type of Strategy Would Be Addressed to Comply with NEPA Requirements

Management Strategy Type	When Would This Management Strategy Be Implemented?	Why Would This Management Strategy Be Implemented?	Is Impact Analysis Included in This EA?	Is Additional Impact Analysis Needed if Implemented in the Future?
Immediate management strategy	Currently in use and possibly used more frequently in the immediate future upon plan implementation	To maintain desired conditions	No	No, covered by previous compliance or categorical exclusion
Near-term potential management strategy	Likely to be needed in the near future (next 5 years)	In response to changing conditions when immediate management strategies are insufficient to achieve desired conditions	Yes	No
Long-term potential management strategy	May be needed in the distant future (5–20 years)	In response to changing conditions when immediate and near-term potential management strategies are insufficient to achieve desired conditions	No	Yes, details would be developed when the strategy is needed, and impact analysis would be completed at that time

The following sections describe changing conditions that could affect visitor use and facilities. Each section includes immediate, near-term potential, and long-term potential management strategies that could be used proactively or in response to these changes from climate change or social and fiscal factors.

Strategies to Address Impacts on Visitor Use and Experience from Climate Change

Climate change can impact visitor use and experience and park management’s ability to achieve desired conditions for visitor use and experience. For example, glacial retreat will make it harder for visitors to see the glacier or potentially less safe for guided visitors to travel upon it. Less snowfall or shorter winter seasons may limit activities like fat tire winter snow biking or snowmachine use.

The planning team considered potential changes to the frontcountry area due to climate change over the next 20 years; impacts those changes may have on visitor use and experience; the relative importance of that change to achieving desired conditions; immediate, near-term, and long-term potential management strategies that may be taken to address the impact or achieve desired conditions in another way; and what conditions may trigger a change in management. Table 2 summarizes these considerations and related management strategies.

Table 2. Visitor Use and Experience Management Strategies and Actions That Would Be Implemented as Needed under Alternative B Based on Climate Change Impacts

Potential Climate Change Impact	Impact on Visitor Use and Experience	Relative Importance of Impact	Management Strategies	Conditions That Trigger Management Strategies
Retreat of Exit Glacier	Visitors can no longer see Exit Glacier from easily accessible areas of the frontcountry, including the Glacier Overlook Loop Trail and Glacier View Loop Trail.	Given the historical emphasis on seeing Exit Glacier, the ability to view the glacier is highly important to visitors having a quality experience in this area. A recent visitor survey found that many visitors believe extreme glacier recession is unacceptable, and visitors reported that their desire to visit would decrease because of extreme glacier recession (Moser 2016).	<p>Immediate Management Strategies</p> <p>Prioritize efforts that deemphasize Exit Glacier as the primary visitor destination, such as improving trip planning messaging to set appropriate expectations as discussed in “Visitor Messaging, Wayfinding, and Interpretation” above.</p> <p>Prioritize shifting interpretation to focus on how glaciers shape the landscape and how anthropogenic changes impact the glacier. Also shift the focus to other resources, including the surrounding mountains, forests, and creeks. The focus could include updating the nature center displays as discussed in “Visitor Messaging, Wayfinding, and Interpretation” above.</p> <p>Long-Term Potential Management Strategies</p> <p>Decommission some Exit Glacier-focused facilities (e.g., the Glacier View Loop Trail and Glacier Overlook Loop Trail) if/when they no longer provide a view of the glacier or a discernable visitor destination or experience.</p> <p>Consider extending the Harding Icefield Trail to provide trail access overlooking the Harding Icefield and highlight the frontcountry area as the gateway to the Harding Icefield.</p>	The view of Exit Glacier reaches the recession view displacement level identified in Moser 2016 (i.e., the glacier is distant and is barely seen from the Glacier Overlook Loop Trail and Glacier View Loop Trail).
Less snowfall in fall and early winter	The surface of the outwash plain and other traversable areas is no longer conducive to snowmobiles or fat tire winter snow bikes.	Over-snow access is somewhat important to the diversity of visitor opportunities available in the frontcountry area.	<p>Near-Term Potential Management Strategies</p> <p>As described in “Recreational Opportunities” above, park management would expand winter recreational opportunities for nonmotorized fat tire winter snow bikes through changes to 36 CFR Part 13 Subpart P, but the snow level needed to allow for snowmachines and winter biking may shorten the winter use seasons.</p>	Snow cover is not sufficient to shield plants and other park resources from damage.

Potential Climate Change Impact	Impact on Visitor Use and Experience	Relative Importance of Impact	Management Strategies	Conditions That Trigger Management Strategies
Less snowfall in fall and early winter	The duration of the snow-covered winter season becomes shorter or nonexistent, meaning the state no longer closes the road to Exit Glacier. Year-round vehicle access to the frontcountry would be physically possible, meaning there would be no time when pedestrians did not share the road with cars.	Maintaining a season when motor vehicle access is not present is somewhat important to the diversity of visitor opportunities available in the frontcountry area. Visitors enjoy the unique opportunity to use the closed road for biking, walking, and running.	<p>Near-Term Potential Management Strategies</p> <p>Close the road to motor vehicles at the NPS gate at the Resurrection River to maintain an established "winter season" or "shoulder season," and preserve opportunities to use the paved and uncovered road surface for biking, walking, and running from November through April. This also ensures operational sustainability, especially during spring opening.</p>	If state and USFS-maintained sections of the Herman Leirer Road are open to the park boundary past November 1 and/or before April 30 three or more times, park managers may consider establishing the winter season.

Strategies to Address Impacts on Facilities from Changing Climate and Physical Geography Conditions

Due to climate change, the physical geography of the frontcountry area is changing rapidly. These changes impact the frontcountry facilities. In the past, outburst flooding, migration of the outwash plain, erosion, and debris flow events have damaged facilities in the area. These events are expected to continue with implications for facilities investments and the quality of the visitor experience.

The planning team considered how climate and physical geography-related changes could impact key facilities in the frontcountry area and what might be done in response to impacts that could foreseeably happen to these facilities over the next 20 years. Key facilities under consideration included restrooms (both vault toilets and flush toilets), the campground, nature center, trails, parking lot, and the access road (including the Resurrection River Bridge). The relative importance of each facility to achieving desired conditions and mission requirements was a factor in considering potential management strategies and adaptations for addressing facility changes or damages. Potential adaptations might include moving the facility, decommissioning it, or rebuilding it more resiliently (see the Resist-Accept-Direct [RAD] Framework in Schuurman, GW, et al. 2021). Park management would develop a funding strategy for rebuilding and moving facilities. Lastly, the planning team considered whether it would be best to take action before or in response to impacts occurring. Table 3 summarizes these considerations and potential adaptations.

Table 3. Considerations for Climate Adaptation and Management Strategies for Facilities Affected by Future Changing Conditions under Alternative B*

Facility	Climate Vulnerabilities	Relative Importance of Facility	Potential Adaptations	Proactive or Reactive?
Restrooms (vault toilets and flush toilets)	Flooding damage, avalanche, landslide, wildfire	The restrooms are essential to providing quality visitor experience and resource protection. If they were removed, a human waste issue would likely occur in the area.	<p>Long-Term Potential Management Strategies</p> <p>Move restrooms to new location, likely to higher ground.</p> <p>Use temporary restroom facilities that can be removed from the area during high-risk flood season.</p>	<p>Due to the importance of these facilities, the cost of removal, and the relatively low likelihood that flooding will occur in the next few years, these actions would only be taken reactively.</p> <p>If conditions indicate a flood is likely to occur imminently, vaults may be pumped proactively to prevent the contamination of surrounding areas.</p>
Campground	Flooding damage and outwash plain migration (this facility is the most vulnerable to these risks, and campsites have already been lost)	The campground is not critical to achieving desired conditions or mission success. A very small proportion of visitors camp here, and the campground is rarely full. Alternative camping options exist in the area. The loss of the facility would have a negligible impact on visitor opportunities.	<p>Near-Term Potential Management Strategies</p> <p>Decommission individual sites if/when they are lost to flooding or outwash plain migration. If half or more of the sites are lost, the full campground may be decommissioned.</p> <p>Long-Term Potential Management Strategies</p> <p>Move the campground to a new location if special funding (e.g., disaster response funding) becomes available and demand for camping in the park is high.</p>	These actions would be taken reactively if/when flooding impacts the campground.
Nature center	Flooding, fire, avalanche, landslide	The nature center is essential to providing quality visitor experiences. If the center were removed, visitors would lack a central point of orientation, as described in desired conditions for the visitor facilities zone.	<p>Immediate Management Strategies</p> <p>Redirect water away from the nature center during runoff events.</p> <p>Conduct hazard fuel reduction to reduce fire threat to the nature center.</p> <p>Long-Term Potential Management Strategies</p> <p>Elevate the nature center in its current location.</p> <p>Decommission the current nature center, and instead use a mobile visitor center that could be removed during hazardous conditions.</p>	<p>Redirecting water in emergency situations would be used reactively as needed. If flooding becomes common, elevating the nature center or using a mobile visitor center could be used proactively.</p> <p>Hazard fuel reduction could be done proactively.</p>

Facility	Climate Vulnerabilities	Relative Importance of Facility	Potential Adaptations	Proactive or Reactive?
Harding Icefield Trail	Flooding, landslides, avalanches	The Harding Icefield Trail is essential to providing a key park experience and is tied to the park's enabling legislation by providing access to the Harding Icefield. Its existence is essential to all of the desired conditions of the hiker zone.	<p>Immediate Management Strategies</p> Reconstruct or reroute portions or sections of the trail around or through hazards, washouts, or landslide debris.	This action would be done reactively in response to conditions when there is a safety risk.
Glacier View Loop Trail	Flooding, landslides, (this trail is less vulnerable than other trails due to its location and paved surface)	The Glacier View Loop Trail is essential to providing a key park experience, as it provides access to the Harding Icefield Trail and is universally accessible. The trail's existence is essential to the desired conditions of the pedestrian zone.	<p>Immediate Management Strategies</p> Reconstruct the trail in its current location. Reroute trail.	<p>Long-Term Potential Management Strategies</p> Consider removing the southern portion of the trail so that it becomes an in-and-out trail rather than a loop trail.
Creekside section of Glacier Overlook Trail and spur trails accessing the outwash plain	Flooding, being truncated by outwash plain migration	Maintenance of at least one designated access point to the valley floor zone is important to achieving desired conditions for that zone. While having two is convenient for outreach programs, it is not essential to desired condition achievement.	<p>Immediate Management Strategies</p> Rebuild or relocate trails to provide at least one access to the outwash plain.	Rebuilding or relocating trails would be done reactively, based on safety risk.

Facility	Climate Vulnerabilities	Relative Importance of Facility	Potential Adaptations	Proactive or Reactive?
Access road, bridge, and parking lot	Flooding, bridge washouts	These facilities are essential to providing access to the frontcountry area in general.	<p>Immediate Management Strategies Use Jersey barriers to mitigate flooding. Rebuild the bridge as it washes out.</p> <p>Long-Term Potential Management Strategies Raise road again, as it was raised 5 feet in 2015.</p>	<p>Using Jersey barriers and rebuilding the bridge would be reactive adaptations.</p> <p>Proactively maintaining the bridge may be advised or required by the Federal Highway Administration.</p> <p>Raising the road again may be done proactively if frequent flooding is an issue.</p>

* See figure 3 to orient to the locations of facilities and trails. Flooding management would comply with NPS Director's Order 77-2: *Floodplain Management*.

Visitor Use Management

This plan incorporates aspects of the Visitor Use Management Framework to develop strategies for monitoring and managing visitor use in the park (IVUMC 2016). Key aspects of visitor use management incorporated into the alternative B include the identification of indicators and thresholds, as well as visitor capacities.

Indicators and Thresholds

Monitoring in this plan is accomplished through the establishment of “indicators” and “thresholds.” Indicators are specific resource or experiential attributes that can be measured to track changes in conditions so that progress toward achieving and maintaining desired conditions can be assessed. Thresholds are the minimum acceptable conditions associated with each indicator. Indicators and thresholds provide park managers with monitoring strategies to ensure that desired conditions for resources and visitor experiences are achieved and maintained over time.

The planning team considered many potential indicators but ultimately identified six that are the most important to monitor the effectiveness of the frontcountry management plan. The six topics the indicators monitor include the following:

- invasive plant species
- soundscapes
- trail crowding
- visitor crowding in the visitor facilities zone
- the quality of guided hike participation
- bear-human interactions

See appendix B for detailed descriptions of the indicators and thresholds, along with rationales and monitoring strategies.

Just as in the “Management Responses to Changing Conditions” section, the planning team identified immediate, near-term, and long-term potential management strategies associated with each indicator. Immediate management strategies would be used or increased to avoid approaching thresholds. Near-term potential management strategies would be implemented if monitoring indicates that thresholds are being approached or exceeded. Long-term potential management strategies would be explored if immediate and near-term potential management strategies are not successful in achieving desired conditions and thresholds continue to be exceeded.

The iterative practice of monitoring, implementing management strategies, and then continuing to monitor their effectiveness allows park managers to maximize benefits for visitors while achieving and maintaining desired conditions for resources and visitor experiences in a dynamic setting like the Kenai Fjords frontcountry.

Visitor Capacity

Visitor capacity is the maximum amount and types of visitor use that an area can accommodate while sustaining desired resource conditions and visitor experiences consistent with the purpose for which the area was established (IVUMC 2016). By establishing visitor capacities and implementing them with appropriate management strategies, the National Park Service can help ensure that resources are protected and that visitors have the opportunity for a range of high-quality experiences.

Pursuant to Director's Order 2: *Park Planning*, a park's planning portfolio is the assemblage of planning documents that guide park management and decision-making and satisfy law and policy. Implementation-level plans such as this one can contribute to the statutory planning requirement to identify visitor capacities for specific areas of the park. Kenai Fjord National Park's frontcountry has no prior identification of visitor capacity.

Similar to the indicators and thresholds in the "Management Responses to Changing Conditions" section, the planning team identified immediate, near-term, and long-term potential management strategies associated with the visitor capacity analysis for each zone to ensure use levels are managed within identified visitor capacities. See appendix C for the visitor capacities that were identified for zones in this plan.

Summary Comparison of Alternatives A and B

The management strategies described above for alternatives A and B are summarized below in Table 4. The table is organized by planning issue and describes how and to what extent each alternative would address the planning issue.

Table 4. Summary of Alternatives

Planning Issue	Alternative A: No Action (current management, as established in the 2004 Exit Glacier Area Plan)	Alternative B: Preferred Alternative
Zoning	<p>Zones established in the 2004 Exit Glacier Area Plan would continue to guide management actions.</p> <p>Winter recreation would continue to be managed to achieve desired conditions established for the visitor facilities and pedestrian zones (including the outwash plain).</p>	<p>Park management would update zoning and desired conditions to guide the implementation of management strategies for diversifying visitor opportunities, while protecting resources and values and improving the visitor experience.</p>
Conditions do not match visitor expectations	<p>Changes to highway signs and waysides would continue to focus less on Exit Glacier as the primary attraction of the area and would occur on an ad hoc basis. Therefore, park messaging may continue to inadvertently create expectations among visitors that they can easily approach and touch Exit Glacier, even though current conditions make this difficult and potentially unsafe. Some visitors may still attempt to approach the glacier without adequate preparation or safety precautions.</p>	<p>Park management would strategically improve trip planning messaging to set appropriate expectations, improve wayfinding so visitors understand their location (e.g., by adding simple trail marker and mileage signs at major landmarks along the Harding Icefield Trail such as the cliffs, marmot meadows, the top of the cliffs, the shelter, and end of the Harding Icefield Trail), update climate change interpretation, and integrate Alaska Native place names to shift focus away from Exit Glacier. Together, these strategies would constitute a more cohesive and intentional visitor messaging strategy to set appropriate expectations.</p>
Facility vulnerability in a dynamic landscape	<p>Trails adjacent to Exit Creek would continue to erode due to flooding and glacial outwash runoff events, and no established guidelines for adaptation would exist.</p> <p>Sedimentation from flooding events would continue to bury trails and infrastructure requiring NPS staff to clear these facilities for visitor access.</p> <p>Previous park road improvements could be compromised from future flooding events (e.g., the road grade was raised 5 feet in 2016 to mitigate flooding impacts).</p>	<p>Park management would have established guidelines to adapt and react to severe events that impact park facilities and infrastructure considering the vulnerability and relative importance of frontcountry facilities and infrastructure. Park management would develop a funding strategy to replace or relocate facilities deemed critically important to management of frontcountry resources and visitor experiences to reduce their vulnerability. Management would also develop messaging to inform the public and stakeholders that the National Park Service would decommission noncritical facilities that may become unsafe or affect resource management objectives in the future due to flooding damage, erosion, or sedimentation.</p>

Planning Issue	Alternative A: No Action (current management, as established in the 2004 Exit Glacier Area Plan)	Alternative B: Preferred Alternative
Increasing visitor use	<p>Occasional parking lot congestion during peak visitation periods would continue to occur in the visitor facilities zone, with occasional intervention on behalf of park staff when necessary.</p> <p>Crowding on trails would continue to affect visitor experiences during peak periods of visitation.</p>	<p>Park management would proactively post messages on the park website during peak visitation periods to inform visitors of periods when congestion in the parking lot is anticipated.</p> <p>When parking lot congestion or gridlock events occurred during peak visitation periods, park staff would respond to help manage traffic and parking.</p> <p>Park management would increase and update programs and recreational opportunities to help spread out visitation temporally (within a given day or to encourage shoulder and winter season visitation) and spatially across the frontcountry area.</p> <p>Additional strategies to manage increasing visitation impacts on natural resources are identified below.</p>
Impacts on natural resources	<p>Ongoing, anticipated increases in visitation would have impacts on soil compaction, vegetation trampling, invasive plant establishment and spread, wildlife disturbance and displacement, loss of wildlife habitat, and human-wildlife encounters.</p>	<p>Park management would pursue additional strategies to decrease negative human-wildlife encounters and manage invasive plants.</p>
Recreational opportunities	<p>Winter recreation would be managed to achieve desired conditions in the visitor facilities and pedestrian zones, as well as the natural zone.</p> <p>Public use of snowmachines would continue to be prohibited in the Exit Glacier Developed Area except on the Exit Glacier Road, in parking areas, on a designated route through the Exit Glacier Campground to Exit Creek, and in Exit Creek (Outwash Plain). Bicycles (including nonmotorized fat tire winter snow bikes) would only be allowed on the Exit Glacier Road and in parking areas.</p>	<p>Park management would responsively rebuild or, if necessary, reroute, trails impacted by changing conditions to ensure ongoing visitor access to scenic views and different hiking experiences in the frontcountry in the summer.</p> <p>Park management would intentionally expand and promote recreational opportunities in the winter and shoulder seasons (spring, fall).</p> <p>Through a rule-making process, nonmotorized fat tire winter snow bikes would be allowed in the Exit Glacier Developed Area in the same locations snowmachines are allowed when snow conditions permit.</p> <p>Park management would explore potential partnerships with local stakeholder groups to groom the NPS section of the access road from the park boundary at the Resurrection River bridge to the nature center to extend cross-country skiing, snowmobiling, and nonmotorized fat tire winter snow biking opportunities when snow conditions permit.</p>

Planning Issue	Alternative A: No Action (current management, as established in the 2004 Exit Glacier Area Plan)	Alternative B: Preferred Alternative
		<p>Park management would explore the potential to collaboratively promote public use and cabin-to-cabin winter adventures in cooperation with the Chugach National Forest and Kenai National Wildlife Refuge.</p> <p>Park management would partner with community groups to host organized events on the park access road during the winter and the shoulder seasons in the spring and fall when the gate is closed. These events could include cross-country ski races and other similar events. These actions may require additional plowing of the road and partnering to promote public events.</p>
Park regulations and changing conditions	Park regulations would continue to be tied to rapidly changing glacier conditions. The existing gap between the glacier terminus and the end of the trail defining Exit Glacier Developed Area would continue to grow. Some regulations would become outdated when they no longer applied to current conditions.	Park regulations for Kenai Fjords National Park that no longer apply or are expected to change in the next decade would be removed from regulations and deleted (if they no longer apply) or moved to the annually updated Superintendent's Compendium (if they are expected to change). The Exit Glacier Developed Area would be referenced in a publicly available map that would reflect current conditions.

Management Actions Considered but Dismissed

The National Park Service considered incorporating other management actions in alternative B but dismissed these actions from detailed analyses for one of the following reasons that are permitted by the National Environmental Policy Act:

- technical or economic infeasibility, meaning the alternative could not be implemented if it were selected or would be unreasonably expensive
- inability to resolve the purpose and need for taking action, to a large degree
- duplication with other, less environmentally damaging, or less expensive alternatives
- the alternative conflicts with an up-to-date and valid park plan, statement of purpose and significance, or other policy, such that a major change in the plan or policy would be needed
- the alternative would require a major change to a law, regulation, or policy
- too great of an environmental impact
- the alternative addresses issues beyond the scope of the NEPA review
- the alternative would not be allowed by another agency from which a permit is required and should be eliminated as “environmentally infeasible”

Management actions considered but dismissed are described below. They are grouped by general topics that the plan addresses via other activities in alternative B. The reason(s) for dismissal follow the description of each action.

Several management strategies were dismissed, as they are currently considered technically or economically infeasible due to limited partnership availability, high construction cost, and/or long-term maintenance costs. However, should conditions change over the next 20 years, these strategies could be reconsidered. For example, if partnership opportunities present themselves or new funding streams become available, several of these strategies could be adopted to fulfill the plan’s purpose and need and to maintain desired conditions. In these cases, the National Park Service would conduct the appropriate impact analysis, compliance, and consultation prior to implementing actions that are currently considered infeasible.

Trails

- Develop a multimodal trail (hike, bike, run) that parallels the access road footprint from the Resurrection River bridge to the nature center, including a connector to the campground.

This action has been discussed for over 20 years as part of a multimodal, multiagency trail that would eventually extend from the Seward Highway to the park. The National Park Service released the *Herman Leirer Road Multi-Modal Trail Feasibility Study Environmental Assessment* in 2013, and the bike trail was also included in the 2004 Exit Glacier Area Plan. However, after a decade of discussion following the 2013

feasibility study environmental assessment and determining the high cost of building and maintaining a trail through a wetland area, park management has determined this trail to be infeasible currently. Thus, this management action was considered but dismissed.

- Develop the Paradise Valley Trail crossing Exit Creek and the Unnamed Peak Trail.

This action was dismissed due to the highly dynamic nature of Exit Creek (as well as Paradise Creek), visitor safety concerns, and the challenges of building infrastructure in an active floodplain. In the 2004 Exit Glacier Area Plan, a new 2.5-mile trail through Paradise Valley Trail was part of the preferred alternative. Hikers would be required to ford Exit Creek, as no bridge was planned. The proposed Paradise Valley Trail crossed Exit Creek near its trailhead and then continued in Paradise Creek. A spur trail off the Paradise Valley Trail called the Unnamed Peak Trail was an additional 2.25 miles. Developing Paradise Valley Trail was dismissed because Exit Creek often cannot be crossed in the summer due to its high flow. Furthermore, Exit Creek's main stream course shifts frequently, and the streambed is very braided. Paradise Creek also has variable flow and is braided in its lower reach. More recently, Exit Creek has experienced glacier outburst floods with the retreating glacier during the summer, and having visitors cross Exit Creek would increase safety issues.

- Create a designated GPS route (untrailed) to access alpine areas and nunataks on Harding Icefield.

This action was dismissed due to its inability to meet project objectives or resolve a need. While it would expand visitor opportunities, travel on the Harding Icefield can be very dangerous and will likely become more so as climate change impacts the ice. This activity is currently allowed but should not be encouraged.

- Remove the upper outwash plain section of trail to remove redundancy in the Glacier View Loop Trail and Glacier Overlook Loop Trail, and reduce entry points into the dynamic outwash plain area.

This action was dismissed due to its inability to meet project objectives or resolve a need. This action does not diversify visitor opportunities but rather reduces them. This redundancy is desirable for school groups and interpretive programming and can help avoid human-wildlife conflict if animals occupy one of the outwash plain sections of the Glacier View Loop Trail or Glacier Overlook Loop Trail.

- Remove the spur to the "Edge of the Glacier" back to the "2005" sign, as the "Edge of the Glacier" does not provide any improved view and can tempt visitors to make unsafe decisions.

This action was dismissed due to its inability to meet project objectives or resolve a need. The action does not diversify visitor opportunities but rather reduces them. Substantial funds (approximately \$200,000) were invested in this short trail, which provides a visitor use opportunity, albeit not the original intended one. This location

serves as a location for interpretive programming. Incidents of visitors in danger have been infrequent. If this changes, the spur trail could be removed adaptively.

Parking Lot Congestion

- Develop a dynamic messaging system near the highway to manage parking expectations.

This action was dismissed due to its inability to meet project objectives or resolve a need. While this action would manage expectations, it would be unlikely to change behavior. By the time visitors would reach this messaging system, they would have committed to their planned visit.

- Designate spaces in the parking lot as short-term parking to increase vehicle turnover rate and decrease congestion.

This action was dismissed due to its inability to meet project objectives or resolve a need. This action conflicts with desired conditions for the frontcountry area, specifically the desire that visitors develop a conservation ethic and an appreciation for the area and experience the most accessible portion of the park. A quick visit would not allow visitors to develop these sensibilities or experiences.

- Increase available parking by increasing the size of the parking lot.

This action was dismissed because it is duplicative of other activities identified to address parking lot congestion. These other activities would be less expensive and present fewer environmental impacts.

- Construct an additional parking lot designated for oversized vehicles along the side of the Herman Leirer Road. Connect this oversized vehicle lot to the nature center with a trail.

This action was dismissed because it is duplicative of other activities identified to address parking lot congestion. These other activities would be less expensive and present fewer environmental impacts.

- Develop a shuttle system to transport visitors between the nature center and the USFS Resurrection River Trailhead.

This action was dismissed due to its inability to meet project objectives or resolve a need. The short route would not substantially expand visitor opportunities or address a real need. Parking exists and could be expanded at Resurrection River Trailhead.

This action was dismissed because it is duplicative of other activities identified to address parking lot congestion. For example, implementing a potential management action to address visitor crowding (see Appendix B: Visitor Use Management Indicators and Thresholds) by coordinating a shuttle system from Seward would have much more utility.

- Expand the shoulder along the access road, and designate that space as overflow parking.

This action was dismissed because other activities to address parking lot congestion would be less expensive and present fewer environmental impacts.

Interpretive Programming and Outreach

- Transform the nature center into an interpretive and educational destination with expanded visitor opportunities for learning and discovery, designed for longer visits. This action could include an elevated observation deck above the nature center.

This action was dismissed due to technical or economic infeasibility. The action would likely be very expensive, and it is unclear how (or if) an observation deck could be built on the nature center.

This action was dismissed because it is duplicative of other activities developed to address interpretive programming and outreach. Alternative B already includes actions to expand visitor opportunities at the visitor center that would be less expensive and present fewer environmental impacts.

Visitor Opportunities in the Winter and Shoulder Seasons

- Build a new structure that would serve as a public use cabin open to visitors in the winter.

This action was dismissed because it is duplicative of other activities developed to address visitor opportunities in the winter and shoulder seasons. These other activities would be less expensive and present fewer environmental impacts. For example, an existing building could be used as a second public use cabin for winter use without new construction.

- Promote kite skiing opportunities on the Harding Icefield in the spring. Consider allowing for commercially guided kite skiing.

This action was dismissed due to its inability to meet project objectives or resolve a need. While it would expand visitor opportunities, kite skiing can be dangerous, as wind gusts can lift skiers off the ground causing serious injury or death. This activity is currently allowed but should not be encouraged, as it can put visitors and emergency responders at risk.

Human-Wildlife Interactions

- Haze large wildlife that linger in popular areas to reduce the risk of negative human-wildlife interactions.

This action was dismissed because it is duplicative of other activities identified to address human-wildlife interactions. These other activities would be less expensive and present fewer environmental impacts. Rather than manage wildlife in this

manner, which would be difficult, park managers would address human activity to reduce negative human-wildlife interactions and risks.

Infrastructure

- Manage the Exit Creek to prevent flooding and washouts, potentially with berms or a levy.

This action was dismissed because it presents too great an environmental impact or is duplicative with other, less-damaging alternatives. Lessons learned across the National Park Service advise against constructing infrastructure on unstable or dynamic landscapes. In managing the park's frontcountry, accepting the dynamic nature of the outwash plain is safer than attempting to resist it.



Affected Environment and Environmental Consequences

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CHAPTER 3: AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

INTRODUCTION

The National Environmental Policy Act requires that environmental documents discuss the environmental impacts of a proposed federal action, feasible alternatives to that action, and any adverse environmental impacts that cannot be avoided if an action is implemented. This chapter begins with an explanation of methods; describes the existing conditions, including existing resource trends and planned activities (affected environment); and analyzes the potential environmental consequences (impacts or effects) that would occur because of implementing the alternatives.

In response to changing visitor use conditions, this plan incorporates aspects of the Visitor Use Management Framework to develop strategies for monitoring and managing visitor use in the park (IVUMC 2016). As referenced in chapter 2, key aspects of visitor use management in alternative B include identifying indicators and thresholds, as well as visitor capacities. Similarly, and as noted in chapter 1, the following resources are included in this analysis: soils, water quality, floodplains, wetlands, vegetation, wildlife, soundscape, and visitor experience. Direct and indirect effects are discussed for each alternative and impact topic. Cumulative effects are discussed at the end of each impact topic.

Alternative B includes several straightforward management strategies referred to as “immediate management strategies” that could be implemented to address changing conditions without planning or compliance (due to inclusion in previous planning and compliance, or coverage by a categorical exclusion). Potential long-term management strategies under alternative B that are not detailed, however, are not further analyzed for resource impacts in this chapter. Instead, details of long-term management strategies would be developed at the time they are needed to ensure that the most effective approach is implemented and the appropriate impact analysis and other compliance needed for long-term strategies and actions would be completed before their implementation.

Under alternative B, the “near-term potential management strategies” that do not fit in the “immediate management strategies” category but are likely needed soon (approximately the next five years) in response to changing conditions are analyzed for their potential impacts in this chapter.

SOILS

Affected Environment

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 are typically 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 ongoing 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 in 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 and 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 Glacier Overlook Loop Trail and the glacier's edge, and on the outwash plain and recent terminal moraines.

Soils in and near the study area have been altered in the past due to the 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, unauthorized parking on unpaved areas, and occasionally by isolated areas of erosion where fill slopes exist. In addition to the soil impacts adjacent to facilities, dispersed impacts caused by off-trail pedestrian traffic have 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 National Park Service, adjacent governments, and private entities plan no additional or reasonably foreseeable actions that would adversely affect soils in the study area.

Environmental Consequences

Alternative A: No Action

Current frontcountry activities could make soils slightly less resistant to erosion and affect their ability to support plant and animal life. Compared to glacial outbursts and flooding events that alter soil structure, ongoing frontcountry activities would have little impact on soils. Still, off-trail foot traffic in alpine areas can more easily erode fragile soils during periods when the soils are saturated with water. Soil structure can be damaged by compaction.

Similarly, hikers cutting switchbacks and forming social trails or parallel trails could have localized impacts on soils. Visitor trampling can lead to pronounced erosion on steeper slopes, which would increase sediment loads carried downslope into streams, though these volumes would have little impact on riverine ecosystems compared to more pronounced flooding events.

Alternative B: Preferred Alternative

Under alternative B, the updated management zones would continue to protect soils from high levels of impact in most of the study area. Much of the study area would be zoned as glacial mountain and valley floor and would be expected to receive very little visitation, as no trails would be present. A smaller percentage of the study area would be zoned hiker, pedestrian, and visitor facilities, where most visitors would spend time, resulting in the greatest impacts on soils. Updating park zoning is not anticipated to affect soils. However, once developed, this framework would provide clearly defined thresholds and a more systematic approach for implementing management actions to reduce or eliminate impacts than would occur under alternative A. This framework would likely reduce adverse impacts on soils from visitor use.

The proposed regulatory authorization of fat tire winter snow bike use across the outwash plain (in parallel with winter snowmachine use on the outwash plain) would have little-to-no impact on soils, as fat tire winter snow bike use would only be authorized when snowmachines are authorized, during periods of “adequate snow cover, generally 6–12 inches or more, or a combination of snow and frost depth sufficient to protect the underlying vegetation and soil” (43 CFR 36.11). Other proposed changes in regulations are not expected to have any impact on soils.

Minor changes, such as updating signage on trails, would result in negligible impacts on soils. These impacts would not likely result in changes to the study area’s overall biological productivity.

Cumulative Impacts

The impacts from past, present, and reasonably foreseeable planned actions are described in the affected environment section.

When the incremental impacts of alternative A are combined with the impacts of past, ongoing, and reasonably foreseeable planned actions described in the affected environment section, the overall cumulative impacts would be adverse from compaction along roadways where unauthorized parking occurs. Incremental impacts of alternative A would contribute most of the impacts.

When the incremental impacts of alternative B are combined with the impacts of past, ongoing, and reasonably foreseeable planned actions described in the affected environment section, the overall cumulative impacts would be slightly beneficial with the incremental impacts of alternative B, contributing few of the impacts.

Conclusion

Alternative B would have a long-term, slightly beneficial impact on soils because implementing new management zones, management responses to changing conditions, indicators and thresholds, and visitor capacities would help ensure desired resource conditions are met. While visitor off-trail use compacts soils, resulting in erosion on steeper slopes, these impacts would be broadly dispersed and would not significantly impact soils.

WATER QUALITY

Affected Environment

Water quality baseline testing in frontcountry area waterbodies has been conducted 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 proximity to the road and to high visitor use areas.

Some reaches of a freshwater stream adjacent to the Harding Icefield Trail tested for coliform bacteria revealed small concentrations of fecal coliforms. Although unacceptable for drinking, these areas are within normal limits for water contact recreational uses 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.

Another tributary of Exit Creek adjacent to the road near the park entrance (mile 8.5 on the Herman Leirer Road) was tested to establish a baseline for potential impacts from visitors in this corridor. 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 to characterize the stream. No contaminants or toxic compounds were found. Similarly, both stream locations were tested for dissolved oxygen levels, pH, temperature, and conductivity. Results for these water quality parameters are consistent with healthy stream systems.

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 visitor use of existing trails, particularly the Harding Icefield Trail, 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 (NPS 2004). Testing revealed that water quality was well within state and national standards, implying past actions had no or negligible effects on water quality. The National Park Service, adjacent government, and private entities plan no additional and reasonably foreseeable actions that would adversely affect water quality in the study area.

Environmental Consequences

Alternative A: No Action

With increased visitor use, concentrations of human waste in frontcountry areas would likely increase, which would elevate the level of contaminants entering streams and groundwater.

Temporary and primarily summer seasonal changes in water quality may occur from unconfined human waste entering streams used for drinking water or recreation. Data from a 2001 visitor survey (Swanson et al. 2003) show that approximately 25% of hikers using the Harding Icefield Trail 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 is expected to remain well below the Alaska Department of Environmental Conservation standards.

Alternative B: Preferred Alternative

Updating the park's management zones would protect water quality from high levels of impact in the majority of the study area. Most of the bodies of water in the frontcountry area would occur in the glacial mountain and valley floor zones, where visitation would be low. The greatest impacts on water quality would occur in the hiker, pedestrian, and visitor facilities zones along the Harding Icefield Trail streams and Paradise Creek. The application of the new management zones and capacity framework would be the same as described in the "Soils" section above.

Improved wayfinding and circulation patterns could attract more visitors to the park, resulting in vehicle traffic increases that generate more pollutants. Oil and gasoline runoff entering surface and ground waters adjacent to roads and parking areas, for example, could increase as well. Water quality is expected to remain within Alaska Department of Environmental Conservation standards, however.

Most winter snowmachine use would remain on the road, in the parking area, and on the outwash plain, 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 are expected to decrease over time. Snowcoach use is not expected to adversely affect water quality, whether it burns gasoline or diesel, as it would be equipped with pollution-control devices and burn fuel efficiently. The snowcoach would make a limited number of daily trips and transport more visitors per trip than a snowmachine, resulting in less pollution per visitor. Allowing for nonmotorized fat tire winter snow bike use, as well as other proposed regulatory changes for the Exit Glacier Developed Area, are not expected to have any impacts on water quality.

Cumulative Impacts

Cumulatively, these other past, present, and reasonably foreseeable future actions would have little-to-no impacts on water quality. The impacts from past, present, and reasonably foreseeable planned actions are described in the affected environment section.

When the incremental impacts of alternative A are combined with the impacts of past, ongoing, and reasonably foreseeable planned actions described in the affected environment section, the overall cumulative impacts would be adverse, with the incremental impacts of alternative A contributing few of the impacts.

When the incremental impacts of alternative B are combined with the impacts of past, ongoing, and reasonably foreseeable planned actions described in the affected environment section, the overall cumulative impacts would be adverse, with the incremental impacts of alternative B contributing most of the impacts.

Conclusion

Alternative B is not expected to significantly impact water quality because most waterbodies in the frontcountry area occur in the glacial mountain and valley floor zones, where visitation is low. Current and future visitor use levels have not resulted in any detectable changes in water quality and are not expected to significantly impact water quality under alternative B.

FLOODPLAINS

Affected Environment

The entire lowlands of the study area are in a floodplain. Prior flooding in the area is well documented (NPS 2002).

All facilities and infrastructure in the frontcountry area, including the nature center, employee housing, parking lot, restrooms, and access road, are in this alluvial plain. Currently, no floodplain management plan is in effect for the study area. The floodplain functions naturally with the following exceptions that have altered the floodplain structure:

- the built-up, or diked, area that supports the road used to access the frontcountry area
- a stream diversion and small dike located behind the nature center
- on the paved portion of the Glacier View Loop Trail, streams were diverted and channeled to construct the trail; culverts are used to prevent trail 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 is actively eroding banks. These meandering channels and banks are unstable and constantly shifting, making predicting 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. Flooding of the Resurrection River near the study area is 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. For example, after a flood event in 1995, an extensive deposition of materials, roughly 10–15 feet deep, was found at the base of the Harding Icefield Trail.

Past actions in the study area affecting floodplains include diverting stream channels away from infrastructure, building a levee to support the road to the frontcountry area, installing gabions to divert flood waters away from state-maintained portions of the Herman Leirer Road, and installing various culverts, all altering floodplain function and structure. Current actions include creating a ditch to divert runoff away from the nature center’s foundation, thus altering the natural course of the stream. The National Park Service, adjacent government, and private entities plan no additional or reasonably foreseeable actions that would adversely affect floodplains in the study area. Potentially rapid changes to the park’s glaciers driven by climate change are expected to affect glacier mass balance as increasing temperatures increase surface melt and glaciers lose mass in their lower reaches (Black and Kurtz 2022). These impacts would continue to change the frontcountry landscape over time but would not adversely affect floodplain functions or values.

Actions to protect infrastructure, especially in the visitor facilities and pedestrian zones, such as installing Jersey barriers to mitigate flooding or proactively rebuilding the bridge or raising the road, have been identified as future management responses to changing conditions. These actions would have an adverse impact on floodplain structure and functions and are not analyzed in detail as part of this plan.

Environmental Consequences

Alternative A: No Action

Park infrastructure in the project area is located almost entirely in a floodplain. These ground-based facilities would continue to adversely impact floodplain dynamics, adding to flood and siltation impacts in the lowlands project area.

Alternative B: Preferred Alternative

Updating the park’s management zones would have little additional impact on floodplains in the study area. The high visitor-use areas in the frontcountry have historically been in the floodplain, as this is the most accessible part of the park. Designating these areas as the hiker, pedestrian, and visitor facilities zones would not change floodplain structure or processes. Accounting for each of these considerations, no changes to the floodplain are expected from the continued use of developed hiking trails under the updated zones.

National Park Service activities that have the potential to adversely affect floodplains are subject to the provisions of Executive Order 11988, “Floodplain Management,” as implemented through NPS Director’s Order 77-2: *Floodplain Management*. The director’s order requires a “statement of findings” to justify any unavoidable impacts on floodplains resulting from alternative B. Bike and hiking trail uses are considered “excepted” from statement of finding requirements because the actions fall under the description of “. . . foot trails in non-high hazard areas provided that the impacts of these facilities on floodplain

values are minimized” and “Isolated backcountry sites, . . . sites along trails or roads.” Allowing for nonmotorized fat tire winter snow bike use, as well as other proposed regulatory changes for the Exit Glacier Developed Area, are not expected to have any impacts on the floodplain.

When campsites are severely eroded or washed out, the NPS response to these changing conditions may include not reestablishing or redeveloping lost campsites, thus decreasing the overall number of facilities in the floodplain. Each of these actions would alter floodplain structure and function to varying degrees. Although future actions may not be accurately predicted, as they are dependent on flood events, they are expected to be similar to past actions, which have had long-term to permanent effects in small, comparative areas of the park’s developed area (up to 5 acres).

Cumulative Impacts

The impacts from past, present, and reasonably foreseeable planned actions are described in the affected environment section.

When the incremental impacts of alternative A are combined with the impacts of past, ongoing, and reasonably foreseeable planned actions described in the affected environment section, including anticipated flood events from climate change, the overall cumulative impacts on floodplain structure and function would be adverse. The incremental impacts of the alternative A would contribute slightly to, but would not substantially change, the impacts that are already occurring.

When the incremental impacts of alternative B are combined with the impacts of past, ongoing, and reasonably foreseeable planned actions described in the affected environment section, including anticipated flood events from climate change, the overall cumulative impacts on floodplain structure and function would be adverse. The incremental impacts of the alternative B would contribute slightly to, but would not substantially change, the impacts that are already occurring.

Conclusion

Alternative B is not expected to have significant impacts on floodplains because updated management zones would not change floodplain structure or processes, and no new building construction is being proposed. Trails may be reestablished following a washout, but trail segments of loop trails may be abandoned as described in table 3.

WETLANDS

Affected Environment

The western portions of the frontcountry area include approximately 450 acres of wetlands. Additionally, small discrete wetland and bog areas are found throughout the study area. Many of the area wetlands have been mapped based on hydrology.

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 the frontcountry area bisects a wetland dammed by beavers in the late 1980s. Area wetlands are currently functioning naturally and unaltered, except for the filled area supporting the road. When the park road was raised in 2016, box culverts were added to allow water to flow to wetlands north of the road from Exit Creek.

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

Wetlands in and near the study area have been altered in the past to facilitate bridge and road building to the frontcountry area, causing impacts such as loss of wetland area. Several acres of wetland area and structure were permanently altered by the placement of fill necessary to construct a levee to accommodate the road. The National Park Service, adjacent government, and private entities plan no additional and reasonably foreseeable actions that would adversely affect wetlands in the study area. Cumulatively, these other past, present, and reasonably foreseeable future actions would have adverse impacts on wetlands.

Environmental Consequences

Alternative A: No Action

Current management activities near wetlands would continue to cause disturbance that may include, but are not limited to, filling low-lying areas with soils or aggregates, draining wet areas, or otherwise disrupting wetland hydrology and ecology. However, these actions impact small, localized areas (e.g., less than 1 acre), which is minor in comparison to storm events and climate change impacts that have far greater impacts on the study area, wetland, and park ecosystems.

Alternative B: Preferred Alternative

Updating the park's designated management zones would protect most wetlands in the study area from high levels of impact. The majority of wetlands in the frontcountry area would be located in the backcountry valley floor zone, where many visitors would not be expected. Some impacts might occur on the small percentage of wetlands in the visitor facilities zone, such as trampling and soil compaction at the edges of wetlands closest to visitor facilities. Impacts from updating management zones and implementing new management zones, management responses to changing conditions, indicators and thresholds, and visitor capacities are the same as described in the "Soils" section. Allowing for nonmotorized fat tire winter snow bike use, as well as other proposed regulatory changes for the Exit Glacier Developed Area, are not expected to have any impacts on wetlands.

National Park Service 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: *Wetland Protection*. The director's order requires a "statement of findings" to justify any unavoidable impacts on wetlands resulting from alternative B. Proposed actions would be "excepted" from the statement of findings

requirements because the activities with potential for adverse impacts on wetlands fit the category of “water dependent” actions or other actions with “minimal impacts” (e.g., signs and wayfinding aids) that fulfill primary purposes to benefit public education, interpretation, or enjoyment of wetland resources. Best management practices listed in the NPS *Procedural Manual 77-1: Wetland Protection* (NPS 2016) would be applied to minimize wetland impacts.

Cumulative Impacts

When the incremental impacts of alternative A are combined with the impacts of past, ongoing, and reasonably foreseeable planned actions described in the affected environment section, including filling of localized (less than 1 acre), low-lying areas with soils or aggregates and draining wet areas to maintain park infrastructure, the overall cumulative impacts on wetlands would be adverse. The incremental impacts of the alternative A would contribute slightly to, but would not substantially change, the impacts that are already occurring.

When the incremental impacts of alternative B are combined with the impacts of past, ongoing, and reasonably foreseeable planned actions described in the affected environment section, including trampling and soil compaction at the edges of wetlands closest to visitor facilities in the updated management zones, the overall cumulative impacts on wetlands structure and function would be adverse. The incremental impacts of the alternative B would contribute slightly to, but would not substantially change, the impacts that are already occurring. The additional contribution of negligible impacts from this alternative would not substantially alter wetlands in the study area or impair wetland functionality.

Conclusion

While there might be some trampling and soil compaction at the edges of wetlands closest to visitor facilities that would occur in the updated visitor facilities zone, these impacts would not substantially degrade wetland functionality. Impacts would be small in comparison to storm events and climate change impacts that have much greater impacts on wetlands parkwide. Because most wetlands in the frontcountry area are in the backcountry valley floor zone, where most visitors are not expected, alternative B would not have significant impacts on wetlands.

AIR QUALITY

Affected Environment

Kenai Fjords National Park is a Clean Air Act Class II area. In the Clean Air Act, Congress set a national goal “to preserve, protect, and enhance the air quality in national parks, national wilderness areas, national monuments, national seashores, and other areas of special national or regional natural, recreational, scenic or historic value” (42 USC 7470[2]). This goal applies to all units of the national park system. While the most stringent protections are provided to Class I areas, the legislation aims to limit the level of additional pollution allowed in all NPS units (Class I and Class II areas), and the potential impacts on air quality, sensitive ecosystems and clean, clear views of these areas are to be considered.

Clean air enhances the color and contrast of the park's landscape features; allows visitors to see great distances; enhances views of the wide-open expanses and naturally dark night skies; and contributes directly to ecosystem, visitor, and staff health. While pollution-caused haze can diminish distant views, park visibility is in good condition, according to a nearby monitor on the peninsula and NPS Air Resources Division methods.

Park resource managers base the general description of the airshed in the study area on general observations over the past several years. The air quality and visibility in the frontcountry area 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, the frontcountry area 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 frontcountry area and 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 are impacts from dust and fine particulate matter from the road and parking area, as well as smoke or haze produced by wildfires outside of the study area. Wildfire impacts are transient and have had no permanent impact on air quality. In addition, 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 converge in the road, outwash plain, and Exit Creek areas of the frontcountry. Snowmachine exhaust can also be noticeable on busy days, and woodstove smoke is present daily throughout the winter.

Environmental Consequences

Alternative A: No Action

Current vehicle emission levels and the use of generators or other internal combustion engines in the project area would continue to adversely impact local air quality. Most winter snowmachine use would occur on the road, parking area, and outwash plain and likely remain at current levels. Similarly, wood-burning firepits would continue to be provided for visitors in the campground and picnic areas, causing localized smoke and slightly diminished air quality in those areas.

Alternative B: Preferred Alternative

Updating the park's designated management zones would protect air quality and visibility from high levels of impact in most 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 a small percentage of the study area. Updating management zones and implementing new management zones, management responses to

changing conditions, indicators and thresholds, and visitor capacities would be the same as described in the “Soils” section above. Allowing for nonmotorized fat tire winter snow bike use, as well as other proposed regulatory changes for the Exit Glacier Developed Area, are not expected to have any impacts on air quality.

Wood-burning firepit/fireplaces would continue to be provided for visitors in the campground and picnic areas, and impacts would be like alternative A.

Under alternative B, noticeable emissions and odors considered objectionable would be largely limited to the road corridor. In some weather conditions and depending on winds, exhaust may drift further but would not be detectable throughout most of the study area. Under both alternatives, snowmachine hydrocarbon emissions may decrease over the next decade as technology improves, and if improved machines are used, overall emission levels could be reduced from current levels.

Cumulative Impacts

When the incremental impacts of alternative A are combined with the impacts of past, ongoing, and reasonably foreseeable planned actions described in the affected environment section, the overall cumulative impacts on air quality would be negligible. The incremental impacts of the alternative A would contribute slightly to, but would not substantially change, the impacts that are already occurring.

When the incremental impacts of alternative B are combined with the impacts of past, ongoing, and reasonably foreseeable planned actions described in the affected environment section, the overall cumulative impacts on air quality are negligible. The incremental impacts of the alternative B would contribute slightly to, but would not substantially change, the impacts that are already occurring. The additional contribution of negligible impacts from this alternative would not adversely impact air quality in the study area.

Conclusion

Alternative B would not have significant impacts on air quality because emissions associated with motor vehicles, power tools, burning woodstoves, and campfires are negligible.

SOUNDSCAPE

Affected Environment

Soundscape refers to the ambient acoustic environment in a given area. The soundscape in the frontcountry 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 overall sound levels include location with respect to noise source, topography and terrain, wind, and vegetation. Occasional human-generated noise, including snowmachines (in the winter), voices, road vehicles, and rustling footsteps (mainly summer), may surprise or disturb some wildlife, such as birds. With the area’s thick vegetation, most human-made noise is muffled in the frontcountry area. The overall soundscape in the study

area is predominated by the natural sounds of wind and water, although road vehicles can be heard near the road.

Snowmachine activity would not likely occur for more than six hours a day due to short winter days. If overall snowmachine use increases in the future, this may result in increases in other anthropogenic noises.

Past actions affecting the soundscape in the study area include road construction and paving and the construction of a restroom facility and nature center. These facilities improvements resulted in permanent impacts on the natural soundscape. 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 National Park Service, adjacent government, and private entities plan no additional and reasonably foreseeable actions that would adversely affect the 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 in the park, such as helicopter-assisted skiing in nearby national forest lands.

Environmental Consequences

Alternative A: No Action

Current visitor, administrative, and commercial services activities—including motorized use—would continue to impact the natural soundscape. The use of trails and facilities in the frontcountry area would continue to produce human activity and noise, disturbing the natural quiet during routine maintenance, and by visitor activities. A potential increase in winter visitation could elevate noise levels during these traditionally low-visitation periods. Winter motorized vehicle use would continue to occur primarily along the road, parking lot, and the outwash plain. Although snowmachine noise would likely be heard at distances of over a mile, the highest-intensity noise would be concentrated around the use areas. Similarly, winter trail maintenance, such as plowing or grooming, would also continue to create noise. In all seasons, dense vegetation would muffle most noises, decreasing the intensity and limiting the overall impact and distances that human-caused noise would have in the study area.

Alternative B: Preferred Alternative

Updating management zones would protect the soundscape from high levels of impact in most of the study area. The soundscape conditions that allow for natural sounds to predominate would occur in the majority of the study area (i.e., backcountry primitive, backcountry valley floor, and hiker zones). Noise would be expected more often in the visitor facilities and pedestrian zones.

Under alternative B, noise is not expected in the frontcountry study area (especially areas surrounding the glacier terminus) in the summer, although increased visitation could cause a

slight increase. The park's promotion of increased winter recreation in alternative B might increase snowmachine use, which may result in increased noise. Allowing for nonmotorized fat tire winter snow bike use, as well as other proposed regulatory changes for the Exit Glacier Developed Area, are expected to have very minor impacts on soundscape. Overall, there could be a slight increase in noise if visitation continued to increase and winter recreation increased.

Cumulative Impacts

When the incremental impacts of alternative A are combined with the impacts of past, ongoing, and reasonably foreseeable planned actions described in the affected environment section, the overall cumulative impacts on the frontcountry soundscape would be negligible. The incremental impacts of the alternative A would contribute slightly to, but would not substantially change, the impacts that are already occurring.

When the incremental impacts of alternative B are combined with the impacts of past, ongoing, and reasonably foreseeable planned actions described in the affected environment section, the overall cumulative impacts on the frontcountry soundscape are negligible. The incremental impacts of the alternative B would contribute slightly to, but would not substantially change, the impacts that are already occurring. The additional contribution of negligible impacts from this alternative would not adversely affect the soundscape in the study area.

Conclusion

Alternative B would not have a significant impact on the soundscapes because generally low noise levels would predominate throughout the study area.

VEGETATION

Affected Environment

Situated on the south-central coast of Alaska, the Kenai subregion 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.

Climate change is impacting the park's vegetation, as retreating glaciers, longer growing seasons, and current models predict warming over the next century. Increasing temperatures may increase the potential for the expansion of nonnative invasive plants such as smooth brome (NPS 2017). Continuing long-term monitoring of the park's vegetation communities are among its increasingly important resources to determine condition and trends in a changing climate.

Past actions in the study area have resulted in numerous permanent and temporary measurable impacts on vegetation. Impacts include the removal of trees for constructing the parking area, the trampling of mosses and lichens on trails like Glacier Overlook Loop Trail

from foot traffic, the development of switchbacks and social trails, and the introduction of invasive plant species. These actions have resulted in long-term impacts on vegetation in these areas, although no known species have been extirpated. Lesser impacts include picking of wildflowers and brushing of trail corridors. These actions have not had long-lasting adverse impacts on vegetation. The National Park Service, adjacent government, and private entities plan no additional and reasonably foreseeable actions that would adversely affect vegetation in the study area.

Vegetation communities present in the frontcountry area include the following:

- **Seral scrub:** This open, sparsely vegetated community is an early successional community found near the glacier terminus containing Sitka alder, fireweed, and a variety of 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. Successional 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 valley of the frontcountry area. 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 occurring in the understory indicate that, in time, this community will 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.
- **Closed needleleaf forest:** This community represents the oldest successional stage present in the frontcountry area 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 bluejoint reed grass 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.

Invasive Plants

The frontcountry is a high priority for invasive plant management because it includes the park's only designated road and established trails and concentrated visitation during the summer. The area also has the largest populations and highest diversity of invasive plants in the park (Visconti and Kriedeman 2023). Early detection and rapid response are the park's primary strategy to find and control invasive plants. Where invasive plant populations can be discovered while they are still small and easy to treat, there is a greater chance managers can contain them to eradicate a particular species or at least reduce infestations. Containing invasive plant populations in the frontcountry and stopping the spread of invasive plants to trails and undisturbed areas are the park's highest priority vegetation management objectives. These areas have been naturally disturbed by glacier-fed hydrology and generally have little native vegetative cover. Under such conditions, invasive plants can flourish because they do not have to compete with native plants for space.

The Kenai Fjords National Park invasive plant management team has surveyed and treated invasive plants in the park since 2004. During the 2022 field season, the team identified a total of 14 invasive plant species in the park and on park properties and treated high-priority invasive plant populations in the Exit Glacier area, coastal areas, and Seward. Within the frontcountry study area, the team surveyed and treated invasive plant populations numerous times around the nature center plaza, along trails, in the campground, in the employee housing area, and at other known populations throughout the summer (Visconti and Kriedeman 2023). Of note, the team discovered common peppergrass (*Lepidium densiflorium*) in the maintenance facility (located outside of the frontcountry area, near where maintenance vehicles enter the frontcountry area) for the first time and conducted retreatment methods invasive two times at the site. Common dandelion (*Taraxacum officinales*), fall dandelion (*Leontodon autumnalis*), meadow foxtail (*Alopecurus pretensis*), and white clover (*Trifolium repens*) are examples of other invasive plants the team documented and treated. In coordination with local partners, the team surveyed a total of 74 acres and conducted manual (e.g., hand pulling) and herbicide treatments on just over 1 acre of land, respectively. The team also deployed pheromone traps in the Exit Glacier Developed Area as part of an ongoing survey for invasive spongy moth (*Lymantria disparasiatica*). No invasive moths were detected.

Environmental Consequences

Alternative A: No Action

Under alternative A, visitor uses would continue to trample and compact vegetation in concentrated areas. Hiking trail use may increase, for example. Invasive plant infestations would continue to adversely impact native vegetation communities in concentrated visitor areas in the frontcountry. Plants colonizing the terminal moraine in the outwash plain are susceptible to damage from visitor trampling, for example, as are alpine plants due to their slow recovery rates. Additionally, invasive plant seeds and propagules can be spread by visitors in terminal moraine areas and may find new vectors for invasion of undisturbed areas.

Impacts on vegetation occur primarily in the fragile alpine areas and in the seral and tall shrub communities in the outwash plain, along the Glacier Overlook Loop Trail, and along the Harding Icefield Trail. These impacts are generally caused by off-trail use, resulting in the trampling of plants, the creation of social trails, and delayed natural plant succession. Visitors not wishing to use 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. Under alternative A, there would be some off-road use of motorized vehicles in the winter in the Exit Glacier outwash plain.

Due to the rustic nature of the proposed hiking trails, maintenance 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.

Alternative B: Preferred Alternative

Updating park zoning is not anticipated to affect vegetation. Common vegetation in these zones consists of alder and willow species, which regenerate quickly, and recreation-related impacts are generally not too apparent. In areas where designated trails enter forest, some trampling or the destruction of herbaceous plants, such as fireweed and grasses, may occur with increased use, although this type of vegetation rebounds quickly.

Effects to the vegetation in the frontcountry area would be similar to Alternative A. Park staff would periodically monitor the change in number of gross acres infested with high-priority invasive plants species as part of visitor use management. If the number of gross acres infested approaches or exceeds the threshold set in appendix C, park staff would implement additional management strategies.

Similar to alternative A, hiking trail use may increase on the trails in the updated management zones, where more concentrated visitation is expected. Social or informal trails could establish, for example, and some erosion could occur. Shortcuts may develop between switchbacks in steep areas and denude vegetation. Trails can eventually widen, and trail braiding could develop with increased traffic on wet or steep slopes. 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. While the potential exists for the above impacts to occur under alternative B, trail use and vegetation impacts are not anticipated to be substantial. Natural succession is not likely to be disrupted.

Under alternative B, there would be some off-road use of motorized vehicles in the winter in the Exit Glacier outwash plain. However, since deep snow is required to navigate this area, most vegetation would be covered by snow and protected from snowmachine impacts. The proposed regulatory authorization of fat tire winter snow bike use across the outwash plain (in parallel with winter snowmachine use on the outwash plain) would have little-to-no impact on vegetation, as fat tire winter snow bike use would only be authorized when snowmachines are authorized, during periods of “adequate snow cover, generally 6–12 inches or more, or a combination of snow and frost depth sufficient to protect the underlying vegetation and soil” (43 CFR 36.11). Other proposed changes in regulations are not expected to have any impact on vegetation.

Like alternative A, trails would be maintained to reduce impacts on vegetation, although brushing would continue. Social trails and bare ground would be rehabilitated. While the maintenance of trails generally requires some manipulation of the natural vegetation, damaged or restored areas would be reseeded where denuded. Care would be taken in reseeding efforts to use local seed sources as a means to avoid impacts on genetic stocks in the park and to eliminate the introduction of invasive plant species. Both maintenance and revegetation efforts are expected to have long-term positive impacts by replanting damaged vegetation or restoring impacted areas.

At the edges of developed areas and trails in the frontcountry, trampling from visitor activities could compact fragile developing soils and delay normal plant succession in these fringe locations. Vegetation that is resistant to trampling and soil compaction may become established in high-use areas, displacing or outcompeting existing vegetation and altering species composition, often from an area dominated by herbs to an area dominated by grasses. Under alternative B, these types of impacts would occur in localized areas (comprising approximately 5 acres or less). Because natural success processes would be somewhat regularly disrupted in these areas, impacts would be considered outside of the natural variability. However, the continued existence of herb-dominated vegetation would not be threatened because trampling of vegetation would occur on only a small proportion of these habitats.

The actions discussed above, combined with increased visitation projected under alternative B, have the potential to impact vegetation indirectly through the introduction and spread of invasive plant species. Infestations would likely occur along the park road and in areas adjacent to visitor services. The potential for introduction and/or spread of invasive plants can be expected to increase as visitation increases. In particular, the threats of introduced species from increased vehicle traffic would remain a concern for possible negative impacts on native vegetation. Under alternative B, the park's active invasive plant management program would include increased efforts to control invasive plant species, including along the park road.

Cumulative Impacts

When the incremental impacts of alternative A are combined with the impacts of past, ongoing, and reasonably foreseeable planned actions described in the affected environment section, the overall cumulative impacts on vegetation would be adverse. The incremental impacts of the alternative A would contribute slightly to, but would not substantially change, the impacts that are already occurring.

When the incremental impacts of alternative B are combined with the impacts of past, ongoing, and reasonably foreseeable planned actions described in the affected environment section, the overall cumulative impacts on the frontcountry vegetation would be adverse. The incremental impacts of the alternative B would contribute slightly to, but would not substantially change, the impacts that are already occurring. The additional contribution of the impacts from this alternative would adversely affect vegetation in the study area slightly but not substantially.

Conclusion

While some trampling or destruction of herbaceous plants, such as fireweed and grasses, would occur with increased visitor use under alternative B, vegetation communities typically rebound quickly throughout the study area, and alternative B would not significantly impact these communities or ecosystem functionality.

WILDLIFE

Affected Environment

Terrestrial Mammals

Numerous terrestrial mammal species occur or are expected to occur in Kenai Fjords National Park. Habitats suitable for all or most of these species are present in the frontcountry 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 (*Clethrionomys rutilus*) are the species most frequently encountered (AKNHP 2000; NPS 2001). 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 canadensis*), river otter (*Lutra canadensis*), little brown myotis bat (*Myotis lucifugus*), and mink (*Mustela vison*) (NPS 2004). The distribution and abundance of terrestrial mammal species in the frontcountry area is unknown. Most information regarding terrestrial species in this area has come from anecdotal reports by park staff and visitors and is supported by a small number of surveys.

Mountain goats occupy nearly all the steep and rocky high country around frontcountry area. Goats can be seen throughout the year from frontcountry area trails and the parking lot and are occasionally encountered at close range along the Harding Icefield Trail. During the summer, the goats spend most of their time above tree line in alpine habitats. In the fall and winter, goats move to lower elevations at or below tree line 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 frontcountry and Resurrection River area year-round but are most visible during the winter. In the 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 frontcountry area during the winter. Black bears are common in the frontcountry area. In early May, bears are often observed above tree line on the north side of the frontcountry area valley foraging on emerging vegetation. The area has had several reports of black bears preying on newborn moose and goats in the spring and early summer. In the summer and fall, black bears feed on berries, primarily salmonberry (French 2003), and are encountered daily throughout the frontcountry area.

Brown bears are infrequent visitors to the frontcountry area, typically passing through the valley in the spring and late fall. Brown bears are occasionally observed around the frontcountry area in the summer or fall.

Wolves are rarely observed in the frontcountry area. Given the low frequency of sightings, it is unlikely that wolves den in or near the study area.

Coyotes are more frequently encountered than wolves in the study area. Coyotes prey on ptarmigan, marmots, snowshoe hare, and other small mammals and 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 frontcountry nature center suggests that coyotes may den in the area (NPS 2004).

Lynx are extremely rare in the frontcountry area. Suitable habitat and prey (especially snowshoe hare) are present in the study area. However, the frontcountry area likely lacks 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 (NPS 2004). 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. Mink and otter inhabit the river and creeks of the study area. Whether mink or otter den in the study area is unknown.

Birds

Over 200 bird species occur or are expected to occur in the park. Over two-thirds of these species are expected to occur in the frontcountry area, although a smaller number likely nest there due to limited available nesting habitat (NPS 2004). Species most observed include the Wilson's warbler (*Wilsonia pusilla*), varied thrush (*Ixoreus naevius*), and hermit thrush (*Catharus guttatus*). Other songbird species commonly encountered include Steller's jay (*Cyanocitta stelleri*), black-billed magpie (*Pica hudsonia*), northwestern crow (*Corvus caurinus*), and common raven (*Corvus corax*). Raptor species include bald eagle (*Haliaeetus leucocephalus*), northern goshawk (*Accipiter gentilis*), sharp-shinned hawk (*Accipiter striatus*), great horned owl (*Bubo virginianus*) and northern saw-whet owl (*Aegolius acadicus*). Additionally, willow ptarmigan (*Lagopus lagopus*), rock ptarmigan (*Lagopus mutus*), white-tailed ptarmigan (*Lagopus leucurus*), and spruce grouse (*Falcapennis canadensis*) inhabit the frontcountry area.

Park management has, for decades, worked to facilitate an increase in visitation to the frontcountry area. Impacts resulting from past park development of this area have had undocumented and possibly major effects on species that have large home range requirements and a low tolerance for human disturbance, such as brown bears, wolves, wolverine, and lynx (NPS 2004). Hunting and trapping are allowed in adjacent USFS land, which have may also contributed to the scarcity of those species in the park. A lack of predevelopment data, however, makes it difficult to assess whether the current scarcity of these species in the frontcountry area, relative to surrounding areas, is a direct result of park development and increases in visitation, although, human disturbance is widely recognized for its negative impacts on the physiology, behavior, and demographics of individuals and

populations of wildlife (Steven and Castley 2013; Coetzee and Chown 2016). Development outside of the NPS boundary but near the frontcountry area and winter motorized use are likely to increase, making it conceivable that these species could be reduced further in the area. Additionally, the Resurrection River valley is an important travel corridor for these species. 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.

Environmental Consequences

Alternative A: No Action

Under alternative A, increasing visitation may adversely impact wildlife habitat, displace wildlife, and increase opportunities for wildlife to obtain human foods, which increases the risk of human-wildlife encounters. Similarly, moose and mountain goats may be adversely affected by snowmachines and other winter use activities in the project area. Impacts from visitor use activities can alter moose and mountain goat behavior, including the potential displacement feeding, bedding, or calving areas. Similarly, ongoing actions in alternative A to facilitate winter visitation to the frontcountry area, including operating a snowcoach 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 the winter may displace moose and goats from these critical foraging areas during periods of high human use.

For several decades, park managers have facilitated increases in visitation to the frontcountry area. Facilities constructed to support visitation have been numerous through the years. These changes have likely 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 (NPS 2004).

Other mammal and bird species are subject to periodic disturbance, displacement, or mortality by the activities of visitors and park staff but remain relatively abundant in the area, but abundance could change over time. Mountain goats and marmots are sometimes subject to human disturbance along the Harding Icefield Trail, for example. Documented occurrences of small mammals (e.g., red squirrels, voles, and shrews) and birds (e.g., warblers and thrushes) have been killed along the park road by vehicles.

Winter Visitation

Snowmachine activity in the winter is concentrated in and adjacent to winter moose browse areas, especially in the outwash plain. Cross-country skiing can cause behavioral disturbance to wildlife, particularly large ungulates, such as moose, which may be startled by the quiet approach of skiers (NPS 2004).

Alternative B: Preferred Alternative

Updating management zones under alternative B would result in little impact on wildlife in the study area. However, potential increases in human activity and noise would disturb the

natural quiet during routine maintenance and visitor use periods in the frontcountry area near wilderness, which would impact wildlife similar to alternative A. The disturbance of wildlife and impacts on wildlife habitat in the summer would be greatest in the visitor facilities, pedestrian, and hiker zones, for example, which comprise just over 10% of the study area, where the majority and visitation and development occurs. Administering updated management zones would be the same as described in the “Soils” section above.

Winter Visitation

Increased winter encounters between humans and moose may result from promoting winter recreational activities. Disturbances could reduce moose winter energy reserves by eliciting behavioral responses such as flight or limiting bedding time. Though moose may be temporarily disturbed by nonmotorized fat tire winter snow bikers, 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. Similarly, allowing for winter nonmotorized fat tire winter snow bike use, as well as other proposed regulatory changes for the Exit Glacier Developed Area, may contribute to very minor impacts on wildlife.

The increase in human activity during the winter may also impact wolves, wolverine, and lynx, all species which have large home range requirements and a low tolerance for human disturbance. If winter use increases, the occurrence of these species in the frontcountry area may become more infrequent during daylight hours, though because most human use would remain concentrated in the developed areas of the frontcountry, changes in the behavior of these animals would probably be minor. These species would be unlikely to be excluded from the area entirely, especially as most winter recreationists use the frontcountry area primarily during limited hours of daylight, and these species are known to be active nocturnally.

Cumulative Impacts

When the incremental impacts of alternative A are combined with the impacts of past, ongoing, and reasonably foreseeable planned actions described in the affected environment section, the overall cumulative impacts on wildlife would be adverse. The incremental impacts of the alternative A would contribute slightly to, but would not substantially change, the impacts that are already occurring.

When the incremental impacts of alternative B are combined with the impacts of past, ongoing, and reasonably foreseeable planned actions described in the affected environment section, the overall cumulative impacts on the frontcountry vegetation would be adverse. The incremental impacts of the alternative B would contribute slightly to, but would not substantially change, the impacts that are already occurring. The additional contribution of negligible impacts from this alternative would have slight impacts but not adversely impact wildlife in the study area.

Conclusion

Increases in winter recreational activities, outlined in alternative B, are expected to have small, negative impacts on wildlife. However, these impacts are not expected to be significant, as snowmachine use and skiing already occur, and projected increases in use are

expected to be small. The addition of nonmotorized fat tire winter snow bikes when snow is sufficient is not expected to have a significant impact.

VISITOR USE AND EXPERIENCE

This section describes the affected environment of visitor use and experience at Kenai Fjords National Park. The description of this element is based on the best professional judgment of NPS staff, existing data, monitoring, and observations from NPS staff. This section evaluates recreation opportunities and quality of visitor experience, including scenic views.

Affected Environment

Kenai Fjords National Park is in south-central Alaska, a region known for an abundance of natural and scenic views, as well as wildlife, vegetation, and other resources. The park offers opportunities for outdoor recreation and educational opportunities for residents of the region and for visitors traveling to the area. The frontcountry area is open year-round. The majority of visitation, approximately 99%, occurs in the summer months when the weather conditions allow the park to open facilities and visitors can access the park. Visitor use in the winter is a small fraction of the overall annual visitor use.

Over the past five years (2018–2022), the park welcomed on average 320,000 visitors annually. An upward trend in visitation has an estimated 21% increase in annual visitation from 2018 to 2022. Managers have expanded parking areas to accommodate more visitors. In 2022, the park saw roughly 100,000 visits each month in August, September, and October. This seasonal trend has been consistent since the park was established. This trend is also representative of the visitation trends in the frontcountry. The park is beginning to see an increase in visitation during the shoulder seasons in both spring and fall as temperatures allow. The nature center is typically open from May to September, which aligns with the road leading to the park being open.

Current visitor recreation opportunities in the frontcountry area include camping, hiking, wildlife viewing, enjoying the sounds of nature, snowshoeing, cross-country skiing, and snowmachine use. The park has approximately 26 commercial use authorizations (CUAs) with concession operators in 2023 that offer guided hiking, guided rafting and pack rafting (on the Resurrection River), and guided mountaineering.

Beginning in approximately October, the state road to the frontcountry area is closed and becomes inaccessible to cars. While the frontcountry area is open to winter use, access to the frontcountry after the state road closure is only available (depending on snow) by foot, skis, bikes, dogsled, snowmachines, or snowcoach. Weather permitting, the state typically opens the road in May. Visitors can access the frontcountry area by vehicle once the park road conditions allow. Access may begin sometime after the state road opens. Winter visitor use in the frontcountry is difficult to measure, but observations by NPS staff indicate that motorized winter use has increased over the past two decades. Snowmachine use is primarily on the road and the outwash plain, although it does occur near Paradise Creek.

In summer, the frontcountry of Kenai Fjords National Park is one of the most popular road-accessible visitor attractions in Alaska. The frontcountry area was known for up-close views

and opportunities to touch Exit Glacier. The rapid retreat of the glacier has made it more difficult, if not impossible, for most visitors to get the iconic up-close experiences with the glacier that have made the area popular. The rapid change has also created unrealistic expectations for visitors expecting to touch the glacier or to see the glacier at a close distance. A mismatch between expectations and actual experiences is a cause of perceived low-quality visits. In the past, park managers have responded by extending trails to provide access to the glacier and related experiences to see, touch, and recreate upon it. However, these actions are no longer feasible due to technical nature of the terrain into which the glacier is retreating. The glacier is expected to continue its rapid retreat, and opportunities to recreate on or near Exit Glacier for visitors of average physical ability will continue to diminish. The expectation gap for those expecting up-close experiences will also widen, contributing to worsening visitor experience quality.

Social trails are a concern, as visitors have hiked off-trail to get closer to or have better views of the glacier. Encounter rates along the Harding Icefield Trail are increasing, which impacts the quality of the visitor experience in areas where desired conditions specify that areas provide a more dispersed visitor experience and opportunities for connection with nature. Increased visitor use presents additional search and rescue incidents in which visitors are in unsafe situations due to not having the correct equipment, getting injured, or dynamic weather events. The landscape is challenging to navigate, as evidenced by increased search and rescue events. The vast landscape also has opportunities for wildlife viewing. Human-wildlife encounters are a potential concern. Increased visitor use can lead to bears accessing human food, which often leads to trail closures as a safety precaution.

Currently, management zoning from the 2004 Exit Glacier Area Plan provides general direction for the frontcountry. The plan does not provide adequate guidance needed to manage visitor use. The rapid recession of Exit Glacier presents challenges to manage the amounts and types of current visitor use in conjunction with relevant state laws and guidance. Continuation of management under the 2004 Exit Glacier Area Plan would result in outdated management that is inconsistent with new and emerging visit use types where the previous zones were identified, resulting in adverse impacts on resources and the visitor experience. Park staff have difficulty enforcing regulations, since the current boundary of the legal definition of Exit Glacier Developed Area has shifted due to the rapid retreat of Exit Glacier. Visitation patterns at the park are affected by the climate change trends and extended shoulder seasons. The location, timing, and number of visitors are likely to change with the effects of climate change.

Environmental Consequences

Alternative A: No Action

Under alternative A, visitor use and experience would remain the same as described in the affected environment section. The current impacts on and trends in visitor use and experience would continue to occur.

Alternative B: Preferred Alternative

Under alternative B, park managers would update zoning and desired conditions for the frontcountry area to better align with current conditions and to guide management of visitor opportunities in each zone. Park managers would improve trip planning messaging to set appropriate expectations and improve safety, including the signage at the park entrance, to shift focus from Exit Glacier to reflect current conditions and visitor opportunities in the frontcountry area. Additionally, waysides, interpretive displays, and interpretive panels would be updated, and interpretive programs and materials distributed by NPS staff and CUA holders would be expanded. Under this alternative, park staff would take action to reduce vehicle congestion in the parking lot. Park staff would manage human-wildlife encounters and develop and enhance educational materials and food storage. Expanded visitor opportunities in the winter and shoulder seasons provide greater diversity of opportunities in the visitor facilities, pedestrian, hiker, and valley floor zones. These actions would facilitate safer and smoother circulation in these areas. Updated educational messaging would improve visitors' awareness of current wildlife safety and stewardship concerns. Expanded winter and shoulder season opportunities would increase visitor opportunities to experience frontcountry resources and experiences during nonpeak times of the year. Allowing nonmotorized fat tire winter snow bikes to access the outwash plain would provide additional recreational opportunities.

Indicators, thresholds (appendix B), and visitor capacities (appendix C) are identified in alternative B to monitor resource conditions and visitor experiences. These tools identify the type and maximum amount of use an area can accommodate while achieving and maintaining the desired resource conditions and visitor experiences consistent with the purpose for which the area was established.

During monitoring, if thresholds were consistently exceeded and desired conditions were not being met, the National Park Service would implement management actions to modify amounts and types of use to achieve desired conditions. For areas where current use levels were well below the identified capacity, the National Park Service would conduct future planning and compliance to identify strategies to manage use levels should amounts and types of use begin to exceed thresholds and compromise desired conditions. This iterative practice of monitoring, implementing potential management strategies, and then continuing to monitor to gauge the effectiveness of those actions allows park managers to maximize benefits for visitors while achieving and maintaining desired conditions for resources and visitor experiences in a dynamic setting. This iterative framework for managing the amounts and types of use in a dynamic setting has a beneficial impact on visitor use and experience by protecting resources and providing for sustainable visitor experiences.

Cumulative Impacts

As noted in the affected environment section and under alternative A, the quality of the visitor experience in the area is declining due to the increased distance between Exit Glacier and viewing areas, a growing gap between visitor expectations and actual experiences for proximity to the glacier, proliferating social trails, increased encounters on the Harding Icefield Trail, increased search and rescue incidences and potential negative human-wildlife

encounters, and outdated regulations. The cumulative effect of alternative B would be to reverse many of these trends by diversifying recreational opportunities and shifting the focus away from the glacier, setting more appropriate expectations, and managing visitor use adaptively through the indicators, thresholds, and related management strategies. While alternative B may not fully remedy the impacts on visitor experience from the ongoing retreat of Exit Glacier, it would not compound any of the existing trends.

Conclusion

In conclusion, alternative B has a beneficial impact on visitor use and experience. The actions described in this alternative enhance the visitor experience and improve visitor safety. Specifically, safety concerns related to increasing visitation and unprepared visitors attempting to access the glacier would be improved through trip planning messaging and enhanced wayfinding and orientation (e.g., preparedness for different types and lengths of trails in the area) to set appropriate expectations. Similarly, the vulnerability and long-term sustainability of facilities impacted by flooding, erosion, and sedimentation would be assessed to determine whether these assets could be responsibly maintained or should be relocated or decommissioned while still providing safe access and accommodating high-quality visitor experiences. Overall, alternative B would broaden visitor opportunities and help manage visitor expectations for their visit to the park.

WILDERNESS

Affected Environment

While no lands were designated as wilderness in Kenai Fjords National Park under the enabling legislation (ANILCA, section 701), the 1984 general management plan included a wilderness suitability study, which determined that nearly 97% of the park's lands were eligible for wilderness designation (NPS 1984). The eligible wilderness acreage excludes "the developed lands in the Exit Glacier area" (NPS 1984). Per bureau policy, the National Park Service preserves wilderness character on eligible lands.

Current and future actions adjacent to eligible wilderness that could impact wilderness character involve trail maintenance activities using power tools that can affect the soundscape. Snowmachine use may also increase in this area in addition to USFS surrounding areas. The potential reconstruction or relocation of trails in response to changing conditions in the frontcountry area may increase human activity and noise, disturbing the natural quiet near the wilderness boundary during construction periods. The National Park Service, adjacent agencies, and private entities plan no additional and reasonably foreseeable actions that would adversely affect eligible wilderness in the study area.

Environmental Consequences

Alternative A: No Action

Kenai Fjords National Park staff are currently managing the park's eligible wilderness areas consistent with designated wilderness management strategies. Under alternative A, impacts

on eligible wilderness would occur primarily through human activities mostly confined to roads and trails in the immediate frontcountry area. Impacts on the natural soundscape (i.e., natural quality of wilderness character), for example, would continue maintenance actions for park infrastructure, roads, trails, parking lots, and buildings. Winter snowmachine use, occurring in wilderness or adjacent to wilderness, elevates noise levels during traditionally low visitation periods. Snowmachine noise would likely be heard at distances of over a mile, and the highest-intensity noise would be concentrated around the use areas, which would disturb the natural soundscape in and near the wilderness boundary. Similarly, winter trail maintenance in the frontcountry, such as plowing or grooming, would create noise. In all seasons, dense vegetation would muffle most noises, decreasing the intensity and limiting the overall impact and distances that human-caused noise would have on eligible wilderness.

Even in visitor use areas (primarily outside eligible wilderness), park lands retain a high degree of natural features and support other wilderness values, including primarily undeveloped and untrammeled character. Outside of these developed areas, however, impacts on wilderness character qualities would be negligible and seldom noticed.

Alternative B: Preferred Alternative

While the park's eligible wilderness acreage excludes the frontcountry developed area and the Harding Icefield Trail, the updated glacial mountain zone in alternative B overlays eligible wilderness (figure 10). Impacts on wilderness character would be small because impacts would only be observable in a very small portion of the park's 570,000 acres of eligible wilderness. Uses occurring in this zone under alternative B that could impact wilderness character include human sounds from hiking and mountaineering activities (including CUA-guided hikes) that start from the Harding Icefield Trail (hiker zone) or the valley floor zone. Allowing for nonmotorized fat tire winter snow bike use in the outwash plain area is not expected to impact wilderness, as the outwash plain area is located outside of wilderness. Making the proposed regulatory changes is not expected to affect wilderness character, as the changes focus primarily on the Exit Glacier Developed Area. Other impacts on wilderness would be the same as those indicated in alternative A, as rezoning this area is not expected to increase use.

Cumulative Impacts

When the incremental impacts of alternative A are combined with the impacts of past, ongoing, and reasonably foreseeable planned actions described in the affected environment section, the overall cumulative impacts on wilderness would be adverse. The incremental impacts of the alternative A would contribute slightly to, but would not substantially change, the impacts that are already occurring.

When the incremental impacts of alternative B are combined with the impacts of past, ongoing, and reasonably foreseeable planned actions described in the affected environment section, the overall cumulative impacts on wilderness would be adverse. The incremental impacts of the alternative B would contribute slightly to, but would not substantially change, the impacts that are already occurring. The additional contribution of small impacts from this alternative would have slight impacts but not adversely impact wilderness in the study area.

Conclusion

Impacts on wilderness would be small because impacts would only be observable in a very small portion of the park's eligible wilderness. Uses occurring in the glacial mountain zone under alternative B that could impact wilderness character include human sounds from hiking and mountaineering activities. Potential increases in human activity and noise would disturb the natural quiet during routine maintenance and visitor use periods in the frontcountry area near wilderness. Activities occurring in the glacial mountain zone under alternative B, for example, may affect wilderness character, including human activities that start from the hiker zone and the valley floor zone. Compared to alternative A, impacts on wilderness under alternative B would be about the same.



Consultation and Public Engagement

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CHAPTER 4: CONSULTATION AND PUBLIC ENGAGEMENT

The National Park Service consulted with Alaska Native groups and key stakeholders and provided an early opportunity for the public to provide input in preparing this document. This chapter summarizes the consultations and public outreach related to his plan.

Alaska Native Groups

Park staff mailed letters to seven Alaska Native groups in November 2021 to inform them of this planning process. The groups contacted were the Chugach Alaska Corporation, English Bay Corporation, the Native Village of Nanwalek, the Port Graham Corporation, Native Village of Port Graham, the Qutekchak Native Tribe, and the Seldovia Village Tribe. The Port Graham Corporation and Chugach Alaska Corporation responded, and park staff followed up with e-mails and phone calls. No substantial input was offered.

Park staff reached out again to the seven Alaska Native groups in December 2023 and in July 2024 to notify them in advance of the opportunity to review the plan.

Alaska State Historic Preservation Officer

Park staff reached out the Alaska State Historic Preservation Officer via e-mail/letter in December 2023, informing them of this plan. This correspondence included a statement of the National Park Service's determination that the planning vision is not an undertaking under section 106 of the National Historic Preservation Act, and, therefore, no section 106 review had taken place at that time. The National Park Service further indicated that as specific management actions may be implemented in the future under the guidance of this plan, the Service will complete efforts to identify historic properties in the specific project area and evaluate the potential effects on those historic properties in consultation with the Alaska State Historic Preservation Officer to avoid, minimize, or mitigate adverse effects prior to authorizing any final decisions.

US Fish and Wildlife Service

Via the US Fish and Wildlife Service Information for Planning and Consultation website, the National Park Service requested a species list and any designated critical habitat protected under the Endangered Species Act that may be impacted by projects in Kenai Fjords National Park. This action served as a record that the National Park Service had initiated consultation with the US Fish and Wildlife Service pursuant to the requirements of section 7 of the Endangered Species Act of 1973 (16 USC 1531-1544) and NPS management policies. No species or designated critical habitat protected under the Endangered Species Act were identified for the project area.

Public Engagement

Early in 2022, the National Park Service developed a project home page and StoryMap to inform the public about the project and provide opportunities to comment. These platforms provided background on the project, an orientation to the site, and instructions for providing comments; identified key issues; and conveyed some preliminary management strategies.

The National Park Service also held a virtual public meeting on February 2, 2022, from 4:00 p.m. to 6:00 p.m. Alaska Time. The meeting was attended by 18 members of the public. Park staff discussed the need for the frontcountry management plan, key issues the plan will address, and potential management strategies. A 20-minute presentation was given twice (one hour apart), each followed by an open question-and-answer session.

The public was afforded opportunities to comment on the project through a comment link on the project planning home page; a comment link on the StoryMap site; traditional mail; and phone and e-mail to the park's director of resource management. Six questions were presented to the public, along with an open field for additional comments.

Public comments were consolidated on the project's Planning, Environment and Public Comment website (<https://parkplanning.nps.gov/projectHome.cfm?projectID=106155>). Twelve respondents left comments. The following section summarizes key points raised by respondents. Appendix D contains a question-by-question summary of this same feedback, along with original responses to each question.

Summary of Public Comments

The park frontcountry experience should shift its focus to interpreting and “experiencing” climate change and its impacts and to other educational opportunities, including the following:

- Share the fate of Exit Glacier with the world through online platforms as an educational opportunity and warning about global warming. Use Exit Glacier as a rallying cry for addressing climate change.
- Interpret the glacier's retreat and the interesting recessional features in the valley and glacial forelands.
- Develop a visitor center that educates visitors about the park and human impacts on wilderness.
- In an expanded trail system, loop trails of different lengths could include wayside information about geological and biological features.

Some commenters recommended expanding the current trail system (note: one respondent was strongly against any development at all):

- Continue to maintain and/or expand the Harding Icefield Trail for a variety of user groups and usage types.
- Develop more trails into the valleys running south from the current road and parking area (Paradise Valley).
- Develop a trail heading north up the Resurrection River valley from the parking area (or even create a new parking area about a mile or so closer to the bridge over the river), possibly up into one of the hanging valleys on the west side of the river.
- Develop more trails along Resurrection River or park side, or add a way across Exit River to access Paradise Valley.

- Add a multiuse path along the Exit Glacier Road that connects trails in the valley to the Seward Highway.
- Engage in interagency cooperation when trail expansion in the park is not feasible by expanding and improving nearby trails on state and USFS lands to connect with park trails.

Visitors interested in ice hiking, ice climbing, and other technical pursuits want continued access via the Harding Icefield Trail and Mountaineering Route.

- Maintain access to glacial ice and the alpine terrain for private mountaineering, climbing, and ice hiking parties.
- Maintain private party access (for skilled and experienced hikers) to existing mountaineering routes, such as the trail from Marmot Meadows to the glacier.

Additional comments included the following:

- Provide more seasonal activities in the fall and winter (see the breakdown under question #2 in appendix D). Interest was also expressed in accessing Exit Glacier during the shoulder season and in year-round activities.
- Limit vehicle access: “the congestion has been getting out of control.” Or reorganize the parking area to accommodate more passenger vehicles (less commercial/large vehicles). Alternatively, develop a remote parking area and shuttles instead of building more parking at the current Exit Glacier area.
- Reduce the size and number of commercial “for-profit” parties.

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APPENDIX A: DESIRED CONDITIONS

COMPARATIVE MATRIX OF DESIRED CONDITIONS THAT WOULD BE MANAGED FOR UNDER ALTERNATIVE B

The following tables are comparative matrixes for the five proposed management zones and the desired conditions that would be managed for under alternative B. See chapter 2 for narrative summaries of the desired conditions for each zone and maps that illustrate proposed changes to the zones.

Table A-1a. Overview of Management Zones

Topic	Visitor Facilities Zone	Pedestrian Zone	Hiker Zone	Glacial Mountain Zone	Valley Floor Zone
Brief summary	Visitors would arrive, get oriented, and learn through visitor facilities.	Visitors could spend 1–2 hours to easily be “out in the park” on maintained trails.	Visitors could hike on steeper maintained trails outside the developed area.	Self-reliant visitors could access off-trail areas that are dominated by mountains, the glacier, and geologic processes (including glaciation and glacier retreat).	Visitors could meander freely along the area on the valley floor with no maintained trails and relatively high self-reliance.
General description	<ul style="list-style-type: none"> • This zone would include the basic infrastructure necessary to accommodate visitors arriving to the Exit Glacier area and would be the most developed zone of the park. • Visitors would arrive primarily by motorized vehicle and transition to walking mode, orient themselves at the nature center, and immerse themselves in the natural world by 	<ul style="list-style-type: none"> • This zone would accommodate numerous visitors, many of whom would wish to experience easily accessible vistas and views of Exit Glacier (currently). • Social opportunities would be plentiful. Visitor comforts and structures would be available but fewer and less concentrated than in the visitor facilities zone. Opportunities would be abundant for visitor education 	<ul style="list-style-type: none"> • This zone would allow visitors to access more remote locations of this area along well-maintained trails. • The zone would provide a mostly natural experience with moderate social possibilities, increasing opportunities for connection with nature, and fewer visitor comforts. • Many visitors with varying outdoor skills would be able to hike 	<ul style="list-style-type: none"> • This zone would have unmaintained routes and would allow free-flowing use of the glacier and the surrounding mountainous land off trail. • The zone would provide a natural experience, with rare encounters with other visitors. • The zone would allow visitors to understand and experience the power and enormity of the glacier and icefield. 	<ul style="list-style-type: none"> • This zone would allow free-flowing visitor use in an area without trails, primarily on the outwash floodplain area. The zone would require self-reliance to choose one’s own pathway and creek crossings. • The dynamic nature of the outwash plain changes throughout the season. • Geomorphology is a substantial force, and large amounts of sedimentation and

Topic	Visitor Facilities Zone	Pedestrian Zone	Hiker Zone	Glacial Mountain Zone	Valley Floor Zone
	<p>moving out of this zone.</p> <ul style="list-style-type: none"> The experience would be highly social, with few opportunities for solitude. The infrastructure would blend in and would not dominate the environment but still would provide basic visitor services expected at an NPS entrance, including accessible trails. 	<p>through signs and personal contacts.</p> <ul style="list-style-type: none"> Trails would be uneven and slightly steeper in some places and partly accessible to visitors who are mobility impaired. The risk of encounters with wildlife would be more likely in this area than in visitor facilities zone. 	<p>into this more remote area.</p> <ul style="list-style-type: none"> While danger and hazards still exist, day hikers could access this zone with only a moderate amount of preparation and education about the area and physical capability. Trails would be steep, narrow, and uneven in places and not accessible. The preservation of the natural system would be a high priority, but impacts from trail development and associated use would be common. Visitors would experience scenic views and other characteristics of eligible wilderness. 	<ul style="list-style-type: none"> Navigating hazards could be challenging. Visitors should be trained and experienced in mountain risk assessment and mountaineering skills and able to assess their risk and accept that risk. High mountaineering skills would be required in this challenging mountainous landscape, where avalanche and rockslides commonly occur. The canyon area is very dynamic and subject to a moment's notice for dangerous change. Hikers should be aware of these dangers before entering. Hazardous and often unsafe conditions would be present where areas may be closed for safety when necessary. The landscape would require visitors to have a high skill level and be 	<p>aggradation occur in this zone.</p> <ul style="list-style-type: none"> Visitors could see changing cuts in the outwash plain, which shift constantly. Wildlife are present in this zone, and visitors could observe from a distance.

Topic	Visitor Facilities Zone	Pedestrian Zone	Hiker Zone	Glacial Mountain Zone	Valley Floor Zone
				responsible for their own safety.	
Focus	<ul style="list-style-type: none"> This zone would prioritize visitor needs, safety, and a positive visitor experience in a natural setting. 	<ul style="list-style-type: none"> This zone would prioritize visitor needs, safety, and a positive visitor experience in a natural setting with some resource management. 	<ul style="list-style-type: none"> This zone would prioritize resource protection and a positive visitor experience in a natural setting. 	<ul style="list-style-type: none"> This zone would prioritize resource protection and a positive visitor experience in a natural setting. 	<ul style="list-style-type: none"> This zone would prioritize self-reliance in a natural dynamic setting.
Exit Glacier Developed Area	<ul style="list-style-type: none"> This zone would be in the Exit Glacier Developed Area. 	<ul style="list-style-type: none"> This zone would be in the Exit Glacier Developed Area. 	<ul style="list-style-type: none"> This zone would not be in the Exit Glacier Developed Area. 	<ul style="list-style-type: none"> This zone would not be in the Exit Glacier Developed Area. 	<ul style="list-style-type: none"> This zone would not be in the Exit Glacier Developed Area.
Winter use	<ul style="list-style-type: none"> Winter would be an opportunity to experience the unique landscape with much fewer visitors. Some facilities may be available to accommodate winter use such as warming huts and vault toilets. 	<ul style="list-style-type: none"> Winter would be an opportunity to experience the unique landscape with much fewer visitors. Trails would not be maintained in the winter. 	<ul style="list-style-type: none"> Winter would be an opportunity to experience the unique landscape with much fewer visitors. Trails would not be maintained in the winter. 	<ul style="list-style-type: none"> Because other zones would not have maintained trails in the winter, this area would be challenging to access. Winter would be an opportunity to experience the unique landscape in solitude. 	<ul style="list-style-type: none"> Winter would be an opportunity to experience the unique landscape, with much fewer visitors.

Table A-1b. Natural Resources Conditions

Topic	Visitor Facilities Zone	Pedestrian Zone	Hiker Zone	Glacial Mountain Zone	Valley Floor Zone
Evidence of human use	<ul style="list-style-type: none"> Evidence of human use would be common, but generally, the landscape would retain a high degree of natural features and would not be dominated by human-made structures. Human-made structures would not be visible along the entrance road. Human activities would be primarily confined to roads and trails 	<ul style="list-style-type: none"> Evidence of human use would be primarily nonmotorized and common, but generally, the landscape would retain a high degree of natural features and would not be dominated by human-made structures. 	<ul style="list-style-type: none"> Evidence of human use would be occasional and may persist long term. Impacts from infrastructure would be limited to the trail itself and directional aids (i.e., trail markers). The higher levels of use in the pedestrian and visitor facilities zones can sometimes be seen from this zone at a distance. This area would be one step closer to wilderness. 	<ul style="list-style-type: none"> Evidence of human use would be low, and natural features would be very difficult to navigate through. The landscape would feel untouched with impressive views. 	<ul style="list-style-type: none"> Evidence of human use would be occasional. Natural features would be somewhat difficult to navigate through.
Impacts from development	<ul style="list-style-type: none"> Impacts from development and infrastructure would be allowed (e.g., construction and maintenance of roads, trails, parking lot, and buildings), with an emphasis on minimal resource damage. 	<ul style="list-style-type: none"> Impacts from development and infrastructure would be allowed (e.g., trail construction and maintenance, installation of interpretive exhibits, regulatory signs, and safety barricades) but to a lesser extent than in the visitor facilities zone. 	<ul style="list-style-type: none"> Impacts from development and infrastructure would be occasionally allowed (e.g., trail construction and maintenance, installation of signs, trail markers, and safety barricades). 	<ul style="list-style-type: none"> Impacts from development and infrastructure would be minor and seldom seen. Visitors would likely be far from facilities and would acknowledge search and rescue may be challenging. 	<ul style="list-style-type: none"> Impacts from development would be seldom seen due to the dynamic nature of the river and floodplain.
Natural soundscape	<ul style="list-style-type: none"> Intrusions to the natural soundscape can be expected more often and may be of 	<ul style="list-style-type: none"> Intrusions on the natural soundscape could be expected often, but less overall, 	<ul style="list-style-type: none"> Periodic, low-intensity noise intrusions would come from outside the zone (e.g., vehicle and 	<ul style="list-style-type: none"> The natural soundscape of changing geophysical sounds related to glacial 	<ul style="list-style-type: none"> Visitors would be immersed in geophysical sounds and biological sounds, with

Topic	Visitor Facilities Zone	Pedestrian Zone	Hiker Zone	Glacial Mountain Zone	Valley Floor Zone
	<p>higher intensity than in any other zone. Noises may often come from both inside and outside the zone, including noise from vehicles, and people talking and shouting.</p> <ul style="list-style-type: none"> • Within close proximity of Exit Creek, the sound energy of flowing water would be seasonally audible and limit how far visitors and wildlife may hear other natural sounds or sources of noise. Further from the water, this masking effect would be reduced, and sounds are expected to be audible from a greater distance. • Natural sounds would be mostly predominant in the winter, such as the sound of ice cracking on the bark of trees, the sound of wind, and rain. However, snowmachines could be heard in the distance. 	<p>than in the visitor facilities zone.</p> <ul style="list-style-type: none"> • Natural sounds would be predominant in the winter, such as the sound of ice cracking on the bark of trees, and the sound of wind and rain. However, snowmachines could be heard in the distance. 	<p>aircraft noise), but noise intrusions originating in the zone, such as human voices, would be less common. This zone would be the first area where visitors experience predominantly natural sounds (and other senses).</p> <ul style="list-style-type: none"> • Natural sounds would be predominant in the winter, such as the sound of ice cracking on the bark of trees, the sound of wind, and rain. However, snowmachines could be heard in the far distance. 	<p>dynamics would be dominant, giving a sense of the enormity of earth system processes. Visitors may feel humbled and a heightened human-nature connection and may enjoy a sequence of coastal mountain habitats.</p> <ul style="list-style-type: none"> • The sounds of mass movement (e.g., icefall and avalanches) intermittently may break the intense stillness of the Alaskan winter months. However, snowmachines could be heard in the far distance. 	<p>intermittent, human-caused noise.</p> <ul style="list-style-type: none"> • Natural sounds would mostly be predominant in the winter, such as the sound of ice cracking on the bark of trees, the sound of wind, and rain. However, snowmachines could be heard frequently.

Topic	Visitor Facilities Zone	Pedestrian Zone	Hiker Zone	Glacial Mountain Zone	Valley Floor Zone
Natural processes	<ul style="list-style-type: none"> This landscape would be dynamic, and managing this zone would require accepting some level of impacts from natural processes, although some natural processes (e.g., flooding or fire) may be interrupted to protect infrastructure and resources. 	<ul style="list-style-type: none"> This landscape would be dynamic, and managing this zone would require accepting some level of impacts from natural processes, although some natural processes (e.g., flooding, fire) may be interrupted on a limited basis to protect resources and infrastructure. 	<ul style="list-style-type: none"> Disturbance of natural processes would be uncommon and on a small scale (e.g., ditching along trails to direct runoff and brushing). 	<ul style="list-style-type: none"> Natural processes would be dynamic and not directly manipulated by humans. Physical processes, such as melting ice and shifting rocks, may alter or impede access or routes in the area. Danger would be eminent from natural processes, more so than any of the other zones. 	<ul style="list-style-type: none"> Natural processes would be dynamic and not directly manipulated by humans. Physical processes, such as streamflow, sediment load, and shifting rocks, may alter or impede access in the area. Natural processes would present a higher level of hazard.
Wildlife encounters and behaviors	<ul style="list-style-type: none"> Encounters with wildlife, including bears, would be possible. Wildlife in this zone may show a higher degree of habituation to humans. 	<ul style="list-style-type: none"> As human-wildlife conflicts due to reduced sightlines and wildlife defense of territory, young, or food caches would be likely, management actions may be taken to reduce and mitigate encounters. Disturbance to wildlife behaviors would be minimal. 	<ul style="list-style-type: none"> This zone would have a high potential for human-wildlife interactions. Opportunities for viewing wildlife and wildlife would be left relatively undisturbed. 	<ul style="list-style-type: none"> This zone would have a high potential for human-wildlife interactions. The zone would have good opportunities for viewing wildlife on the land between the Harding Icefield Trail and the glacier. Wildlife interactions on the glacier itself would be uncommon. Wildlife would be left relatively undisturbed. 	<ul style="list-style-type: none"> This zone would have a high potential for human-wildlife interactions. The zone would have good opportunities for viewing wildlife. Wildlife would be left relatively undisturbed.

Topic	Visitor Facilities Zone	Pedestrian Zone	Hiker Zone	Glacial Mountain Zone	Valley Floor Zone
Vegetation	<ul style="list-style-type: none"> Native vegetation may be brushed or removed to ensure access and prevent damage to facilities. Visitors may encounter management activities to remove nonnative species and steward natural plant communities 	<ul style="list-style-type: none"> Native vegetative succession would usually be allowed to proceed unimpeded but may be managed minimally to preserve views and ensure trail access. 	<ul style="list-style-type: none"> Native vegetative succession would usually be allowed to proceed unimpeded, but brushing occurs on trails. Dense vegetation would be less apparent moving higher in elevation. 	<ul style="list-style-type: none"> Native vegetation succession would be allowed to proceed unimpeded, though vegetation would be dependent on ice levels year-round. 	<ul style="list-style-type: none"> Native vegetation succession would be allowed to proceed unimpeded, though little vegetation would be on the outwash plain due to dynamic streamflow and sediment changes.

Table A-1c. Social Conditions

Topic	Visitor Facilities Zone	Pedestrian Zone	Hiker Zone	Glacial Mountain Zone	Valley Floor Zone
Human encounters	<ul style="list-style-type: none"> The likelihood of encounters with other visitors and with park staff would be very high. Winter encounters would be occasional on the road and campground area. 	<ul style="list-style-type: none"> The likelihood of encounters with other visitors and park staff would be moderate to high. Winter encounters would be occasional on trails. 	<ul style="list-style-type: none"> The likelihood of encounters with other visitors and park staff would be moderate. Winter encounters would be rare. 	<ul style="list-style-type: none"> The likelihood of encounters with other visitors and park staff would be low. Winter encounters would be extremely rare in the high country and low to moderate in the canyon area (which is open in the winter). 	<ul style="list-style-type: none"> The likelihood of encounters with other visitors and park staff would be low to moderate. Winter encounters would be occasional on the outwash plain.
Potential for solitude and connection to nature	<ul style="list-style-type: none"> This zone would have a very low potential to find solitude. Social conditions should be expected. This zone would include the nature center and campground, where numerous people may be concentrated. 	<ul style="list-style-type: none"> Opportunities for solitude would be low. Visitors may find moderate opportunities to be close to nature with trees providing visual barriers and creek sounds masking the sounds of others. 	<ul style="list-style-type: none"> This zone would have a moderate potential to find connection with nature. Visitors would be able to move freely along the trail. Visitors would have opportunities to be swept up in nature, experience big views, and have opportunities 	<ul style="list-style-type: none"> This zone would have a high potential to find solitude. Visitors would seldom encounter other groups of visitors. However, visitors typically travel in groups for safety and may have a social experience in that group. 	<ul style="list-style-type: none"> This zone would have low-to-moderate opportunities for solitude, depending on the area. This zone would allow visitors to seek solitude in the natural setting, especially if they get away from others in dispersed area.

Topic	Visitor Facilities Zone	Pedestrian Zone	Hiker Zone	Glacial Mountain Zone	Valley Floor Zone
			to view wildlife, wildflowers, and the transition from montane to alpine environments. Some feeling of remoteness would be present.	<ul style="list-style-type: none"> This zone would allow visitors to transition into a different experience after they leave the hiker zone and feel disconnected from development. 	
Groups encountered	<ul style="list-style-type: none"> Large groups of 12 or more individuals may be frequently encountered. 	<ul style="list-style-type: none"> Large groups of 12 or more individuals may be frequently encountered. 	<ul style="list-style-type: none"> Large groups of 12 or more individuals may be encountered regularly on the trail. 	<ul style="list-style-type: none"> Groups of 12 or more individuals may be encountered rarely. 	<ul style="list-style-type: none"> Groups of 12 or more individuals may be seen or encountered regularly.
Level of challenge	<ul style="list-style-type: none"> This zone would have a low level of challenge and adventure. No special skills would be required to visit. 	<ul style="list-style-type: none"> Opportunities for challenge and adventure would be slightly higher than the visitor facilities zone. No special skills would be required to visit. 	<ul style="list-style-type: none"> This zone would have a moderate level of challenge and adventure, particularly due to the presence of ice or snow. Appropriate clothing, shoes, traction devices and equipment for a mountain environment would be needed. A high degree of physical fitness and endurance would be required due to steepness. Visitors would develop awareness and respect for the risks of rapid weather changes; icy water; cold, wet weather; wildlife, including bears, moose, lynx, and wolverines; and a lack of cell 	<ul style="list-style-type: none"> The opportunity for challenge and adventure would be high, as would be the needed level of outdoor skills. Specialized mountaineering equipment including ice axe, crampons, helmets, harnesses, and ropes, may be required. Visitors would develop awareness and respect for the risks from rapid weather changes; icy water; cold, wet weather; wildlife, including bears, moose, lynx, and wolverines; and a lack of cell service. This risk would contribute to the richness of outdoor 	<ul style="list-style-type: none"> This zone would have a somewhat high level of adventure in a highly variable area with uneven and often challenging terrain of rocky grounds and rapid, icy streamflow (stream crossings), and sediment buildup due to changing conditions. Dense vegetation could make movement challenging. Fast-moving and variable water conditions would present a safety risk. Visitors would develop awareness and respect for the risks from rapid weather changes; icy water; cold, wet weather; wildlife, including bears, moose, lynx, and wolverines;

Topic	Visitor Facilities Zone	Pedestrian Zone	Hiker Zone	Glacial Mountain Zone	Valley Floor Zone
			service. This risk would contribute to the richness of outdoor recreational experiences.	recreational experiences.	and a lack of cell service. This risk would contribute to the richness of outdoor recreational experiences.
Time commitment	<ul style="list-style-type: none"> A short time commitment (1 hour) would be needed to experience this zone. 	<ul style="list-style-type: none"> A moderate (1–2 hours) time commitment would be needed to experience this zone. 	<ul style="list-style-type: none"> A moderate-to-higher time commitment would be needed to experience this zone (4 hours to a full day). 	<ul style="list-style-type: none"> A long time commitment (6–10 hours) would be needed to experience this zone. 	<ul style="list-style-type: none"> A short time commitment would be needed to experience this zone for visitors to view the landscape, especially in peak season. Longer time would be spent in the winter. A moderate time commitment would be needed to venture further into this zone.
Visitor feelings and experiences	<ul style="list-style-type: none"> Visitors would sense the awe of the mountains as they arrived along the Resurrection River and arrived in the park. Their eyes would be pulled skyward to the surrounding scenery. 	<ul style="list-style-type: none"> Visitors would experience scenery and beauty in all directions and feel surrounded by the mountains. The area would feel natural, even if the hand of human activities were present. Interpretation would blend with wildlife and creeks in this area. 	<ul style="list-style-type: none"> Visitors would experience natural processes and wild characteristics. As visitors climbed in elevation, the vastness of the valley would become more apparent, and the ecology of forests, then alpine, then icefields is felt. Visitors would start to feel more expanses and see goats, marmots, bears, and foliage more easily. 	<ul style="list-style-type: none"> Visitors would experience the changing temperatures that come with exposure to ice, snow, and rain. Visitors would experience the power and enormity of scale in a landscape shaped by rock and ice. 	<ul style="list-style-type: none"> Visitors would experience the dynamic nature of the outwash plain, which changes throughout the day. Constant shifts in the sediment, geomorphology, and creek would elicit feelings of awe and amazement at the power of nature to change and evolve. Bear and moose could also shape special opportunities.

Table A-1d. Visitor Use

Topic	Visitor Facilities Zone	Pedestrian Zone	Hiker Zone	Glacial Mountain Zone	Valley Floor Zone
Motorized or mechanized uses (does not apply to assistive devices used by people with disabilities or administrative uses)	<ul style="list-style-type: none"> Both motorized and mechanized uses would be allowed on the road and parking lot, such as buses, autos, and bicycles. 	<ul style="list-style-type: none"> Visitor activities in this zone would be nonmotorized and nonmechanized. 	<ul style="list-style-type: none"> Visitor activities in this zone would be nonmotorized and nonmechanized. 	<ul style="list-style-type: none"> Visitor activities in this zone would be nonmotorized and nonmechanized. 	<ul style="list-style-type: none"> Visitor activities in this zone would be nonmechanized and nonmotorized in the summer. In the winter, motorized and mechanized uses would be allowed.
Camping	<ul style="list-style-type: none"> Camping would be allowed in designated campgrounds. 	<ul style="list-style-type: none"> Camping would be not allowed. 	<ul style="list-style-type: none"> In the summer, backcountry camping is allowed away from established trails. 	<ul style="list-style-type: none"> In the summer, backcountry camping is allowed away from established trails. 	<ul style="list-style-type: none"> In the summer, backcountry camping is allowed away from established trails.
Pets	<ul style="list-style-type: none"> Pets would be allowed on a leash on the road and parking lot. In the winter, dogs would be allowed on a skijor harness or dogsled harness when sufficient snow exists for skiing or dog sled use. 	<ul style="list-style-type: none"> Pets would not be allowed, except in the winter on a skijor or dogsled harness when sufficient snow exists for skiing or dog sled use. 	<ul style="list-style-type: none"> Pets would not be allowed, except in the winter on a skijor or dogsled harness when sufficient snow exists for skiing or dog sled use. 	<ul style="list-style-type: none"> Pets would not be allowed, except in the winter on a skijor or dogsled harness when sufficient snow exists for skiing or dog sled use. 	<ul style="list-style-type: none"> Pets would not be allowed, except in the winter on a skijor or dogsled harness when sufficient snow exists for skiing or dog sled use.

The following tables show activities, facilities, and services that would be consistent with the desired conditions described above. While the above desired conditions describe what we are trying to achieve in an area, the tables below describe appropriate activities, facilities, and services that would be consistent with those desired conditions. The items in this table are not **commitments** to take a particular action or strategy, but rather describe the types of actions or strategies that **would be** appropriate given the desired conditions.

Table A-2a. Facilities and Development That Would Be Appropriate to Implement to Achieve Desired Conditions

Attribute	Visitor Facilities Zone	Pedestrian Zone	Hiker Zone	Glacial Mountain Zone	Valley Floor Zone
Roads or parking lots	<ul style="list-style-type: none"> Roads and parking lots would be paved, with roads no wider than two lanes. Parking would be designed to incorporate nature with trees, rocks, morainal structures, and other natural elements present to ensure the area blends with the surroundings and visitors would not feel separate from the environment. 	<ul style="list-style-type: none"> No roads or parking lots would be present. 	<ul style="list-style-type: none"> No roads or parking lots would be present. 	<ul style="list-style-type: none"> No roads or parking lots would be present. 	<ul style="list-style-type: none"> No roads or parking lots would be present.
Trails (the trail is maintained and the route is not maintained)	<ul style="list-style-type: none"> Trails in this zone may be paved, hardened, and compacted; cleared of obstacles; and have a smooth surface. Trail types could include major trails, such as the paved trail, and minor trails, such as in park housing. Trails would be generally accessible. 	<ul style="list-style-type: none"> Trails in this zone may be hardened and compacted, cleared of obstacles, and have a smooth surface. Trail types may include major trails, and most trails that are not steep are accessible. Steeper trails may not be accessible due to terrain. The unpaved 	<ul style="list-style-type: none"> Trail surfaces would be natural, may be uneven and steep, and may contain obstructions such as fallen trees and rocks. The Harding Icefield Trail would be the only maintained trail. 	<ul style="list-style-type: none"> No designated trails would exist in this zone, but ice hiking and ice climbing activities would be allowed. (An existing unmaintained ice climbing route also exists that is used by commercial operators to access the glacier ice.) 	<ul style="list-style-type: none"> No trails would be present. If a route does exist, it would likely be temporary and be washed out with larger stream flooding events.

Attribute	Visitor Facilities Zone	Pedestrian Zone	Hiker Zone	Glacial Mountain Zone	Valley Floor Zone
	<p>The walk-in campground would have a minor trail that loops through campground to get to each campsite.</p>	<p>trail after the end of the asphalt trail would be fairly wide until the footbridge. No administrative vehicular access would be available beyond the bridge. Trails would include the Glacier View Loop Trail and the steeper Glacier Overlook Loop Trail. The Glacier Overlook Loop Trail would not be extended to be closer to ice.</p> <ul style="list-style-type: none"> Winding trails would encourage other senses to guide since sight far ahead would be limited. 		<ul style="list-style-type: none"> Access routes may be available with some restrictions. 	
Function/purpose of facilities	<p>The following would be present:</p> <ul style="list-style-type: none"> resource management (e.g., fences, enclosures, plot markers) administration (e.g., staff housing, weather stations) safety (e.g., handrails, signs, emergency shelters) comfort (e.g., public use cabins, restrooms, benches) 	<p>The following would be present:</p> <ul style="list-style-type: none"> resource management (e.g., fences, enclosures, plot markers) administration (e.g., weather stations) safety (e.g., handrails, signs, emergency shelters) comfort (e.g., benches) education (e.g., signs, interpretive waysides) 	<ul style="list-style-type: none"> This zone would have interpretive and wayfinding signage at trailheads. Trail-related structures would include rough steps, water bars, retaining walls, and footbridges. Structures may exist for resource management, interpretive, administrative, or safety purposes. No structures for visitor 	<ul style="list-style-type: none"> Trail markers, such as blazes or cairns, would be used as needed on wilderness trails. 	<ul style="list-style-type: none"> This zone would have temporary structures only (mostly related to safety) due to the dynamic nature of the streambed.

Attribute	Visitor Facilities Zone	Pedestrian Zone	Hiker Zone	Glacial Mountain Zone	Valley Floor Zone
	<ul style="list-style-type: none"> education (e.g., signs, interpretive kiosks, nature center) transportation (roads and bridges) pedestrian circulation (sidewalks) 	<ul style="list-style-type: none"> pedestrian access (trails and bridges) 	<p>comfort, such as benches, would be present.</p>		
Visibility of facilities	<ul style="list-style-type: none"> Structures could be large, highly visible, and suitable for habitation. 	<ul style="list-style-type: none"> Any structures in this zone would be small to moderate, moderately visible, and not habitable. 	<ul style="list-style-type: none"> Any structures in this zone would be small, moderately visible, and not habitable outside of the shelter near the top of the trail. 	<ul style="list-style-type: none"> Generally, this zone would have no structures. 	<ul style="list-style-type: none"> Generally, this zone would have no structures.
Level of maintenance	<ul style="list-style-type: none"> This zone would have a very high level of road and trail maintenance. 	<ul style="list-style-type: none"> Maintenance activities, such as trail work, would occur at a high level. 	<ul style="list-style-type: none"> Maintenance activities, such as trail work, would occur at a moderate level. Route markers (flagging) may be occasionally maintained. 	<ul style="list-style-type: none"> Maintenance activities, such as installation of signage, would occur at a low level and generally only for extreme resource protection and safety situations. 	<ul style="list-style-type: none"> The evidence of management activities in this zone would be absent or very low.
Signage	<ul style="list-style-type: none"> Wayside exhibits and regulatory and interpretive signs would be very common. 	<ul style="list-style-type: none"> Signs directing visitors or providing interpretive messages would be common. 	<ul style="list-style-type: none"> Interpretive and regulatory signs would be uncommon. Temporary signs may be present. 	<ul style="list-style-type: none"> No interpretive signage would be present. Regulatory signs would be rarely installed, except for extreme resource protection and safety situations. 	<ul style="list-style-type: none"> Signage would be limited to safety and uncommon.

Table A-2b. Visitor Services

Attribute	Visitor Facilities Zone	Pedestrian Zone	Hiker Zone	Glacial Mountain Zone	Valley Floor Zone
Ranger programs and activities	<ul style="list-style-type: none"> Many education and interpretation activities would occur on-site and may include staff-provided information and ranger-led programs. 	<ul style="list-style-type: none"> On-site education and interpretation activities would be present and may include staff presence, formal programs, signs, and wayside exhibits. 	<ul style="list-style-type: none"> On-site education and interpretation would include ranger-led walks and programs. Off-site publications (such as the park brochure and newsletter) and education would be important tools to inform visitors about this zone. 	<ul style="list-style-type: none"> No visitor services would be present. Off-site publications (such as the park brochure and newsletter) and education would be important tools to inform visitors about this zone. 	<ul style="list-style-type: none"> Visitor services would be occasional. Off-site publications (such as the park brochure and newsletter) and education would be important tools to inform visitors about this zone.
Education and Interpretation of cultural resources	<ul style="list-style-type: none"> The interpretation and education of parkwide cultural resources would be available to visitors. 	<ul style="list-style-type: none"> The interpretation and education of parkwide cultural resources would be available to visitors. 	<ul style="list-style-type: none"> No formal education or interpretation would be present. 	<ul style="list-style-type: none"> No formal education or interpretation would be present. 	<ul style="list-style-type: none"> No formal education or interpretation would be present.

APPENDIX B: VISITOR USE MANAGEMENT INDICATORS AND THRESHOLDS

INTRODUCTION

Visitor use management monitoring of resource conditions and visitor experiences in the frontcountry area of Kenai Fjords National Park would be accomplished through the establishment of indicators, and thresholds. The development of these components follows the guidance of the Interagency Visitor Use Management Council's Visitor Use Management Framework (IVUMC 2016). For additional resources in the Visitor Use Management Framework, visit <http://visitorusemanagement.nps.gov/>.

Monitoring is the process of routinely and systematically gathering information or making observations to assess the status of specific resource conditions and visitor experiences (IVUMC 2016). Monitoring is designed and implemented to provide usable data for periodically comparing existing and desired conditions, evaluating the efficacy of ongoing management actions, and assessing the need for additional management actions. Monitoring is an integral component of resource and visitor use management, and it allows managers to objectively evaluate whether desired conditions are being achieved and maintained.

Monitoring includes the selection of indicators, along with establishment of associated thresholds. It also includes routine, systematic observations or data collection of the indicators over time, as well as associated documentation and analysis of the observations or data in relation to thresholds.

Indicators translate desired conditions of the frontcountry management plan into measurable attributes (e.g., visitor crowding) that, when tracked over time, evaluate change in resource or experiential conditions from visitor use. Indicators are critical components of monitoring the success of the frontcountry management plan and are considered common to all action alternatives. The interdisciplinary planning team considered the central issues driving the need for the frontcountry management plan and developed related indicators that would help identify when the level of impact becomes cause for concern and management action may be needed. The indicators described below were considered the most critical, given the importance and vulnerability of the resource or visitor experience affected. The planning team also reviewed the experiences of other park units with similar issues to help identify meaningful indicators.

Thresholds represent the minimum acceptable condition for each indicator and were established by considering the desired conditions (see chapter 2), data on existing conditions, relevant research studies, and the professional judgment of staff from management experience. Although defined as "minimally acceptable," thresholds still represent acceptable conditions. Establishing thresholds does not imply that no action would be taken prior to reaching the threshold. Thresholds identify when conditions approach unacceptable levels and serve as mechanisms to alert managers and the public that corrective action must be taken to keep conditions acceptable. Indicators and thresholds can be tracked over time

and ultimately form the foundation of good monitoring protocols that would allow managers to maintain and achieve desired conditions for resources and visitor experiences.

The planning team considered many potential indicators but ultimately identified six that are the most important to monitor the effectiveness of the strategies and actions in the plan. The six issues or topics the indicators monitor include the following:

1. Invasive plant presence
2. Soundscapes
3. Trail crowding
4. Visitor crowding in the visitor facilities zone
5. Guided hike participation on Glacier View Loop Trail and Glacier Overlook Loop Trail
6. Bear and human interactions

These indicators were selected in part as they met the following five criteria for a quality indicator:

- **Importance:** Is the indicator highly relevant to ensuring desired conditions are achieved? Would management action be taken based on this indicator?
- **Sensitivity to change:** Is the indicator sensitive enough to provide useful information to managers before substantial impact has occurred?
- **Connection to visitor use:** Is there a clear connection between visitor use (levels, timing, location, types of use, and/or behavior) and the indicator?
- **Reasonableness:** Is the indicator related to an existing monitoring effort or can it be reasonably monitored with existing staff or partners?
- **Reliability:** Can the indicator be monitored accurately and yield the same result if measured by different people (not subject to measurement error)?

The indicators identified in this document do not represent an exhaustive list of all monitoring that is currently and will continue to be conducted at Kenai Fjords National Park. Visitor use management is an iterative process in which management direction is continuously informed by new information and improved. Indicators are monitored and adjustments are made as appropriate. As monitoring of conditions gets underway, park managers may decide to modify or add indicators if better ways are found to measure important changes in resource and experiential conditions. Monitoring indicators helps NPS staff determine the most effective way to manage visitor use to attain desired visitor experiences and resource conditions.

The following are detailed descriptions of the indicators. With each indicator, a threshold or objective is identified, as is the rationale for monitoring the indicator and the strategy to be used to execute the monitoring. Lastly, management strategies and actions that may be taken

in association with the indicator are included. Some of the strategies and actions would be implemented immediately, while others would be implemented as thresholds are approached or exceeded. Strategies identified for use as needed are labeled as potential future management strategies.

INDICATOR 1: INVASIVE PLANT SPECIES

Indicator

Gross number of acres infested with high-priority invasive plants species treated annually

Threshold

No more than a 15% increase from baseline conditions in the average annual number of acres treated over any five-year period

Rationale

An increase in the acres infested with nonnative plant species on a site can indicate visitor use impacts for a specific area. Nonnative species spread where people travel, such as on waterways, roads, and trails, as well as recently disturbed sites. Invasive plant species are a concern to resource managers because they can threaten the genetic integrity of native flora through hybridization, outcompete native plant species for limited resources, degrade fish and wildlife habitat, and change the structure and function of ecosystems through alterations of geochemical and geophysical processes (Bauder and Heys 2005). Historically, 27 species of invasive plants have been identified in the Exit Glacier area.

Nonnative species would continue to be present on roads and trails, requiring some level of control in the frontcountry area. Due to their ease of spread, it is very unlikely that all invasive species would be removed from the park. Park personnel analyzed data to determine what impacts would occur from increases to invasive plant populations. Since park-infested areas are small and all known priority populations are actively treated, an increase of greater than 15% in gross acres treated could impact the ecology of the area and the visitor experience detrimentally. The five-year average mark considers bumper years for invasive plants or years when the park has more operational capacity to treat and map more invasive plants than other years. The focus on gross acres rather than net acres allows for repeat infestations in the same area.

Notably, invasive plant seeds may remain viable in the soil for a notoriously long amount of time (e.g., sweet clover seeds can remain viable for more than 80 years). Invasive plants also produce an abundance of seeds per year; untreated plant populations can increase exponentially. Park staff currently select sites and species to treat based on higher invasiveness ranking, location, and feasibility of treatments.

Each management zone has a different set of needs determined by species presence, the invasiveness ranking of a plant, and how many individuals of a plant species in each management zone is tolerated. Desired conditions for vegetation are identified for each zone in this frontcountry management plan. Park staff use best available data and methods for

different areas in each zone to effectively control nonnative species. This indicator supports the natural resource desired condition for vegetation.

Monitoring

Park staff would monitor and treat invasive species annually, based on weather conditions and staff availability. Monitoring and treating occurs under the NPS Alaska Region invasive plant management team protocol. Staff visit specific areas in each zone where invasive plants are spreading to monitor changes in the acres infested, species present, percent cover, percent treated, and assess appropriate management actions (inventory, monitor, or treatment [manual, mechanical, chemical]). Park staff would also determine the most effective method to control the nonnative species and monitor population size. The amount of herbicide used in a specific location would also be recorded and monitored for determining treatment effectiveness and tracking increases or decreases in invasive species presence in a specific area.

Immediate Management Strategies

- Continue to survey and monitor for invasive plant populations and to use NPS Alaska Region invasive plant management team protocol to map populations and track the effectiveness of control methods.
- Continue to manually dig/pull invasive plants.
- Continue to use herbicide as directed in the Alaska Region invasive plant management plan.
- Continue to educate the public on how they can prevent spread of invasive plants.
- Maintain boot brushes at park trailheads to reduce the spread of invasive plants into the park.

Potential Management Strategies

Near Term

If monitoring determines that a threshold is being approached or exceeded, one or more of the following management strategies or actions may be implemented:

- Remove invasive plants and revegetate area with native seeds and/or plants when appropriate.
- Survey new areas to search for new invasive plant populations.
- Install educational signage along the access road, and increase educational messaging on virtual platforms about the importance of stopping the spread of invasive species.
- Discourage off-trail travel.
- Coordinate with local agencies and partners to control priority invasive plant populations infesting areas located just outside park boundaries.

- Request technical assistance from the NPS Alaska Region invasive plant liaison to develop additional strategies to control invasive plant populations.
- Reassess current invasive plant management methods in the park.

Long Term

These future management strategies would be considered if previously executed management strategies are not effective and there is evidence that conditions are trending away from desired conditions or are approaching thresholds. These actions may require that additional compliance be completed before implementing the management strategies or actions.

- Build up additional park staff to concentrate on controlling invasive plant populations.
- Contract additional nonpark staff to control invasive plant populations.

INDICATOR 2: SOUNDSCAPES

Indicator

Median noise-free interval (NFI) between 7:00 a.m. and 7:00 p.m. Median noise-free interval is the typical duration of time between noise interruption of the natural soundscape.

Thresholds

Thresholds for each zone would be established after establishing baseline conditions and considering the relationship of those baseline conditions to desired conditions. If different zones are found to have similar NFI conditions, representative locations may be selected for long term monitoring.

Rationale

For the purposes of this indicator, natural sounds are defined as all nonanthropogenic sounds such as those made by sound producing animals (biophony), wind and water (geophony), and natural quiet. Anthropogenic sounds or “noise” are defined as sounds generated by human visitors (voices, bear bells, music) and machine-generated sounds (automobiles, aircraft, and construction noises). The median noise-free intervals are the typical duration of time when natural sounds are undisturbed by anthropogenic sounds.

The desired conditions for the frontcountry area describe the potential for visitors to be immersed in solitude and experience a connection to nature. They state that most areas of the frontcountry would be free of signs of human disturbance. This indicator monitors the immersive quality of the experience, the opportunity to connect with nature, and the degree of freedom from human noise disturbances.

Natural soundscapes have both a human experience and an ecological component. Visitors may be seeking places to enjoy time away from the sounds of development, while birds and other wildlife can be impacted by how prevalent anthropogenic noises are (e.g., predator-prey relationships). In other words, the frontcountry area possesses a unique and remarkable

soundscape that provides ecological conditions for wildlife and a sonic visitor experience that contrasts sharply with commercially developed landscapes.

This indicator focuses on the human visitor's experience of sound, but it is closely related to the ecological impacts of noise. Therefore, this indicator measures the human perception of noise disturbances (i.e., anthropogenic noise pressure levels below the level of human perception would not count as an interruption of the natural soundscape). This indicator is focused on typical "daytime" hours used in soundscape monitoring when visitors are more likely to be in the area to experience natural sounds or anthropogenic noises.

The desired conditions for natural soundscapes differ across the five zones in the frontcountry (see appendix A). Generally, the tolerance for frequent noise interruptions of the natural soundscape decreases as one moves from the more developed zones (visitor facilities, pedestrian) to the less developed zones (hiker, glacial mountain, valley floor). The logic for this is that visitors should expect and accept a greater level of anthropogenic noise in the parking area than they would on remote portions of Exit Glacier or the outwash plain. Soundscape ecologists working at the park hypothesize that each zone would express a difference in median noise-free intervals consistent with the desired conditions; however, sound data collected in the frontcountry area have not yet been thoroughly analyzed for the presence and duration of noise sources to calculate a median noise-free interval for each zone.

Monitoring

The park's resource management program would concentrate their efforts to sample the sound environment of each zone simultaneously, sampling for a period (not necessarily the entire duration) during the winter (December – March) and summer (June – September), when human visitation is known to contrast the most from low to high, respectively. Park staff would not sample during the spring (April – May) and fall (October – November) because adverse weather and road conditions would make it difficult to acquire a complete data set. Data may be processed through human audible listening and spectral analysis. These data may be analyzed through a focused condition assessment and some assistance from the NPS Natural Sounds Program Listening Lab whenever appropriate.

Park staff would work with the NPS Natural Sounds Program to identify best methods for conducting monitoring approximately every five years.

Immediate Management Strategies

- Complete the sampling effort to determine current conditions.
- Compare current conditions with desired conditions for natural soundscapes.
- Establish thresholds for each zone based on the comparison of current conditions and desired conditions. If different zones have statistically comparable median noise-free intervals, representative locations may be chosen for long term monitoring.
- Continue to provide education and outreach to visitors on natural sounds.

- Continue to determine ways to discontinue use of noisy operational equipment when the public is present, or limit its duration, time, or frequency of operation.

Potential Management Strategies:

Near Term

If monitoring determines that a threshold is being approached or exceeded, one or more of the following management strategies or actions may be implemented:

- Replace NPS operational equipment when there is a quieter alternative.
- Identify anthropogenic sounds that can be reduced or eliminated with mitigation measures.
- Facilitate and encourage quieter winter recreational activities, such as fat tire winter snow biking and skiing.

Long Term

These future management strategies would be considered if previously attempted management strategies are not effective and there is evidence that conditions are trending away from desired conditions or are approaching thresholds. These actions may require that additional compliance be completed before implementing the management strategies or actions.

- Actively manage the type, timing, amount, duration, and distribution of commercial use during the winter.

INDICATOR 3: TRAIL CROWDING

Indicator

Number of hiking parties (either an individual or group) encountered per hour on the Harding Icefield Trail

Threshold

No more than 35 hiking parties encountered per hour 80% of the time

Rationale

This indicator measures visitors' opportunities for connection with nature and the ability to move freely along the trail without obstruction. While it directly measures the number of times hikers meet, pass, or get passed along the trail, it is effectively measuring the presence of "gaps" or breaks between encounters. In those gaps, visitors can experience a connection with nature and have freedom of movement.

This indicator is highly important to achieving desired conditions and addressing issues in the frontcountry management plan. The Harding Icefield Trail is currently the only longer trail in the entire park. As a unique experience in the park, management needs to ensure the

trail is providing opportunities for visitors to have the intended experience. Overall, the desired conditions for the Harding Icefield Trail (in the hiker zone) state that encounters with other visitors would be moderate. The desired conditions state, “As visitors climb in elevation, the vastness of the valley becomes more apparent . . . Visitors start to feel more expanses . . .”

This indicator is known to be reliable and sensitive to change based on experience in other park units. For low or medium volume trails, such as the Harding Icefield Trail, encounter rates are a common and appropriate indicator of visitor experience. This indicator is also thought to be reasonable due the park’s history of collecting encounter rate data on the Harding Icefield Trail. While monitoring was previously discontinued, park staff collected these data largely due to the lack of connection to a plan or management strategies (issues rectified with this management plan). The park has historical data, including encounter rates per hour, for different sections of trail, group sizes, and overall people encountered and has seen change over time.

For purposes of this indicator, an “encounter” includes meeting another park visitor, passing another park visitor, or being passed by another park visitor on the trail while simulating the pace of a typical hiker.

The thresholds for this indicator were established by (1) reviewing encounter rate data to understand current use levels and change over time and (2) considering visitors’ stated perceptions of crowding. The most recent encounter rate data were collected in 2019. During that year, encounter rates were counted seven times on the full length of the trail and back. Hourly encounters were tracked, as shown in table B-1:

Table B- 1. Groups Encountered Per Hour on the Harding Icefield Trail in 2019

Time	7/13	7/20	7/26	7/30	8/5	8/26	Average
10:00	20	12	9	24	16	9	15
11:00	13	15	11	17	8	14	13
12:00	22	20	18	25	11	18	19
13:00	28	20	21	28	17	26	23
14:00	43	40	13	27	38	26	31
15:00	18	12	20	23	18	9	17

Overall, the average number of groups encountered on the hour in 2019 ranged from 13 to 31, with the average being 20. The 80th percentile hourly count was 26. Park staff collected encounter rate data in a similar manner going back to 2007. In that initial year of encounter rate monitoring, hourly encounters were tracked, as shown in table B-2:

Table B- 2. Groups Encountered Per Hour on the Harding Icefield Trail in 2007

Time	7/3	7/11	7/16	7/23	8/1	8/7	8/16	8/22	8/29	Average
10:00	5	1	0	2	13	10	3	0	4	4
11:00	6	2	2	0	10	4	3	1	3	3

Time	7/3	7/11	7/16	7/23	8/1	8/7	8/16	8/22	8/29	Average
12:00	13	3	5	3	21	16	5	3	7	8
13:00	10	5	10	3	11	9	3	7	7	7
14:00	11	13	19	7	11	29	10	12	18	14
15:00	19	5	16	5	14	19	13	11	10	12

Overall, the average number of groups encountered on the hour in 2007 ranged from 3 to 14, with the average across all hours being 8. The 80th percentile count was 13. The comparison of the two tables shows a marked increase in encounter rates over time. The data from 2007 are relevant, as they are likely more indicative of the conditions experienced by respondents to visitor surveys in the early 2000s related to perceptions of crowding on the Harding Icefield Trail.

The first survey found that 94% of visitors at that time felt that the “level of crowding on Harding Icefield Trail was “about right” (Bergeson 2000). A similar study found that, of the visitors who hiked the Harding Icefield Trail and encountered another visitor, 63% found that trail congestion “detracted” slightly from their enjoyment, while 14% found it “detracted moderately,” and 5% found it detracted greatly (Swanson et al. 2004). Taken together, these findings indicate that at visitation levels encountered in the 2000s, trail crowding was a slight issue for visitors but not a major one. Without more recent survey data, park managers can extrapolate that with an approximate doubling of encounter rates since 2007, visitors are likely much more likely to find current trail crowding levels to be an issue. For this reason, the threshold for the trail below Marmot Meadows is identified only slightly above current use levels (currently, 80% of hourly trail encounter rates collected are at or below 26 encounters).

Monitoring

Responsibility for monitoring this indicator would be shared amongst the park’s Visitor and Resource Protection, Interpretation, and Resource Management Divisions. Monitoring would occur during the peak season for hiking on the Harding Icefield Trail, generally July and August, and during peak use times, generally between 10:00 a.m. and 4:00 p.m. Monitoring would occur every three to five years. Encounter rate monitoring would occur in tandem with monitoring of daily user counts at the Harding Icefield Trail register to determine the strength of the correlation between the two. As the correlation between encounter rates and trail counts is often statistically strong and stable over time, park staff may begin to use trail register counts as a proxy for the encounter rates when direct encounter rate monitoring cannot occur.

Immediate Management Strategies

- Continue to encourage visitors to hike early in the morning or later in the afternoon to improve the temporal distribution of trail use. This strategy could include informing visitors of the busiest times on the trail, allowing people to avoid those hours if they can. Visitors could also plan to spend an entire day on the trail by hiking up early in

the morning, enjoying the icefield and meandering at the top, and returning later in the afternoon after visitation subsides.

Potential Management Strategies

Near Term

If monitoring determines that a threshold is being approached or exceeded, one or more of the following management strategies or actions may be implemented:

- Improve proactive messaging about desired and expected conditions for the Harding Icefield Trail to set appropriate visitor expectations. Ensure that visitors understand that during peak season, the Harding Icefield Trail is a somewhat social experience and offers only moderate opportunities to connect with nature.
- Educate visitors seeking solitude about alternative trails in the area where that experience is more likely to occur. Of note, as of 2002, “experiencing solitude” was rated as “extremely important” or “very important” by 26% of visitors to the frontcountry area (Swanson et al. 2004).
- Where possible, construct some wider “passing areas” along the trail to improve visitors’ ability to move freely along the trail.

Long Term

The following future management strategies would be considered if previously attempted management strategies are not effective and there is evidence that conditions are trending away from desired conditions or are approaching thresholds. These actions may require that additional compliance be completed before implementing the management strategies or actions.

- Consider amending permit stipulations for commercial operators to shift guided hikes to off-peak times and/or manage the amount of guided hike use that occurs.
- Consider working with commercial operators to voluntarily change the timing of guided hikes on the Harding Icefield Trail.
- Manage overall CUA use levels, CUA group size, timing of CUA use, or locations of CUA use to prevent crowding at certain times or places through changes in CUA permit conditions. Encourage broader distribution of CUA use across the frontcountry area, including the outwash plain, Paradise Creek, and extending off the Harding Icefield Trail, with consideration for gaps in opportunities and potential business opportunities.
- Consider shifting commercial operators onto one or more concession contracts to build long-term certainty, strengthen relationships with commercial operators, and provide the National Park Service with a greater ability to manage commercial use and associated visitor use levels in the frontcountry area.

- Consider actions to manage the pace and flow of use along the Harding Icefield Trail, including requiring visitors to obtain a limited quantity of permits for hiking the trail during peak season or implement a first come, first served quota system. The potential for implementing such a system would be considered in the context of visitation to the broader area. If thresholds are exceeded only in the Harding Icefield Trail, a trail-specific measure may be appropriate. However, if thresholds are exceeded on a more widespread basis, a more holistic approach may be warranted. Of note, managing the number of visitors on the Harding Icefield Trail was supported by 58% of respondents in a 2002 survey (Swanson et al. 2002). A similar study in 2000 found that 60% of Harding Icefield Trail visitors said that a first come, first served system was an “acceptable” method to reduce visitor congestion on the trail, while 50% said that a reservation system was “acceptable.”

INDICATOR 4: VISITOR CROWDING IN THE VISITOR FACILITIES ZONE

Indicator

Visitor comment cards received that contain a complaint or negative feedback regarding crowding in the visitor facilities zone

Threshold

Five complaints or negative comments in a summer season (May to September)

Rationale

Complaints or negative feedback on comment cards include difficulty in accessing facilities (i.e., long wait times), such as parking, restrooms, the nature center, or the campground; visitor use conflicts, such as competition for destinations, noise, or annoyance; crowding in the nature center; or other similar topics. This indicator was selected for monitoring because it is a direct feedback loop from visitors to the frontcountry area and is, therefore, a valuable measure of the park’s achievement of desired conditions for visitor experience.

The desired conditions for the visitor facilities zone describe an area “where visitors arrive, get oriented, and interact with visitor facilities. In this zone visitors orient themselves to the landscape and transition from vehicle to foot travel.” While the desired conditions note that this zone would be a highly social environment, it should provide visitor comforts that are “basic visitor services expected at an NPS entrance area and basic infrastructure necessary to accommodate visitors arriving to the area.” The visitor services zone places a “high priority for visitor needs and safety and focuses on a positive visitor experience.” Ultimately, this indicator measures the achievement of that positive visitor experience and whether visitors are having the type of experience where they can “sense the awe of the mountains as they arrive . . . in the park.”

Park staff considered several indicators that focused on facility use exceeding their design limits, such as restroom wait times or the frequency that the campground, parking lot, nature center, or picnic area is full. These alternative indicators were dismissed because they are less reliable or sensitive to change. Some would also be much less reasonable to monitor and

would likely miss the holistic picture by focusing on just one attribute of the visitor facilities zone.

Currently, the park receives very few, if any, complaints that would count toward this indicator. Therefore, a relatively low threshold was identified, as it could indicate a profound shift in conditions in the visitor facilities zone that visitors are finding unacceptable. The park receives comment cards (mostly positive) from a very small fraction of overall visitors, so a total of five comment cards would represent a much larger population having a negative experience.

Monitoring

Visitor comment cards are collected by the Interpretation Division manager. The division manager reviews the comment cards and tracks any that fit the description of this indicator. Key elements of the comment are tracked including the date of the comment, location received, subject, and any other relevant data. The comment cards are then be forwarded to the superintendent's office for further disposition.

Immediate Management Strategies

- Continue to make comment cards available and continue to collect and track responses.
- Continue to opportunistically manage traffic congestion in the parking lot, as needed during peak visitation periods.

Potential Management Strategies

If monitoring determines that a threshold is being approached or exceeded, one or more of the following management strategies or actions may be implemented:

Long Term

These future management strategies would be considered if previously attempted management strategies are not effective and there is evidence that conditions are trending away from desired conditions or are approaching thresholds. These actions may require that additional compliance be completed before implementing the management strategies or actions.

- Explore opportunities for increased collaboration with local stakeholders to provide shuttle service from Seward to the frontcountry area, for example, to run a regular shuttle from the Harbor Visitor Center in Seward to the nature center during peak visitation periods, as discussed in chapter 2 under alternative B. Consideration would be given to the delivery volume associated with a shuttle service to ensure it does not exceed identified thresholds and visitor capacities. Adjust oversized vehicle parking to better configure parking spaces to accommodate more vehicles.
- Prohibit buses from parking in the parking lot during peak use times, and instead require them to drop off passengers and then depart the park and return to pick them up later.

INDICATOR 5: GUIDED HIKE PARTICIPATION ON GLACIER VIEW LOOP TRAIL AND GLACIER OVERLOOK LOOP TRAIL

Indicator

Percentage of total guided hikes (including both NPS- and CUA-led hikes) on the Glacier View Loop Trail and Glacier Overlook Loop Trail that exceed 25 participants per season

Threshold

No more than 20% of guided hikes led during a summer season exceed 25 participants

Rationale

This indicator monitors the quality of visitors' interpretive experience on guided hikes. By monitoring the proportion of guided experiences that are inconsistent with the staff-identified optimal range of hike participants (2–25), this indicator helps to ensure that most hike participants have a quality visitor experience where they can learn about interpretive themes and can hear the ranger or guide.

This indicator is related to visitor crowding on the Glacier View Loop Trail and Glacier Overlook Loop Trail (pedestrian zone) and the ability of hikers to pass other groups freely and easily. If guided hike group sizes routinely exceed 25 people, it may be difficult for hikers not part of the guided group to pass. As an indicator focused on the pedestrian zone trails, this indicator is also a useful complement to the encounter rate on the Harding Icefield Trail indicator. While these trails are too busy for encounter rates to be a reasonable measure of crowding, this guided hike group size indicator is a reasonable, if indirect, measure of that potential for crowding. In this way, the two indicators together monitor crowding on the entire existing frontcountry trail system.

This indicator is also related to the overall interest in hiking the Glacier View Loop Trail and Glacier Overlook Loop Trail and helps park managers understand whether issues related to crowding are occurring on the pedestrian zone trails. This indicator is also related to visitor impacts on wildlife and the opportunity to observe wildlife. While the precise relationship between crowds and wildlife encounters isn't clear, black bears and moose are often encountered on these trails. Frequent large crowds may disrupt these animals, and due to the often nonlinear relationship between visitor use and wildlife displacement, park managers need to keep an eye on any changes to the frequency of large groups moving through these trails.

This indicator is important, as it monitors a critical part of the frontcountry visitor experience; hiking on the Glacier View Loop Trail and Glacier Overlook Loop Trail are two of the primary ways visitors experience this part of the park. Currently, park managers do not believe there are substantial issues with crowding or achieving the desired condition on these trails. Desired conditions for the pedestrian zone note that "social opportunities are plentiful" as are "opportunities for visitor education through signs and personal contact" and "large groups of 12 or more people may be frequently encountered." However, this indicator informs whether visitors still have the space necessary to achieve other desired conditions,

including “moderate opportunities to be close to nature,” experiencing “scenery and beauty in all directions,” and feeling “surrounded by the mountains.”

The threshold was identified in two parts. First, park interpretive staff identified a reasonable maximum group size. Based on staff experience, a level of 25 participants was identified. Beyond that size, it can become difficult for visitors to hear the interpreter or guide, gather around resources that are being demonstrated, and follow the interpretation. Members of the group may also have difficulty moving around and past others. In fact, staff note that visitors often leave guided hikes when there are more than 25 participants. Second, the current data for guided ranger-led hikes and guided CUA-led hikes were reviewed. In 2022, park interpretive staff led 190 hikes on the Glacier View Loop Trail and Glacier Overlook Loop Trail, 18 (9.5%) of which exceeded 25 participants. The average number of participants was 13, while the 80th percentile guided hike include 20 participants. Similarly, for CUA-led hikes, the average group size in the summer of 2022 was 16. Based on these current use numbers and the general perception that crowding is not currently an issue on the Glacier View Loop Trail and Glacier Overlook Loop Trail, a threshold of 20% of guided hikes led during a summer season exceeding 25 participants was established. This threshold acknowledges that not every hike will be perfect, and desired conditions will not always be achieved, but in general, they will be.

Monitoring

Interpretive rangers currently keep data on the number of participants on their guided hikes. Commercial use authorized operators are required to self-report data on guided hikes, as well. This data collection would continue, and the division managers for the Interpretation and Visitor and Resource Protection Divisions would collaborate to compile the data annually. Once compiled, the division managers would review the data and calculate the percentage of guided hikes that exceed the 25 participants maximum group size and compare that to the threshold. Since the ranger-led hikes often lose or gain participants during the hike, rangers would begin reporting both starting and ending numbers for hike group size to analyze optimum group size, potentially informing refinements to the maximum group size.

Immediate Management Strategies

- Provide additional guided hikes during times when demand for guided hikes is greatest and participant numbers most typically exceed 25. This strategy could include adjustments to the timing of existing hikes to match the timing of demand more closely.
- Continue (as staffing allows) to split up bigger groups of NPS-guided hikers into multiple groups.

Potential Management Strategies

Near Term

If monitoring determines that a threshold is being approached or exceeded, one or more of the following management strategies or actions may be implemented:

- Change the structure of NPS-led programs in the frontcountry area and shift more attention to stationary programs at the pavilion, nature center, or at key points on the trail system to reduce the contribution to crowding on trails at peak trail use times. Shift guided hikes to less busy times to reduce conflict between guided hikes and other users.
- Adapt the hiring of interpretive staff and staff schedules to accommodate the increased demand for guided hikes.
- Establish a maximum group size of 25 people.

Long Term

These future management strategies would be considered if previously attempted management strategies are not effective and there is evidence that conditions are trending away from desired conditions or are approaching thresholds. These actions may require that additional compliance be completed before implementing the management strategies or actions.

- Consider requiring reservations for NPS-led hikes.
- Consider amending the permit stipulations for commercial operators to limit group sizes on the Glacier View Loop Trail and Glacier Overlook Loop Trail (currently, pedestrian zone trails have no limit, and the Harding Icefield Trail has limits).

INDICATOR 6: BEAR AND HUMAN INTERACTIONS

Indicator

Number of negative human-bear incidents a summer season

Threshold

No more than a 10% increase from baseline conditions

Rationale

Negative bear incidents are a concern for both visitor safety and the potential harm to bears that can come from food conditioning and habituation. Due to this importance, current park management requires that visitors report negative incidents with bears to park staff. While some variability exists in the number of negative incidents from year to year, largely due to food availability in the high country, this indicator is important to monitor, as a human food rewards can have a large impact on bears. Negative human-bear incidents are monitored separately from overall encounters, as there are acceptable (positive) human-bear interactions. However, any bear food rewards are considered unacceptable. An uptick in negative human-bear incidents is often a precursor to a bear getting a human food reward.

Increasing use, increasing geographic and temporal dispersion, and the increasing occurrence of visitor behaviors that are inconsistent with bear country guidelines are likely to contribute to incidences of negative bear-human incidents.

This indicator supports management actions that reduce and mitigate encounters, as well as supporting efforts to keep disturbance to wildlife behaviors at a minimum. The indicator also supports the desired condition to have safe opportunities for bear viewing.

The indicator is reasonable to monitor. Since 2011, park staff have entered reports of bear-human incidents into the Bear-Human Incidents Management System, a system used by multiple parks. In addition, park staff track all incidents and summarize them annually. The public is supportive of closing trails to protect bears from potential visitor use conflicts. The pedestrian and visitor facility zones have the highest potential for visitors to encounter bears.

Monitoring

Park staff currently monitor this indicator daily across all zones and take management action as needed to ensure the safety of visitors and wildlife. This indicator would be monitored weekly by reviewing the number of incidents reported by visitors. Although reporting is dependent upon visitors, these data are likely to be reliable and consistent because park management requires that visitors report negative incidents with bears to park staff. The severity of each encounter varies due to location and incident type.

Immediate Management Strategies

- Continue to use trail closures to protect wildlife and ensure visitor safety.
- Continue to provide education to visitors on bear safety and the dangers to bear if they get a food reward.
- Continue to implement the aversive conditioning of bears consistent with the park's bear management plan.

Potential Management Strategies

Near Term

If monitoring determines that a threshold is being approached or exceeded, one or more of the following management strategies or actions may be implemented:

- Increase the number of park staff who monitor Glacier View Loop Trail and Glacier Overlook Loop Trail and educate visitors on appropriate behavior in bear country.

Long Term

These future management strategies would be considered if previously attempted strategies are not effective and there is evidence that conditions are trending away from desired conditions or are approaching thresholds. These actions may require that additional compliance be completed before implementing the management strategies or actions:

- Implement a recommended or enforceable viewing distance for bears and other large wildlife.

APPENDIX C: VISITOR CAPACITY ANALYSIS

OVERVIEW

This section provides additional information about the visitor capacity identification as it relates to the Kenai Fjords National Park Frontcountry Management Plan/Environmental Assessment. Visitor capacity is the maximum amounts and types of visitor use that an area can accommodate while achieving and maintaining the desired resource conditions and visitor experiences that are consistent with the purposes for which the area was established (IVUMC 2016) (<http://visitorusemanagement.nps.gov/>). Visitor capacities were identified using best practices and examples from other plans and projects across the National Park Service. Based on these best practices, the planning team used the following guidelines to identify capacity: (1) determine the analysis area, (2) review existing direction and knowledge, (3) identify the limiting attribute, and (4) identify visitor capacity and strategies to manage the capacity.

Visitor Capacity Analysis Areas

The determination of an analysis area has far-reaching effects on identifying visitor capacity because it involved recognizing (1) where geographically the visitor capacity would be implemented, (2) the displacement or other unintended effects of managing visitor use levels, and (3) the effect of managing allocation(s) of visitor use in the analysis area(s). To determine the appropriate analysis area(s), the planning team sought to understand the relationship between existing and potential visitor use patterns and desired conditions.

The planning team identified the analysis areas as the five priority locations that are the focus of the frontcountry management plan:

1. valley floor zone
2. glacial mountain zone
3. hiker zone
4. pedestrian zone
5. visitor facility zone

For each location, an overview of the analysis follows.

Review Existing Direction and Knowledge

The frontcountry management plan/environmental assessment updates previous planning by identifying visitor capacities and strategies necessary to implement the visitor capacity in the five management zones. The planning team reviewed desired conditions, indicators, and thresholds, with detailed consideration of the park values that must be protected and are most related to visitor use levels. Each of the following key areas lists relevant indicators, thresholds, and associated monitoring strategies.

The following descriptions explain current conditions and visitor use patterns for each analysis area. The amount, timing, and distribution of visitor use in the project area for the park influences both resource conditions and visitor experiences. Visitor impacts influence the ability of the National Park Service to maintain desired conditions. Appropriate management strategies can be selected and implemented to maintain desired resource conditions and visitor experiences consistent with the purposes for which the park was established. Visitor capacities were based on alternative B in the frontcountry management plan/environmental assessment.

Visitor Use at Kenai Fjords National Park

The park’s purpose includes preserving the scenic and environmental integrity of the icefield and glacier ecosystems. The park includes five management zones where visitor use transitions from a highly developed zone to a remote zone, which can be difficult to access. The park protects the Harding Icefield and its outflowing glaciers and provides opportunities to experience, understand, and appreciate the wild and scenic qualities of the park.

Over the most recent five-year period (2018–2022), Kenai Fjords National Park averaged 320,000 visitors per year, with greater than 99% of visitation primarily occurring from May to October, as illustrated in figure C-1. Visitation patterns are largely influenced by the weather and the amount of snowfall each year. The frontcountry area is often inaccessible by passenger vehicle during the winter months. The Herman Leirer Road is not typically plowable until May each year.

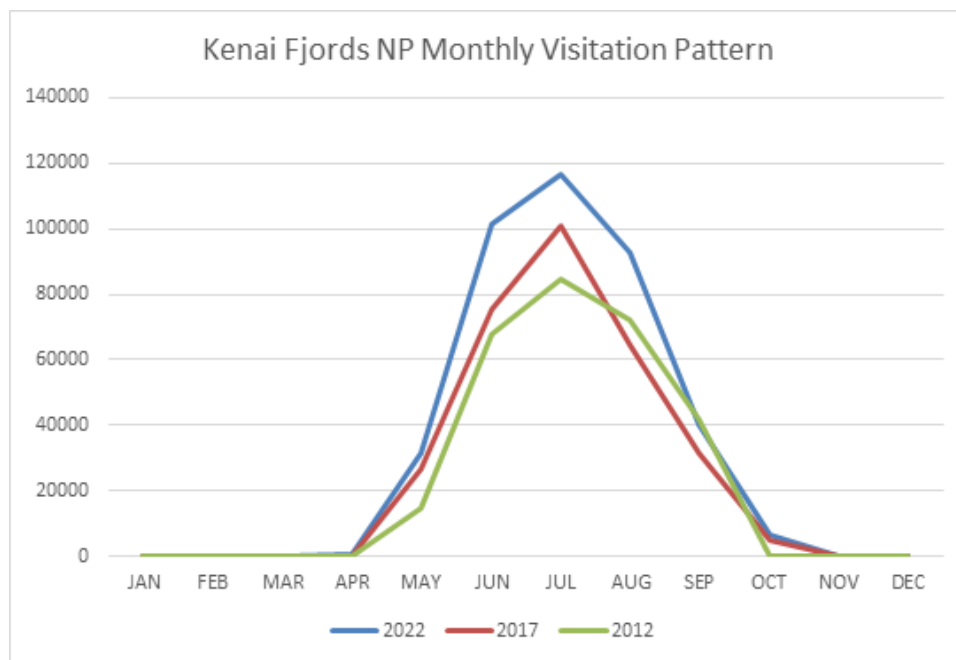


FIGURE C-1. KENAI FJORDS NATIONAL PARK MONTHLY VISITATION

The frontcountry area includes the nature center and the Harding Icefield. Figure C-2 shows a breakdown of total visitors and the subsets of visitors entering the nature center and hiking the Harding Icefield Trail.

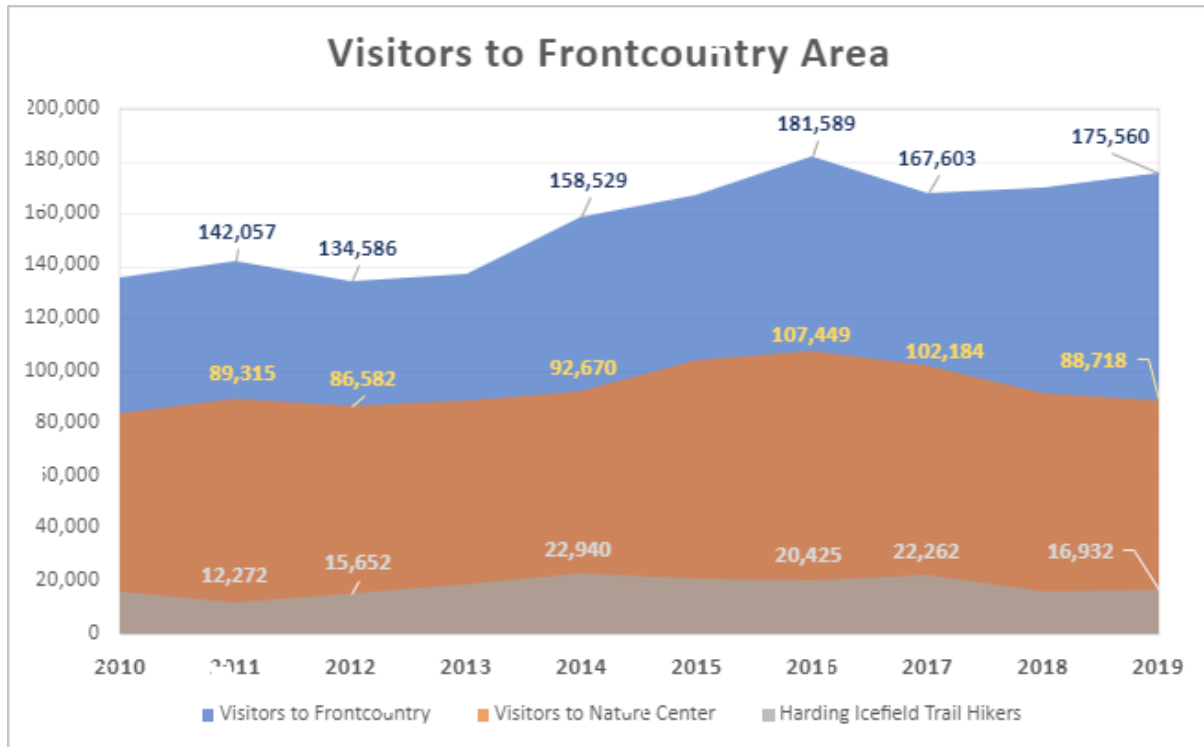


FIGURE C-2. TOTAL NUMBERS OF FRONTCOUNTRY VISITORS, INCLUDING ESTIMATES OF THE NUMBERS OF VISITORS COMING TO THE NATURE CENTER AND HIKING THE HARDING ICEFIELD TRAIL IN KENAI FJORDS NATIONAL PARK

The proposed management alternative includes proactive strategies for managing visitation and visitors’ expectations by adapting trip planning messaging and signage and expanding interpretive programs to deemphasize the focus on Exit Glacier while enhancing messaging about other features in the area such as the site’s dynamic conditions, other natural resources, and the significance of the area to Alaska Native groups. Parking lot congestion would be managed by requiring buses to park elsewhere when not dropping off or picking up visitors. The vulnerability and long-term sustainability of facilities impacted by flooding, erosion, and sedimentation would be assessed to determine whether these assets can be responsibly maintained, relocated, or decommissioned while still providing safe access and accommodating high quality visitor experiences.

Identify the Limiting Attribute

This step requires identifying the attribute(s) that most constrains the analysis area’s ability to accommodate visitor use. The limiting or constraining attribute(s) may vary across the analysis areas and is described under each key analysis location. This step is important given that an analysis location could experience a variety of needs regarding the best tools for providing quality experiences and protecting resources. Within the following location descriptions, the limiting attribute(s) is identified. Identifying the amounts and types of use that the analysis locations can accommodate could include more than one limiting attribute.

Identify Visitor Capacity and Implementation Strategies

To identify the appropriate amount of use at key analysis locations, outputs from previous steps were reviewed to compare current conditions to desired conditions for the area. Visitation data collected annually by NPS staff to track levels of visitor use parkwide and by location were used as a data source.

Visitor capacity includes two parts: (1) the identification of maximum amounts and types of use consistent with desired conditions and (2) the identification of implementation commitments to manage within identified visitor capacities. To this end, the analyses include an identification of indicators related to each analysis area's visitor capacity. Future monitoring of these related indicators would inform the National Park Service if use levels were at or near visitor capacities. If so, the management strategies, including all potential management strategies, listed for the relevant indicators could be implemented. Additionally, the analyses include management strategies and adaptive management strategies specific to each analysis area that could be taken if indicator monitoring indicates use levels are approaching thresholds. These management strategies could also be used if it is known that visitor capacities are being exceeded due to some form of direct census monitoring (rarer).

VISITOR CAPACITY ANALYSIS BY ZONE

Valley Floor Zone

Review Existing Direction and Knowledge

Visitor use types in the valley floor zone are mixed. In the summer, they include walking, hiking, and wildlife watching. In the winter, they include snowshoeing, cross-country skiing, and snowmachine use. The outwash plain is the key feature of this zone. The valley floor zone has two primary entry points where densities can be a little higher, but the vast landscape allows visitors to spread out quickly. Visitors use is naturally dispersed in this area, allowing visitors to see one another in the distance because visitors are not restricted to trails in this zone. Climate change has the potential to increase the severity and frequency of flooding events in this area. The area currently has a unique view of Exit Glacier, but that view will diminish over time as the glacier recedes.

The desired conditions for the valley floor zone include low visitor encounters and moderate opportunities for solitude. These conditions are accommodated by the fact that visitors are not restricted to trails but instead can spread out, though others may still be visible. Visitors "must be self-reliant to safely enjoy free access across the landscape." The valley floor zone provides "easy access to a trail-free open primitive area without the aerobic challenge of the Glacial Mountain Zone" (see Appendix A: Desired Conditions).

Dense vegetation outside of the outwash plain makes it difficult for visitors to explore. The terrain is highly variable with uneven and often challenging surfaces. This area has constant shifts in sediment, geomorphology, and creek movement. At times, the creek moves close to the north bank of the outwash plain, limiting the space available to visitors without crossing the creek (which generally requires waders). Although trails are not present in this zone,

social trails could become a potential concern if several visitors or groups of visitors use the same route to access points of interest. Social trails can lead to natural resource impacts.

One informal staff data collection effort estimated current use levels to be 70 people per day. This estimate represents a busy weekday in late July, which is high visitor use for this zone. The most relevant indicators to monitor changes in these conditions are the soundscapes and invasive plant species indicators.

Identify the Limiting Attribute(s)

The limiting attributes that most constrain the amounts of use and types of use in this zone are the quality of the visitor experience and the ability to achieve desired conditions for “low encounters with other visitors and moderate opportunities for solitude.” The resources in the outwash plain are highly resilient and not very susceptible to impacts from visitor use.

Visitor Capacity

Due to the ability of visitors to spread out in the dispersed and untrailed landscape, it is possible to accommodate a relatively high number of people in the outwash plain while still achieving desired conditions for low encounters and moderate opportunities for solitude. For this reason, park staff identified visitor capacity at a level several times greater than current use. Visitor capacity for the valley floor zone is identified at 500 people per day. One complicating factor is that the outwash creek sometimes shifts to be close to the north bank of the outwash plain. When this happens, it limits visitors’ ability to spread out, and the number of people who can be accommodated, while still achieving desired conditions, is much lower. When the creek is close to the north bank, the visitor capacity for the valley floor zone is identified at 100 people per day.

Immediate Management Strategies

- Educate visitors on the area, including how the landscape changes throughout the year.
- Educate visitors on the dynamic landscape and risks to reduce search and rescue events.

Potential Management Strategies

Near Term

If monitoring determines that conditions are trending away from desired conditions (related thresholds are exceeded), one or more of the following management strategies or actions may be implemented:

- Educate visitors on the dynamic landscape and risks to reduce search and rescue events.
- Facilitate and encourage quieter winter recreational activities, such as fat tire winter snow biking and skiing.

Glacial Mountain Zone

Review Existing Direction and Knowledge

The glacial mountain zone includes the surface of Exit Glacier, “the canyon” and areas above it where the glacier has retreated, and the mountainous hillsides surrounding Exit Glacier. This area tends to receive less visitation than some of the other zones. Access is not facilitated in this zone by trails or other infrastructure, and some technical expertise and equipment for mountaineering, canyoneering, and/or glacier travel and crevasse rescue is needed to safely visit this zone. Due to the technical nature of the terrain, much of the visitation to this zone is guided by CUA holders, who access Exit Glacier via a mountaineering route from Marmot Meadows. During the summer 2022 season, CUA holders guided 402 trips on Exit Glacier. Most of these trips occurred in June, July, and August, with those months seeing 106, 125, and 113 trips, respectively. The average group size on these trips was 7 individuals. During the peak month of July, 1,081 visitors participated in CUA-led mountaineering trips on Exit Glacier, which averages to 35 visitors per day. Assuming some days are busier than others due to weather, weekends, and holidays, the typical busy summer day includes an estimated 50 CUA-led visits to Exit Glacier. An analysis of more granular data from 2019 confirms this estimate, as the second-busiest day of the summer included 50 CUA-led visits on to Exit Glacier. In addition to the 50 CUA-led visits, it is estimated that another 10 nonguided visitors visit the Exit Glacier ice on a typical busy summer day. Visitation to other parts of the area, such as the canyon rim and the various hillsides (not including those on or predominantly traveling on the Harding Icefield Trail), is estimated at 20 people per day on a typical busy summer day. To summarize, about 80 people per day access the glacial mountain zone on a typical busy summer day.

As the glacier continues to retreat, this area will change, and visitor use patterns will evolve. How long glacial travel will be viable and what the area will look like are unknown. Once the glacier retreats, it is reasonable to anticipate that the resulting canyon area will draw visitors, though it is unknown how attractive or how hazardous conditions may be. The existing canyon area is currently closed during summer months for visitor safety.

Desired conditions for the glacial mountain zone describe a place where “visitors with the necessary training, expertise, and/or guidance encounter the power and enormity of the landscape” (NPS 2004). The area is full of environmental hazards and can be unsafe. For these reasons, “encounters between visitors are generally low” and the “landscape feels untouched” due to its recent exposure. Visitors to the glacial mountain zone “may feel humbled, may feel a heightened human-nature connection, and may temporarily forget the ‘human world’ of the Exit Glacier Developed Area” (see Appendix A: Desired Conditions).

Park managers are concerned about the increase in social trails and related vegetation impacts in this zone, as people try to get near the glacier as it retreats. Increased use in the area could also lead to fewer opportunities to view wildlife, including mountain goats and bears. Given the environmental hazards, park managers are also concerned about the increase in the need for emergency search and rescues. Additional people in the area, as well as vehicles in the developed area, also impacts the soundscape. The most relevant indicators

to monitor changes in these conditions are the percent time natural sounds are audible and the presence of invasive species.

Identify the Limiting Attribute(s)

The limiting attributes that most constrain the amounts and types of use that can be accommodated in the glacial mountain zone are (1) the ability to achieve and maintain the resource desired conditions for an “untouched landscape” and (2) the ability to achieve and maintain the experiential desired conditions for a “low level of encounters” with other visitors. As visitation to the glacial mountain zone increases, visitors will likely create more social trails along the side of the glacier as it moves up the canyon. At a certain point, this will result in unacceptable impacts on the “untouched landscape” managers aim to preserve in the newly exposed area—an important resource given the relative rarity of lands humans have not previously been able to see or touch. Likewise, increased visitation will eventually unacceptably impact the desired condition for a “low level of encounters.”

Visitor Capacity

Park staff determined that it is not possible to accommodate a substantially greater number of people in the glacial mountain zone while still achieving desired conditions for an “untouched landscape” and “low level of encounters.” For this reason, park staff identified visitor capacity at a level only slightly greater than current use. Visitor capacity for the glacial mountain zone is therefore identified at 90 people per day. Of note, the space available on the ice is shrinking, so this modest increase in people per day may result in an appreciable increase in visitor density.

Immediate Management Strategies

- Work in partnership with CUA holders to disperse use across the glacial mountain zone. If successful in decreasing the proportion of visitors to this zone concentrated on the ice, the visitor capacity may be reanalyzed and potentially increased via a memo to file (assuming desired conditions are still being met and impacts do not change).

Potential Management Strategies

Near Term

If monitoring determines that conditions are trending away from desired conditions (related thresholds are exceeded or visitor capacity is approached if information is available), one or more of the following management strategies or actions may be implemented:

- None identified

Long Term

The following future management strategies would be considered if previously attempted current and near-term potential management strategies are not effective in maintaining desired conditions, staying within established related thresholds, or managing within visitor

capacity (if information is available). These actions may require that additional compliance be completed before implementing the management strategies or actions.

- Manage overall CUA use levels, CUA group size, timing of CUA use, or locations of CUA use to prevent crowding at certain times or places through changes in CUA permit conditions.
- Consider shifting commercial operators onto one or more concession contracts to build long-term certainty, strengthen relationships with commercial operators, and enable the National Park Service to effectively manage commercial use and associated visitor use levels in the frontcountry area.
- Consider extending the Harding Icefield Trail to provide trail access overlooking the Harding Icefield and highlight the frontcountry area as the gateway to the Harding Icefield.
- Consider actions to manage the pace and flow of visitation to the frontcountry area, such as implementing a timed entry reservation system, daily permits, queueing on the access road, or similar actions.

Hiker Zone

Review Existing Direction and Knowledge

The hiker zone includes the Harding Icefield Trail, which sees both private and CUA use for hiking under current conditions and management. Most CUA-guided hikes use the Harding Icefield Trail to access Marmot Meadows, which provides access to the mountaineering route and the surface of Exit Glacier (the glacial mountain zone described above). A far smaller number of CUA-guided itineraries include hiking the full length of the Harding Icefield Trail. The desired conditions for this zone mention that this zone has the most remarkable views of the glacier. The desired conditions also include moderate opportunities for solitude and few visitor comforts. The topography of the landscape requires visitors to be prepared with skill and knowledge of the landscape. The hiker zone is highly visited in the summer months, typically from June to September. During this time of year, there is additional daylight later in the day, so visitors typically begin their hike around 9:00 a.m. and as late as 6:00 p.m. Key destinations in this zone include Marmot Meadows, top of the cliffs, top of the trails, and the emergency shelter.

Increasing encounter rates during peak months and times may impact the visitor experience and can cause resource impacts or an increase in trail maintenance because of visitor-created social trails. Human-bear incidents can occur in this area, which can have an impact on both the visitor experience and wildlife. Due to the topography and weather conditions, this area has the potential for an increased need for emergency services, including search and rescue.

Visitor use data is collected by a trail counter on the Harding Icefield Trail (figure C-3). The device counts every visitor entering the trail; however, not all visitors complete the entire stretch. Visitor use for the Harding Icefield Trail decreased in 2020 and spiked in 2021, which

was related to the COVID-19 pandemic. Beyond those years, visitation has remained at approximately 16,000 visitors per year from June to September.

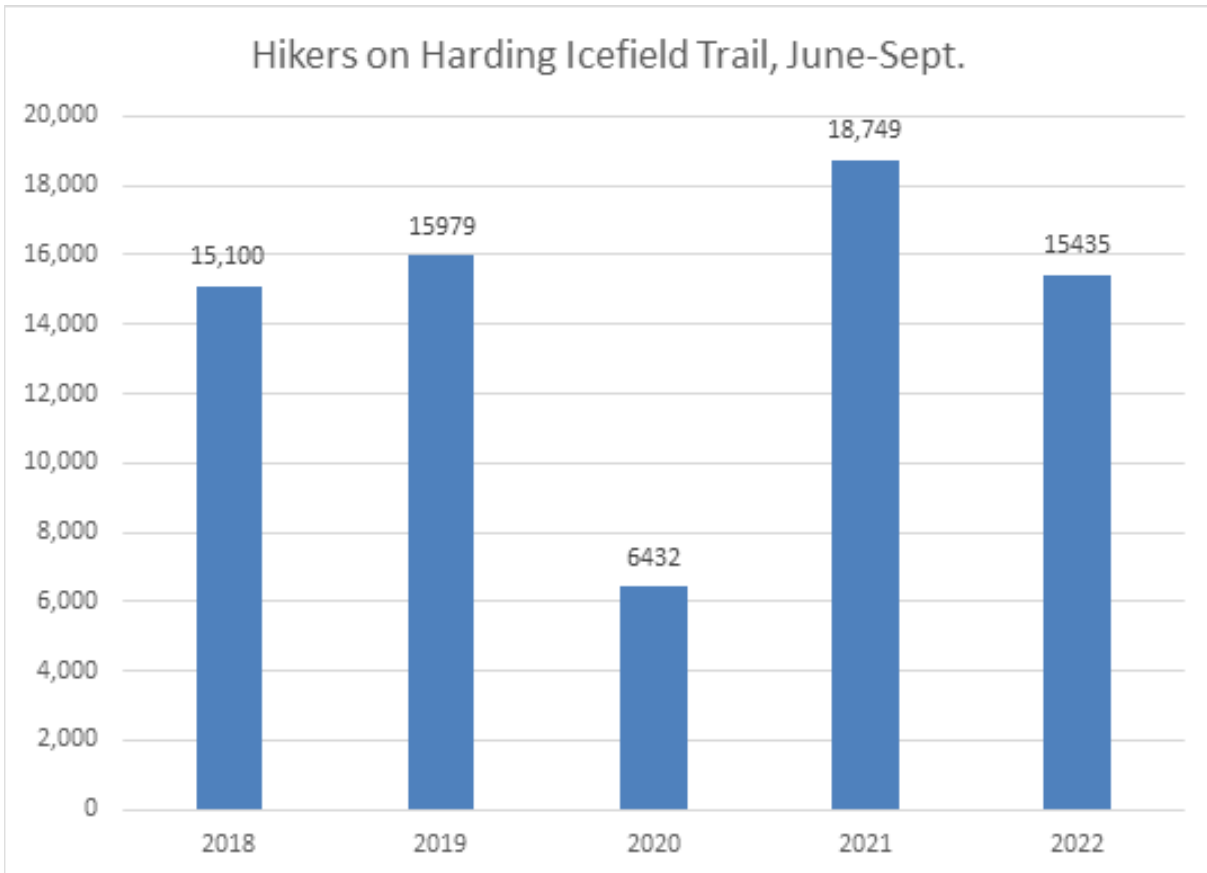


FIGURE C-3. TRAIL COUNTER ESTIMATES OF HIKERS USING THE HARDING ICEFIELD TRAIL

In 2019, the average number of groups encountered per hour of the day in 2019 ranged from 13 to 31 encounters, averaging 20 encounters over this period. The 80th percentile hourly count was 26 encounters, which represents current use on the typical busy summer day. The most relevant indicators to monitor changes in these conditions are the encounter rates, soundscapes, invasive plant species, and bear and human interactions.

Identify the Limiting Attribute(s)

The limiting attribute that most constrains the amounts of use and types of use in the hiker zone is the quality of the visitor experience and potential impacts on alpine vegetation. Impacts on vegetation occur when the area is crowded; as visitors try to disperse away from crowded areas, vegetation trampling and development of social trails may occur. The upper part of the trail often has snow early in the season, and visitors leave footfalls as they attempt to find the trail, leading to vegetation impacts and inadvertent social trails.

Visitor Capacity

Park staff identified that visitor capacity should be identified at slightly above current use levels based on existing direction and knowledge, as well as the limiting attributes related to

the quality of the visitor experience and potential impacts on alpine vegetation. The visitor capacity for the hiker zone is 35 hiking parties per hour.

Immediate Management Strategies

- Continue education on Leave No Trace principles, including the disposal of human waste.
- Continue education for trip planning to encourage visitors to avoid peak use times for the Harding Icefield Trail.

Potential Management Strategies

Near Term

If monitoring determines that conditions are trending away from desired conditions (related thresholds are exceeded or visitor capacity is approached if information is available), one or more of the following management strategies or actions may be implemented:

- Implement additional messaging about human wildlife encounters.
- Add educational messaging to virtual platforms about the importance of stopping the spread of invasive species and encouraging visitors to stay on the trail.

Long Term

None identified.

Pedestrian Zone

Review Existing Direction and Knowledge

The pedestrian zone includes the Glacier View Loop Trail and Glacier Overlook Loop Trail and the trail to the campground. Almost every visitor to the frontcountry visits this zone, as visitors must pass through it to access the hiker, glacial mountain, or valley floor zones. Park staff estimate that 95% of visitors who make it to the frontcountry area visit the pedestrian zone, with the remaining 5% either turning around in the parking lot or only visiting the nature center.

Given this estimation, park staff can calculate how many visitors per day the pedestrian zone receives each day based on vehicle counts. Per the vehicle counts and classification described in the visitor facilities zone analysis below, the frontcountry area received 59,198 recreational visits in July 2022—1,910 visits per day on average. Accounting for variations in weather, weekends, holidays, and other factors that cause fluctuations in visitor use, a busy July day can see roughly 2,100 visitors per day. As July is the busiest month of the season, this estimate represents a typical busy day in the summer, if not the busiest day. Accounting for staff estimates that 95% of visitors to the frontcountry visit the pedestrian zone, current use is estimated at 2,000 people per day in the pedestrian zone ($2,100 \times 0.95 = 2,000$).

During 2022, CUA operators led 537 guided hikes on the Glacier View Loop Trail and Glacier Overlook Loop Trail in this zone. The bulk of these guided hikes occurred in June, July, and

August, with 136, 162, and 165 guided hikes, respectively. The average hike included 16 clients. During the busiest month of July, 2,633 clients participated in guided hikes, for an average of 85 people per day.

This zone contains the only universally accessible trails in the park and hosts many interpretive and educational programs. The zone is a common place for wildlife sightings and interactions, including with bears and moose. Due to the retreat of the glacier, the overlooks along the Glacier View Loop Trail and Glacier Overlook Loop Trail do not provide the best views of Exit Glacier, and in this way, this zone is the most impacted by climate change and glacial retreat.

Desired conditions for the pedestrian zone call for visitors to be able to “experience vistas including distant views of the receding glacier and backcountry,” as well as the experience of being “out in the park.” Social opportunities are expected to be “plentiful” in this zone. The desired conditions acknowledge that the “risk of encounters with wildlife is more likely in this area than in the Visitor Facilities Zone” and that “Human-wildlife conflicts are potentially more dangerous from wildlife defense of territory, young, or food cache.” However, “disturbance to wildlife behaviors should be minimal.”

Park managers are concerned about a variety of phenomena in this zone, including an increased demand for interpretive services, additional trail maintenance needs from increased flooding, the time it takes visitors to get to a destination with a view of the glacier, large groups and the associated trail congestion along the trail, and social trailing. Human-bear and other wildlife interactions are also a primary concern due to visitors not understanding how to behave around wildlife or failing to comprehend the hazards posed by moose, increased occurrences of predators taking prey in the area and caching food sources, and visitor reactions to wildlife encounters (e.g., fleeing from a bear). The most relevant indicators to monitor changes in these conditions are the incidents of bears getting human food rewards and average number of participants on guided hikes on Glacier View Loop Trail and Glacier Overlook Loop Trail.

Identify the Limiting Attribute

The limiting attribute that most constrains the amounts and types of use that can be accommodated in the pedestrian zone is the presence of wildlife in the area and the related potential for adverse human-wildlife interactions and wildlife displacement from the area. Currently, wildlife, including moose and bears, are abundant in the pedestrian zone. However, as visitation to the pedestrian zone increases, the potential for adverse human-wildlife interactions increases, as well as the potential that wildlife will begin to avoid the area or become less active. Wildlife being displaced or too many negative human-wildlife interactions would be inconsistent with desired conditions that “disturbance to wildlife behaviors should be minimal” and park goals for visitor safety and the opportunity to view wildlife. Displacement of wildlife may also occur due to the presence of large groups on the trail.

Visitor Capacity

Park staff identified that visitor capacity could increase by 10% from current use levels based on existing direction and knowledge, as well as the limiting attribute. The visitor capacity for the pedestrian zone is 2,200 people per day.

Immediate Management Strategies

- Close trails when certain wildlife conditions are present, including aggressive behavior, wildlife with young, and cached food sources.
- Educate visitors on bear safety and how food rewards endanger bears.

Potential Management Strategies

Near Term

If monitoring determines that conditions are trending away from desired conditions (related thresholds are exceeded or visitor capacity is approached if information is available), one or more of the following management strategies or actions may be implemented:

- Provide additional guided hikes during times when demand for guided hikes is greatest and participant numbers most typically exceed 25. Adjustments could include timing existing hikes to match the timing of demand more closely.
- As staffing allows, split larger groups of NPS-guided hikers into multiple groups.
- Redirect bears, consistent with the park's bear management plan.

Long Term

These future management strategies would be considered if previously attempted immediate and near-term potential management strategies are not effective in maintaining desired conditions, staying within established related thresholds, or managing within visitor capacity (if information is available). The following actions may require that additional compliance be completed before implementing the management strategies or actions:

- Redistribute temporal summer visitor use in the frontcountry from times when human-wildlife interactions are most likely to occur.
- Change structure of NPS-led programs in the frontcountry area, and shift more attention to stationary programs at the pavilion, nature center, or at key points on the trail system to reduce trail crowding at peak trail use times. Shift guided hikes to less busy times to reduce conflicts between guided hikes and other users.
- Consider requiring reservations for NPS-led hikes.
- Adapt the hiring of interpretive staff and their schedules to accommodate the increased demand for guided hikes, particularly during peak visitation periods.

- Consider amending permit stipulations for commercial operators to limit group sizes on the Glacier View Loop Trail and Glacier Overlook Loop Trail. (These trails currently have no limit; Harding Icefield Trail has limits).
- Consider actions to manage the pace and flow of use along the Glacier View Loop Trail and Glacier Overlook Loop Trail, including requiring visitors to obtain a limited quantity of permits for hiking the trails during peak season or implementing a first-come, first-served quota system. The potential for implementing such a system would be considered in the context of visitation to the broader area. If thresholds are exceeded only on the trails, a trail-specific measure may be appropriate. However, if thresholds are exceeded on a more widespread basis, a more holistic approach may be warranted.
- Increase open hours at the nature center to distribute use away from peak hours.

Visitor Facilities Zone

Review Existing Direction and Knowledge

The visitor facilities zone is located at the entrance of the frontcountry management area. The area includes an access road, parking lot, restrooms, nature center, campground, and pavilion, which are open from May to October. The parking lot consists of 75 passenger vehicle spaces, 24 longer recreational vehicle spaces, and 6 tour bus spaces. The parking lot is considered full during most days during July from 10:00 a.m. to 4:00 p.m.

The desired conditions for visitor experience call for a highly social setting, with few opportunities for solitude. Park staff can easily have interactions with visitors, and opportunities exist to educate visitors on the park, as well as positive visitor behaviors throughout the park. Large groups of 12 or more people can be encountered regularly. This zone includes the basic infrastructure necessary to accommodate visitors arriving to the Exit Glacier area. From a resource perspective, the visitor facilities zone is considered the most “developed” zone of the park. Infrastructure provides basic visitor services expected at an NPS entrance. Visitors are expected to arrive primarily by motorized vehicle or tour bus and transition to walking. Generally, visitors park or disembark buses here, orient themselves at the nature center, and immerse themselves in the natural world by moving out of this zone.

Kenai Fjords National Park uses a traffic counter and classifier located at the entrance to the frontcountry parking lot to estimate visitor use statistics. The traffic counts recorded are multiplied by the persons-per-vehicle by vehicle (PPV) for each classification. A multiplier of 1.3 PPV is used for class 1 (motorcycle), 2.8 PPV for class 2 (passenger car), 4.0 PPV for class 3 (van), 26.8 PPV for class 4 (tour bus), 7.0 PPV for class 5 (small bus), 2.8 PPV for classes 6–13. This method, which is more precise than what was used previously, was adopted in 2021, resulting in an increase of approximately 20% compared to previous years (indicating previous counts were undercounting). The traffic count data is recorded and reported monthly.

All visitors to the frontcountry go through the visitor facilities zone, as it provides access to all other zones. For this reason, the recreational visit counts described above are, in essence, the

current use levels to the visitor facilities zone. The visitor facilities zone received 59,198 recreational visits in July 2022. This equates to 1,910 visits per day on average. Accounting for variations in weather, weekends, holidays, and other factors that cause fluctuations in visitor use from day to day, a busy July day can see roughly 2,100 visitors per day. As July is the busiest month of the season, this represents a typical busy day in the summer, if not the busiest day.

Identify the Limiting Attribute(s)

The limiting attribute that most constrains the amounts of use and types of use in the visitor facilities zone is the visitor capacities of the other four analysis areas, described above. As the means of access to the frontcountry area system, changes in visitor use in the visitor facilities zone are reflected in the “downstream” analysis areas. For example, an increase in visitor use in the visitor facilities zone would lead to additional visitors in the pedestrian, hiker, glacial mountain, and valley floor zones, barring any direct action in those locations to change the visitation pattern. As this zone is primarily developed and transitory in nature, the natural and cultural resources and visitor experiences are not particularly sensitive to impacts from visitor use levels, and the capacities of other areas are more limiting than any resource or experiential attribute in the zone. Put another way, as visitation to the visitor use zone increases over time, conditions in the downstream zones would become unacceptable well before conditions in the visitor facilities zone itself became unacceptable. All indicators identified are relevant to monitoring changes in conditions for this zone as they relate to conditions either in this zone or the downstream zones.

Visitor Capacity

Given that visitor capacities for the more sensitive visitor use zones (glacial mountain, hiker, and pedestrian zones) allow for only slight increases in visitation from current use levels, park staff identified that visitor capacity in the visitor facilities zone should be 10% above current use levels. This increase would be protective of capacities in all the other zones. The visitor capacity for the visitor facilities zone is 2,300 people per day.

Immediate Management Strategies

- Continue to notify visitors of peak hours and when the parking lot is full.

Potential Management Strategies

Near Term

If monitoring determines that conditions are trending away from desired conditions (related thresholds are exceeded or visitor capacity is approached if information is available), one or more of the following management strategies or actions may be implemented:

- Manage traffic congestion in the parking lot to alleviate safety concerns.
- Increase messaging related to the benefits of visiting earlier or later in the day.

Long Term

These future management strategies would be considered if the above immediate and near-term potential management strategies are not effective in maintaining desired conditions, staying within established related thresholds, or managing within visitor capacity (if information is available). The following actions may require that additional compliance be completed before implementing the management strategies or actions:

- Consider actions to manage the pace and flow of visitation to the frontcountry area, such as a timed entry reservation system, daily permits, queueing on the access road, or similar actions.

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APPENDIX D: CIVIC ENGAGEMENT OUTCOMES

This section summarizes public comments submitted to the project’s Planning, Environment and Public Comment website in January 2022 in response to prompting questions intended to generate relevant input for park management’s consideration in the development of the Kenai Fjords National Park Frontcountry Management Plan.

QUESTION-BY-QUESTION SUMMARY OF PUBLIC COMMENTS

1. What experiences in the Kenai Fjords frontcountry are most important to you? How are the experiences that you can have at the Kenai Fjords frontcountry unique from other experiences that are available in the rest of the Seward region? What kind of experiences would you want future visitors/generations to have when they come to the Kenai Fjords frontcountry?
 - Anti-development: less development and fewer visitors
 - Pro-development: more trails
 - “Any additional trails would be welcomed.”
 - “Hiking corridors should be developed to allow for the appreciation and enjoyment of those wishing to experience and learn from the environment.”
 - “The front country infrastructure of the Exit Glacier area also affords unique opportunities to develop more trails into the valleys running South from the current road and parking area.”
 - Usage: the few trails at the park (e.g., Harding Icefield) stand out among the many trails in the Seward area as world-class and well-managed.
 - “I would want future visitors to be able to . . . get near and see a glacier.”
 - “I would hope future generations would continue to find a well-maintained trail system that is accessible to all types of users . . .”
 - “The Harding Icefield Trail remains an important resource for visitors wanting to view the glacier and for those who wish to access the icefield itself.”
 - “Not every visitor to Kenai Fjords can afford ski planes to visit this treasure [Harding Icefield], so maintaining the Harding Icefield Trail into perpetuity is vital for our understanding of our glaciated past and present.”
 - “For experienced mountaineers, the Harding Icefield Trail (HIT) and mountaineering route offer uniquely efficient access to glacial ice for purposes of ice hiking, ice climbing, and other technical pursuits. Accessing the surface of similar nearby glaciers is impossible without expensive air/water transportation or extensive backcountry travel.”

- “There is no other trail-accessible glacier in the Seward region suitable for single day ice climbing or hiking activities with novice mountaineers. Without the HIT and mountaineering route, teaching and practicing glacier skills would be logistically impossible in the Seward region.”
 - “Accessing Exit Glacier for mountaineering, ice climbing and exploration on my own time is extremely important to me. This is unique from anywhere else in Seward because there aren't any other easily accessible glaciers.”
 - Educational opportunities (climate change):
 - “The fate of Exit Glacier should be shared with the world through online platforms, as an educational opportunity and warning about global warming.”
 - “With access to the glacier terminus no longer possible (via Harding Icefield), I think the focus should shift to the story of the glacier's retreat and all of the interesting recessional features . . . that abound in the valley and glacial forelands.”
 - “I would hope future generations would continue to find . . . a visitor center that educates visitors about KFNPN, and our impacts as humans on the wilderness we access.”
 - Ideas for new trails:
 - “There should be a trail heading north up the resurrection valley from the parking area (or even create a new parking area about a mile or so closer to the bridge over the river), possibly up into one of the hanging valleys on the west side of the river. This could attract more visitors and spread out the traffic in the coming years.”
 - “Opportunities to develop more trails into the valleys running South from the current road and parking area. The paradise valley affords visitors an opportunity to hike into relatively untouched backcountry and areas of deglaciation ripe for developing trails.”
2. Are there experiences specific to the fall or winter seasons that you are interested in having?
- Fall season:
 - “Keep the road open longer: In one recent year there was no snow at the toe of the glacier on winter solstice and the road had been closed to traffic since October.”

- “A late September official race up the Harding Icefield Trail: Could be a fundraiser for the park and further cement Seward as having the best trails in Seward.”
 - “Fall often offers good ice climbing conditions in the middle sections of Exit Glacier. Lower water levels make new areas accessible for climbing and mountaineering along the glacier's southern edge.”
 - “More public use cabins similar to Willow made available to the public would be great options for fall/winter recreation.”
 - Winter season:
 - “The area should be rather left alone in the “off season,” at least to motorized access. While summer trails provide hikers low impact access, we should limit motorized access into the future to preserve the quiet, remote feel of the Park.”
 - “Groomed multi-use (bike, snowshoe, ski) trail system that extended beyond Exit Glacier Road.”
 - “Seward Nordic Ski Club is interested in possibly grooming further and more reliably into the park for skiers (skate and classic), snowshoers, and bikers in the winter. Opening up this area to more winter use, particularly to quiet sports.”
 - “There are many winter ice climbing opportunities along the southern side of the glacier and on adjacent mountains: expanding wintertime access to the Kenai Fjords frontcountry via road, off road biking, and skiing will enhance winter climbing opportunities.”
 - “Willow Cabin is an excellent resource for experiencing Exit Glacier in winter. I strongly support an expansion of public use cabin facilities in the area.”
 - “More public use cabins similar to Willow made available to the public would be great options for fall/winter recreation.”
 - No season specified:
 - “Learning about the landscape, it’s animals, recreation adventuring.”
 - “More trails along Resurrection River, Park side, or a way across Exit River to access Paradise Valley.”
3. What activities, facilities, and services would make you feel more welcome or satisfied with your experience in the Kenai Fjords frontcountry?
- “Those with the least impact.”

- Activities identified by respondents:
 - hiking/walking
 - ranger programs
 - photography
 - canoeing/kayaking
 - rock climbing
 - "... with a management plan formed with input from local climbers from Seward."
 - "Bike access beyond the road system."
- Facilities:
 - "We would like less development and facilities. Foot paths and trails are good."
 - Responses relevant to additional trails/an extended multiuse trail system included:
 - "Expanded multiuse trail system in the in the valley. Loop trails of different lengths could include wayside information about the geological and biological features."
 - "A multiuse path along Exit Glacier Road that connects trails in the valley to the Seward Highway would be an incredible resource."
 - "More trails from the parking area south into the Paradise Valley area."
 - "Expanding the Harding Icefield Trail to facilitate more foot traffic."
 - Small food/coffee/snack cart
- Services:
 - Year-round visitor services
 - Reduce the size and number of commercial "for-profit" parties [2 respondents]
 - "If frontcountry facilities (trails and parking) are at capacity with private individuals, then expanding commercial operations would be highly inappropriate."
 - "Frontcountry access is becoming increasingly limited to private parties due to lack of parking and bottlenecks on the Harding Icefield trail."

- Other comments:
 - “Seward is notorious for its bad rock (Mt. Marathon) and the Exit Glacier area would provide a place for the local community to be exposed to outdoor rock climbing on safe and solid rock.”
 - “A groomed trail out to the park would make our users more welcome.”
 - “Adding “passing lanes” and “pullouts” to the busy lower half of the HIT seems like a cost-effective way to reduce congestion and increase long-term capacity on Kenai Fjords most celebrated trail.”
 - “Maintaining access to the Exit Glacier are during shoulder season (past the first snowfall) would enable visitors to experience the park's wild and scenic values in new ways.”
4. Are there any potential management strategies that stand out as particularly promising or effective in addressing the key issues? Do you have any concerns with any of the potential management strategies? Are there any potential management strategies you don't see listed that should be considered?
- Promising/effective:
 - “I like the idea of deemphasizing Exit Glacier as the only portal to the park landscape.”
 - “Please create a shuttle system from Seward. So many people miss out on the experience of visiting that portion of the park due to not having transportation.”
 - “The congestion has been getting out of control. The visitor experience would be so much better if vehicle access was limited.”
 - “More trails in the front country would allow the Park to expand its public offerings.”
 - “Reorganizing the existing parking area to accommodate more passenger vehicles (and fewer RVs, buses, and commercial vehicles) seems like a low-cost way to increase capacity.”
 - “Expanding access and services during shoulder season will be beneficial for many user groups.”
 - “Adjusting visitor expectations is an absolute necessity since physically touching the toe of Exit Glacier is no longer possible. The safest place for visitors to get close to the ice is at the end of the Harding Icefield Trail. A new route could feasibly be developed to offer visitors proximity to the ice somewhere above the existing mountaineering route.”

- “Although formalizing the existing mountaineering route to the ‘middle’ of the glacier may be impractical due to changing ice conditions, there are several other locations along the HIT where developing a formalized ice access route makes sense in the long run. If visitors remain eager to experience the glacier up close, a new trail could provide that opportunity at a suitably stable location along the glacier's edge.”
 - Concerns:
 - “We are concerned that managers want to over develop and destroy park resources and experiences.”
 - “I agree that ‘chasing the glacier’ and ‘touching the ice’ are no longer feasible, but I don't think the idea of a trail following closer to the glacier should be abandoned. There is already a social trail that continues onwards and connects to the ‘Mountaineers Trail.’ End the new loop definitively by returning to the Harding Icefield Trail at the ‘Mountaineers Trail.’”
 - “Regarding trail damage: it sounds like a bridge over the creek towards Paradise valley is out of the question. I think this should be revisited as that could be an excellent place to add a new trail. Other locations in Alaska have had success with suspension-style foot bridges that span similar distances.”
 - “Given the ongoing increase in interest in outdoor recreation nationally, large investments in trail infrastructure should be given full consideration. While bridging Exit Creek anywhere in the frontcountry area would be costly, it would open up huge areas of the outwash plain and park lands south of Exit Glacier to foot traffic.”
 - “Overall, do not invest a tremendous amount of money on infrastructure in the Exit Glacier area. Realistically, anything that is built out there should be considered ‘disposable.’ Exit Creek will continue to be problematic for roads, buildings and trails, and there is every reason to believe that the problems will become worse.”
 - “My greatest concern is maintaining access to glacial ice and alpine terrain for private mountaineering, climbing, and ice hiking parties. I worry that the ice closure zone at the toe of Exit Glacier will grow and limit recreational opportunities on Exit Glacier. I hope that any new management strategy will carefully consider the needs and experiences of the climbing community.”
 - “Maintaining private party access to existing mountaineering routes such as the trail from Marmot Meadows to the glacier. I think this trail should be preserved for skilled and experienced hikers.”

- Other potential strategies:
 - “Tell the World of Exit Glacier's exit, along with Glacier [National Park]'s shrinking glaciers.”
 - “Robust interagency cooperation to expand and improve Seward area trail infrastructure. . . If trail capacity cannot be increased within the park, then expanding and improving nearby trails on state and USFS lands is the next best option.”
 - “Developing an alternative formalized glacier access route above the existing informal mountaineering route would be a lasting investment.”
 - “Expanding wintertime public use cabin opportunities similar to the Willow Cabin.”
5. Do you have any reactions to the key issues?
- “I want international attention and outcry, and war-footing infrastructure change to minimize carbon footprint.”
 - “I would rather see remote parking area and shuttles vs building more parking for the current exit glacier area.”
 - “What is the NPS doing to better educate people about our very real climate changes?”
 - “I agree being proactive in the face of a melting world is the most beneficial course of action.”
 - “The Seward Nordic Ski Club realizes that the community of Seward must expand our winter activities. This will improve the mental and physical health of the area's residents, as well as improve economic health of the community. We notice many tourists visiting in the winter and are surprised there isn't easier access to Exit Glacier specifically.”
 - “This is one of the more grim planning projects that one has encountered for a National Park. The reality in the future may be that the reason for the creation for the park may not exist.”
 - “I'm in support of adding or reconfiguring parking. Particularly replacing designated RV/bus spaces for more car parking”
6. Is there anything else we should know or consider in planning for the management of the Kenai Fjords frontcountry?
- “Thank you for helping us to “think locally” to Seward, yet “act globally” to prevent human extinction.”
 - “Address rock climbing as an activity in the park that some visitors wish they could engage in with some guidance from a management plan.”

- “People want to visit parks and want ways to interact with the landscape. We should direct them to new outlets to learn and experience the wilderness.”
- “I appreciate all the hard-working folks at KFNP do for our small community. I'm looking forward to seeing the future plans.”
- “Consider that the existing glacier access trails were designed and constructed specifically for getting visitors up to the edge of the glacier (see park planning/construction archives). We realized that trails would need to change over time as the glacier changed (the glacier was actually advancing at that time). Trails were constructed in such a way that they can be removed with relative ease and no permanent scars. With that in mind, it may be time to rethink that whole trail system.”
- “Continue to allow responsible CUA's to offer experiences to visitors that are outside of their abilities to do so safely. However, opening those permits to just any outfitter is inviting peril and injury (some CUAs are behaving irresponsibly). CUAs need to be shadowed by trained Park mountaineering rangers and given multiple opportunities to view operations unannounced throughout the guiding season.”
- “The Seward Nordic Ski Club would like to partner with Kenai Fjords.”
- “I know many local residents are eager to be involved with the drafting process in any way possible. I think public meetings (virtual or in person) and updates would go a long way.”
- “Private party access to exit glacier is an invaluable part of my summer and fall and I hope any frontcountry changes don't impede on this.”

Other/General Comments

- “We recommend you do not develop the front country. Please do not [*use*] a retreating glacier as a reason to destroy and impact resources in the quest to develop the front country. Visitors can be exposed to the reasons for the glacier retreat and difficult access to a glacier, online or some other way that does not impact park resources.”
- “When will KFNP begin to consider back-country permitting for unguided individuals, for camping/access to the coastal areas of Bear Glacier, Aialik Bay, and Northwestern Fjord? And when will KFNP reinstate remote rangers in Aialik Bay? So many people are in the park without guide services, and they often have not been properly educated in backcountry food storage, camping, safety, etc.”
- “Love the park, keep up the good work.”
- “Realistically, the planning vision or concept should begin with the future situation that there is no glacier here and consider what a visitor experience would be.”

- “With limited number of high interest experiences, the existing “highlights” would be subject to the devastating impacts of over-visitation, for which plans for facilities like accessible trails and restrooms become essential. Planners, informed by experts from all disciplines, need to present features for consideration that would be especially meaningful for a National Park experience, and whether visitation is sustainable.”
- “The other reality is that the park would be a place to witness the impacts of climate change, and generate the existential question “What have we done?””

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APPENDIX E: ANILCA SECTION 810 ANALYSIS – SHORT FORM NATIONAL PARK SERVICE – ALASKA REGION

The Alaska National Interest Lands Conservation Act (ANILCA) mandates the completion of a section 810 analysis for any decision to withdraw, reserve, lease, or permit the use, occupancy, or disposition of federal public lands in Alaska (16 USC 3120).

Project Title: Kenai Fjords National Park Frontcountry Management Plan and Environmental Assessment

PEPC Number:

Location of Proposed Action: Kenai Fjords National Park Frontcountry Management Area

Summary of Proposed Action: The National Park Service is proposing to implement a new frontcountry management plan (“the plan”) at Kenai Fjords National Park (“the park”) to address visitor use at the park’s most accessible and popular inland destination. Historically, the frontcountry area offered a unique opportunity to see and experience Exit Glacier up close. However, as Exit Glacier has retreated substantially due to a warming climate, a new plan is needed to adapt and diversify appropriate visitor opportunities in the frontcountry while stewarding park resources and guiding park management activities in this area until conditions change that warrant a reconsideration of the planning recommendations. Two alternatives are being considered. Alternative A, no action, maintains the current management plan. Alternative B proposes to update visitor use facilities due to changing conditions.

Dates of Review: February 9, 2024

Analysis:

1. Evaluation of the effect of the proposed action(s) on subsistence uses and needs

There are no federal subsistence activities authorized in the Kenai Fjords National Park. Adjacent to the proposed project area, there are national forest lands open to federal subsistence use. Both alternatives include minor adverse cumulative impacts on wildlife; however, these impacts are unlikely to affect subsistence users on adjacent federal lands beyond what already occurs.

2. Evaluation of the availability of other lands for the purpose sought to be achieved

Due to the purpose and need of the proposed activities, there is no evaluation of other lands.

3. Evaluation of other alternatives that would reduce or eliminate the use, occupancy, or disposition of public lands needed for subsistence purposes

These proposed alternatives do not use, occupy, or involve the disposition of public lands needed for subsistence. Since the proposed area is closed to subsistence, there will be no direct impacts on subsistence activities. The evaluation of other alternatives is, therefore, unnecessary.

4. Evaluation of whether an alternative may “significantly restrict” subsistence use

Consider whether any of the following may occur:

a) a substantial reduction in subsistence uses due to factors such as direct impacts on the resource or adverse impacts on habitat:

yes no

b) a large reduction in the abundance of subsistence resources:

yes no

c) a large reduction in subsistence uses due to changes in the availability of the resources caused by a major redistribution, migration, or relocation:

yes no

d) a reduction in subsistence uses due to major increases in competition for the resource by non-subsistence users:

yes no

e) a reduction in subsistence uses due to substantial interference, with access to harvestable resources, such as by physical or legal barriers:

f) yes no

Findings: This ANILCA Section 810 analysis finds that the proposed action will not significantly restrict subsistence.

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Date: 2024.08.07 12:00:31 -08'00'

Dillon Patterson, AKRO Subsistence Program

Date

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APPENDIX G: PREPARERS

KENAI FJORDS NATIONAL PARK

John Carroll, Superintendent

Kirk Desermia, Facility Manager

Jason Flowers, Facility Management Software System Specialist

Christina Kriedeman, Biologist

Deb Kurtz, Natural Resource Program Manager

Patrick Lewis, Director of Resource Management/Archeologist

Tim Mullet, Ecologist

Patrick Otero, Supervisory Park Ranger (Interpretation)

Jesse Pike, Chief Ranger

Benjamin Pister, Director of Resource Management

Carol Jane (CJ) Rea, Education Specialist

Leah Wold, Lead Ranger/Interpretation

INTERIOR REGION 11 – ALASKA

Kelsey Griffin, Ocean Alaska Science and Learning Center

Sharon Kim, Outdoor Recreation Planner

Shauna Potocky, Ocean Alaska Science and Learning Center

Leah Schofield, Regional Environmental Coordinator

NPS DENVER SERVICE CENTER PLANNING DIVISION

Scott Babcock, Natural Resources/Facility Planning Branch Manager/Alaska Region Liaison

Steve DeGrush, Natural Resource Specialist

Suzanne Digre, Senior Editor (contractor)

Amanda Hardy, Project Manager

John Paul Jones, Visual Information Specialist

John Valainis, Cultural Resource Specialist

Monica Vigil, Outdoor Recreation Planner/Socioeconomics Specialist

Andrew White, Visitor Use Management Specialist

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As the nation’s principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering sound use of our land and water resources; protecting our fish, wildlife, and biological diversity; preserving the environmental and cultural values of our national parks and historic places; and providing for the enjoyment of life through outdoor recreation. The department assesses our energy and mineral resources and works to ensure that their development is in the best interests of all our people by encouraging stewardship and citizen participation in their care. The department also has a major responsibility for American Indian reservation communities and for people who live in island territories under U.S. administration.

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