Chapter Four: Environmental Consequences

Overview

This chapter analyzes the probable impacts, by resource topic, for each alternative described in Chapter Two. Impacts resulting from actions common to all alternatives are also discussed. The Summary Table of Environmental Consequences (at the end of Chapter Two) summarizes the impacts of each alternative.

The impact assessment evaluates the magnitude of impacts and how these impacts compare to current conditions and to the no-action alternative. The cumulative impact assessment outlines overall impacts resulting from past, current, proposed, and reasonably foreseeable management actions. The impact assessment is intended to guide the decision-maker in choosing a management action that protects the environment based on an objective understanding of environmental consequences.

METHODOLOGY

Varieties of methods were used for the impact analyses in this chapter. The principal method involved a review of published and unpublished literature regarding the effects of human activities on the resources discussed in the individual sections in this chapter. Literature sources presenting data collected from Alaska and other northern environments were given priority, and unpublished data were reviewed and assessed for applicability. It is assumed that the results of impact studies in similar tundra and taiga environments in Alaska and Canada can be extrapolated reasonably to the South Denali region when specific data are lacking for the South Denali region. In addition to literature review, the impact analyses were based on observations by agency staff; discussions with residents, interest groups, and businesses at scoping meetings and in telephone conversations; site reconnaissance; and best professional judgment based on previous experience with similar projects and activities. Mitigation measures were assumed to be in place when analyzing the impacts of visitor activities and plan elements under the action alternatives.

The general methods used in the cumulative impacts analysis are based on impact assessment principles outlined in the handbook produced by the Council on Environmental Quality (CEQ 1997: vii).

The geographic scope of this assessment is the South Denali planning area (Figure 3-1). The temporal scope extends to 2020, the duration of the plan.

ASSUMPTIONS

Assessing the consequences of actions proposed in the various alternatives requires making some assumptions about changes in human use patterns over time. Listed below are some of the assumptions that are referenced in the impact analysis for individual resources. Additional assumptions that are only useful for the particular impact topic may appear in the Methodology section of the impact topic. For the impact analysis, the following seasonal references refer to the indicated time periods:

Summer.....Beginning of May to end of September
Late Winter ....Mid-February to the end of April
Early Winter...October and November
Mid Winter.....December through mid-February

1) Summer visitation at Denali National Park and Preserve would resume its growth, although not at the 5% annual growth rate of the 1990's. The rate may be closer to the 2% growth seen in visitor arrivals to Alaska over the past several years (ADCED 2001). Much if not all of the growth would be among package tour travelers associated with cruise ships or other tour companies. Cruise ship arrivals in Alaska climbed 27% from 1999-2003 although this period showed a lull in visitation growth at Denali. The tourism industry clearly expects growth to return to Denali, since the number of rooms available for overnight accommodation in the Denali Borough grew 19% from 1999-2004, demonstrating continued industry interest in investment (statistic courtesy of Denali Borough).

2) Access to and use of public lands near or adjacent to Denali would continue to improve and grow. Limited numbers of new or improved transportation facilities would be responsible for some of the growth – such as planned improvements to the Petersville Road and the gradual expansion of the road system to serve newly developed settlement areas near the Parks Highway. Much of the increased access would occur because of continued technological improvements and increases in ownership of snowmachines and wheeled or tracked all-terrain vehicles. New trail systems serving both motorized and non-motorized users may be constructed or improved on lands within or near the planning area.

3) Increased use of off-road vehicles on general state land and Matanuska-Susitna Borough land will continue to damage resources throughout the South Denali region.

4) Winter visitation to the South Denali region would increase. In part, growth would occur as larger number of out-of-state winter visitors seek winter recreational opportunities in Alaska – the number of off-season (October-April) visitors in state for reasons other than business grew from 114,000 to 142,400 between the winters of 1996/97 and 2002/03, an increase of 25% (ADCED 2003). Additionally, the 73% projected increase by 2018 of the Mat-Su Borough's resident population would cause a demand for easily accessible recreational areas (Matanuska-Susitna Borough Economic Development Plan 2002).

5) The power, speed, and range of the average snowmachine in Alaska and in the South Denali region would continue to increase. The number of people using these snowmachines recreationally in Alaska would continue to increase. Most of the use in the South Denali region would occur from late February through the end of April.

6) Adoption of low impact technology for motorized forms of access – airplane, snowmachine, motorboat – would generally not occur without incentives or regulations.

BACKGROUND FOR ANALYSIS OF CUMULATIVE IMPACTS

Cumulative impacts are defined as the incremental impacts on the environment resulting from adding the proposed action to other past, present, and reasonably foreseeable future actions (also referred to as regional actions), including those taken by both federal and nonfederal agencies, as well as actions undertaken by individuals. This section outlines the actions considered in this analysis for the South Denali Implementation Plan. Cumulative impacts may result from singularly minor but collectively significant actions taking place over a period of time (CEQ Sec 1508.7).

This analysis evaluates the incremental contribution of impacts from the proposed action, the other action alternative, and the no-action alternative to the impacts of unrelated past and reasonably foreseeable future developments and activities in the South Denali region.

The time period considered under cumulative impacts stretches from 1980 to 2020, the end of the life of the plan.

- Resident population growth and visitor use are expected to continue to increase in the south side planning area regardless of the outcome of this development concept plan. Much of the growth would be related to tourism, including new or expanded hotels (such as the Princess Tours hotel near MP 133 on the George Parks Highway), bed and breakfasts, restaurants, service stations, and private full service campgrounds. Along with these new businesses would come more local employment and demands for more housing, especially in summer. Along the George Parks Highway, the development trend has been established.

- Technological improvements in snowmachines enabled a large but unquantified expansion of winter motorized access to the South Denali region during the 1990's. The growth in popularity of snowmachines is demonstrated by an increase in the number of registrations. Since registration in Alaska became required in 2000, the number of registered machines has increased from 33,576 to 41,710, an increase of 7.5% per year. Seventy percent of machines statewide are registered in the area between Anchorage and Fairbanks (DMV 2004).

- River rafting and boating, snowmobile use, ORV use, hiking, hunting, and fishing would continue to be popular recreational activities in the South Denali region and their popularity would increase over time due to the easy accessibility offered by the road system.

- Helicopter landings in Denali State Park could increase under the new policy of allowing helicopter landings in all areas of the park at the discretion of the Director of Alaska State Parks.

- In March 2005 the Board of Game liberalized bag limits for both brown and black bear for GMSU 16A. The black bear bag limit was increased to 3 per year and the brown bear limit is now 1 per year instead of 1 every 4 years. The brown bear bag limit within Denali State Park did not change and remains 1 bear every 4 years. These regulation changes became effective July 1, 2005 (Delfrate 2005).

- Since 1980, new housing and commercial development has occurred along the Petersville Road and throughout the South Denali region. This development has resulted in minor expansion of local road networks or improvements of existing roads. This gradual development spreading out from the Parks Highway corridor is likely to continue, creating increased access to the state and federal park lands. Resort lodges, motels, RV parks, cabins, and campgrounds would likely be developed in the region independent of developments considered under the proposed action.

- Active and inactive placer gold mining claim areas occur in the Peters and Dutch Hills drainages of Cache, Dutch, and Peters creeks. Existing mining activity in the Petersville area, which emphasizes surface mining, is not likely to result in the discovery of new ore bearing deposits. However, the potential for substantial production of gold bearing ores is quite high from deeper channels lying in bedrock buried beneath glacial material. As a rule of thumb applied by mineralogists, the prior existence of minerals suggests that more are likely to be found. Usually a geologist will reason that it is highly likely to find placer gold where such mines have previously existed. This suggests that mining would continue in the Peter and Dutch Hills area for the foreseeable future (NPS 1997).

- Numerous mining claims already filed on state selections along the Petersville Road would become valid upon land conveyance from the federal government. State land management plans and policies would support the maintenance of mining activities and would provide direction on measures to avoid conflicts with other land uses.

- The Matanuska-Susitna Borough aims to solicit comments on its proposed land classification plan to be used for land disposals along the Petersville Road, and Parks Highway from MP 117 to MP 131.

- The Alaska Department of Natural Resources, Division of Mining, Land, and Water would sell 6 parcels of state land comprising 25 acres. These parcels are located in the Denali View subdivision and Swan Lake Alaska subdivision, one mile west of the Parks Highway and 15 miles north of the intersection of the Parks Highway and Petersville Road (DNR 2005).

- The Matanuska-Susitna Borough has one timber contract containing just over 300 acres for MP 108 of the Parks Highway that has just completed harvesting. One contract for the area west of the Parks Highway between MP 115 and 118 that currently contains 640 acres began harvesting in February 2006. This contract may add an additional 1280 acres. It is probable

that the MSB would execute contracts for between 3,000 and 5,000 acres in the next 5 years. Timber operations could also occur on state-owned or private lands.

- The Western Alaska Council of the Boy Scouts of America (Boy Scouts) owns approximately 2,000 acres of Matanuska-Susitna Borough land located between the Susitna and Chulitna Rivers, south of Blair Lake, about 17 miles from Talkeetna. The Boy Scouts anticipate developing a camp that would have a capacity of up to 600 people per day for the summer season. Three hundred of those would stay on the property, and the other 300 would be "adventuring" and may be on a trek in the south side of the national park, hiking in the state park, or rafting on the adjacent river systems (Haines 2004).

- The Western Alaska Council of the Boy Scouts of America hope to acquire an adjacent parcel located in the triangle south of Blair Lake that is not within any council boundaries.

- The McKinley Princess Lodge plans to add 126 rooms. This expansion would make the hotel second in size only to the company's flagship operation in Denali National Park.

- Princess would charter Alaska Railroad (ARR) engines to run their Denali Express from their new docking location in Whittier. This new service would allow visitors to go from Whittier to Denali National Park in one day. The ARR is also interested in developing Curry as an historic interpretive site.

SOILS

Methodology

Information on soils was determined by incorporating a combination of data sources including: aerial photos (Aeromap 1996), previous technical soil studies (Reiger, Schoephorster et al. 1979; Clark and Kautz 1998; Olszewski 1998), small-scale soil maps (State Soil Geographic (STATSGO) Database 1995; Soil Survey Geographic Database (SURGO) 2003), and satellite imagery (IKONOS 1996). Data from these sources were reviewed for background information pertinent to the general planning area, as well as the proposed alignment or facility footprints. After preliminary data collection was completed, field studies were executed and incorporated into the overall soils analysis. For more information on the investigation methods of the 2004 field surveys, please see the URS South Denali Access Soil Report (URS 2004a).

General Impacts

The impacts on soil resources were determined by comparing the development footprints for each alternative with the SURGO and field data GIS maps developed in 2004 (URS 2004a). Soil types at the development sites would primarily be impacted by the development and operation of project facilities that would cause soil erosion, subsidence, or compaction either at the site or in areas adjacent to the site. Soils at the development location were also considered for constructability and/or design criteria of proposed project components. For example, organic soils such as peat, which have a low bearing strength, would require either excavation or

additional engineering to construct certain facilities. Soil features pertinent to planning and engineering considerations are discussed in Chapter Three of this document.

Impact Level Definitions

Criteria for rating the impacts to soil resources are based on magnitude.

- Minor: Impacts are localized and could be easily mitigated with one or two readily available measures if necessary.

- Moderate: Impacts occur in a wide region and would require extensive mitigation or specialized construction methods.

- Major: Impacts would be severe and construction at the location may not be possible.

Alternative A – No Action

Alternative A would result in no direct or indirect effects to soils. No new visitor centers and associated access roads or parking areas would be built under this alternative.

Cumulative impacts

Cumulative impacts include the effects of past, present and reasonably foreseeable future events, which could have or would be expected to impact soils along the Parks Highway, Petersville Road, and in the Peters Hills region within the planning area. In the past, these impacts have mainly been due to increased housing and businesses along the two highways potentially occurring in areas with soils susceptible to erosion, frost heaving, and/or subsidence. Mining activities in the Peters and Dutch Hills area have likely impacted soils causing erosion and subsidence. Cross-country ORV use has continued to grow. ORV use primarily causes loss of productivity (loss of vegetation cover), erosion, compaction, rutting, and displacement. Ruts from ORV use can be seen from the air throughout general state land in the planning area. Despite these impacts, the area is still relatively undeveloped, particularly in the Peters Hills region and along the Petersville Road north of MP 18.6.

The following activities have been identified as reasonable future activities that could occur within the geographic and temporal scope of this proposed project. These activities are generally described at the beginning of this chapter and are described below as they pertain to soils.

- **Recreational activities** – There is an extensive trail system in the planning area branching from the Petersville Road and Parks Highway. Non-motorized and motorized use (particularly cross-country ORV use), picnic areas, and campgrounds primarily cause loss of productivity (loss of vegetation cover), erosion, compaction, rutting, and displacement. Sandy soils, soils located on moderately steep or steeper slopes, and soils on south to west aspects, are more susceptible to erosive forces. In addition, soils above shallow water tables are especially susceptible to rutting, erosion, displacement, and compaction when crossed by mountain bikes, horses, and motorized vehicles (Douglass, Hamann et al. 1999). Non-

motorized trail width is approximately 10 feet, while motorized trails can expand up to an average of 35 feet, depending on soil conditions (Connery 1984). There are approximately 196 miles of multiple-use trails in the West Petersville area, approximately 61 miles in the Petersville-Trapper Creek area, and approximately 95 miles of multiple-use trails in the Denali State Park area. Summer and winter visitation is expected to increase, along with snowmachine and other ORV use, and other recreational activities. Implementation of the *2000 Matanuska-Susitna Trails Master Plan* would also expand non-motorized and motorized trails within the planning area.

- **Development of roads (including Petersville Road and the Parks Highway)** – Construction of the George Parks Highway between Trapper Creek and Healy occurred in the mid-1960s. Petersville Road was constructed in the 1930s and was upgraded in the mid-1980s. Subsequent increase in residential and commercial development along these main roads led to additional road development in the planning area. There is an estimated 134 miles of roads in the planning area (MSB 2001b), directly affecting approximately 848 acres of surface area. Roads affect soils primarily by accelerating erosion, but can also alter channel morphology and flowpaths at road-stream crossings (i.e., cause areas that were previously unchannelized to become channelized) (USDA Forest Service 2000). A need for additional access roads would be expected with an increase in the residential population. Soils in the planning area would likely be impacted as a result.

- **Residential and commercial development** – Impacts from residential and commercial developments have been estimated from private land ownership. There are approximately 18,547 acres of private land within the planning area (MSB 2001c). An increase in tourism is expected to lead to an increase in commercial and residential developments in the planning area. These developments would impact an unknown area of soils.

- **Mining activities** – Active and inactive placer gold mining claim areas occur in the drainages of Cache, Dutch, and Peters Creeks. There are approximately 5,535 acres of mining claims within the planning area. Soils are affected by their direct removal, and potential contamination, in addition to increased exposure to erosion, compaction, and displacement. Mining activity is expected to continue in the Peters Hills area; soils and viewshed from the Peters Hills could be affected by these activities.

- **Boy Scouts of America** – Increased use of lands by the Boy Scouts in the South Denali region, particularly in the state park, would impact soils.

Past, present and reasonably foreseeable future events have impacted or would impact soils in the planning area, largely through reduced productivity (loss of vegetative coverage), acceleration of erosion, compaction, rutting, and displacement. Exposed soils, especially fine-grained silt loams, can be eroded by the forces of wind and waters, resulting in increased sedimentation in rivers and streams. However, exposed soils can generally be stabilized through natural revegetation or by use of BMPs and restoration techniques. The cumulative impacts on soil resources resulting from past, present, and reasonably foreseeable future actions would be moderate.

Conclusion
Alternative A would have no effect on soils in the planning area.

Alternative B - Peters Hills

Under Alternative B, recreational and visitor facilities would be constructed at sites in the Peters Hills area, adjacent to the Parks Highway, and along the Petersville Road.

Peters Hills
Alternative B would construct a new, approximately 7-mile access road starting at MP 28 of Petersville Road to a nature center, trail system, and backcountry facilities in the Peters Hills. A total of about 82 acres would be disturbed during land clearing and excavation during construction of the Peters Hills facilities.

The access road covers about 38 acres in a range of soil types including Kliskon silt loam, Chichantna peat, and Slikok muck. Of these three, both Slikok muck and Chichanta peat have potential subsidence issues. However, potential subsidence could be more of a problem with the muck soils than the peat soils. Peat and muck soils are slightly to moderately susceptible to erosion by water; however, silt loam soils are severely susceptible to erosion by way of wind and water. Construction of an access road could also accelerate the erosion of soils (USDA Forest Service 2000). In addition the road could require two bridges ranging from 100 to 200 feet long. Impacts on soil would be mitigated by the design and constructability of the bridges.

These effects could last throughout the design life of the road, and would require some redesign of the access road and specific BMPs that are unknown at this time. Specific construction techniques and BMPs would be determined based on geotechnical investigation.

The proposed nature center would be located in the upper elevations of the Peters Hills, at the north end of the proposed Peters Hills access road. The proposed location for the nature center is located on 2.5 acres entirely within Chuit-Nakochna-rubble land complex. This land complex has minimal risk of subsidence, but there is potential for frost action and severe wind and water erosion to occur within this soil complex. Soil erosion would be short-term with the use of BMPs during construction. Additional soil testing prior to construction would be required to determine specific construction methods and BMPs.

Soil characteristics would not be as critical for the construction of the trails and backcountry facilities. However, use of non-motorized and motorized trails, picnic areas, and campgrounds can lead to loss of productivity (i.e., loss of vegetative cover), erosion, rutting, compaction, and displacement of soils (Douglass, Hamann et al. 1999). The trails and backcountry facilities proposed as part of this alternative cover approximately 42 acres of surface area. Overall impacts on soils due to the trail system are expected to occur during construction of the trails. Potential impacts from use of the trails would be mitigated by signage warning users to stay on the trails and refrain from damaging or compacting off trail areas.

Visitation to the proposed facilities could affect soils by increasing use of areas located on undisturbed ground off of planned developments. New or expanded parking areas and/or trailheads at Kroto Creek, MP 12.8 and 16.3 of the Petersville Road, MP 28 transportation center on Petersville Road, Forks Roadhouse area, Rabideux Creek, and Parks Highway MP 121.5 and 122 would increase winter and summer motorized use throughout the planning area. Motorized vehicle use would occur off of trails and paved areas. Impacts could include subsidence, erosion and compaction as vegetation is disturbed or removed and could be long-term. Mitigation measures would decrease, but not eliminate, impacts. These measures could include signage, fencing, revegetation and use of geotextiles. No department in the State of Alaska has citation authority to enforce existing regulations related to motorized use on general state land, so impacts from motorized use are expected to increase with the expected increase in use resulting from increased parking areas and trailheads proposed in this alternative.

Parks Highway

Soils in the Rabideux Creek parking area are Nancy silt loam soil and effects (subsidence and erosion) of construction of the parking area on 3.7 acres of these well-drained soils would not be expected to occur at a level requiring mitigation.

No detailed soils information is available for several of the proposed facilities along the Parks Highway, including the parking areas at MP 121.5 (10.7 acres) or the river access at Chulitna Bluffs (2.4 acres). However, it is likely that the proposed locations of these developments are on a variety of soils common to the surrounding uplands of the planning area, none of which are likely to be highly susceptible to erosion. During construction there would be some risk of subsidence depending on the degree of peat or muck at individual sites. Impacts to soil resources would be localized, would occur only during construction, and could be mitigated through the use of BMPs such as bank and ground stabilization using geotextiles or revegetation.

Petersville Road

The Petersville Road campground near the Forks Roadhouse at MP 18.6 covers about 15 acres (of which only about 3 acres would actually be cleared) that are mostly within the Strandline-Spenard-Kroto soil complex and thus, potential frost action and subsidence issues are likely to be minimal. However, this soil type is severely susceptible to erosion by wind and water. A portion of the campground (the northern oval loop) is within the Salamatof peat soils and would therefore be susceptible to subsidence. Construction impacts to soil resources would be localized to the immediate area of the facilities, would be short-term (occurring only during construction), and could be easily mitigated through the use of BMPs to reduce subsidence such as excavating and filling with gravel before constructing.

The viewpoint and turnout proposed at MP 12.8 of Petersville Road covers 1 acre that falls mostly within Spenard silt loam soil complex. However, the northern section, as well as the areas to the east and west of the proposed turnout, are within Salamatof peat soils. These two soil types both have the potential for high corrosion frost action and Salamatof peats are prone to subsidence. Overall, erosion at these sites would be localized to the disturbed area, short-term,

and could be minimized with BMPs as described above for the campground (Clark and Kautz 1998; Olszewski 1998).

The viewpoint and turnout at MP 16.3 of the Petersville Road is less than 1 acre within the Salamatof peat soil and Strandline-Spenard-Kroto soil complex. Therefore, shifting or settling would need to be considered for any structure placed upon these soils. Potential frost action and subsidence occurrence is minimal for Strandline-Spenard-Kroto soils; however these soils are susceptible to wind and water erosion (Clark and Kautz 1998; Olszewski 1998). Impacts to soils are expected to be short-term and mitigated with the use of BMPs such as the use of geotextiles during construction and subsequent and revegetation.

The Kroto Creek turnout improvements would occur within the existing developed footprint so there would be no further impact on soils at this site.

The parking/transportation facility situated at MP 28 of the Petersville Road incorporates three separate areas for parking and a shuttle turn-around area and would cover 5.5 acres. The bus turn-around area, vehicle parking area, and bus parking area are completely or almost entirely located in either peat or muck soils. Approximately half of the RV parking area is Kliskon silt loam, with the other half located in Slikok muck. While the Kliskon silt loam has minimal subsidence issues, there is a potential for frost action and wind and water erosion to occur. The other three soil types located in this area of the proposed transportation facility have similar engineering considerations. Soil erosion would be short-term and could be mitigated with the use of BMPs during construction as described above for the campground and turnouts.

Upgrading Petersville Road to a 24-foot gravel surface to MP 18.6 and constructing a bike path from MP 0-7 would require additional environmental compliance before construction.

Cumulative impacts

Past, present and future developments that would impact soil resources would be the same as those discussed for Alternative A. Cumulative impacts on soil resources resulting from past, present, and reasonably foreseeable future actions and the actions proposed under Alternative B would be moderate. The overall contribution of this alternative to the cumulative impacts on soils in the planning area would be noticeable due to indirect impacts from new or upgraded parking areas and trailheads, which would lead to increased cross-country ORV use throughout the South Denali region.

Conclusion

The direct and indirect impact on soils from development of Alternative B would result from developing facilities on approximately 140 acres of land and increasing opportunities for cross-country ORV use throughout the planning area. Direct impacts would be confined to soils in the immediate vicinity of the developments and could be easily mitigated with typical construction BMPs; however, indirect impacts from increased use would be more difficult to mitigate. For these reasons, impacts to soils would be considered moderate.

Alternative C - Parks Highway

Under Alternative C, recreational and visitor facilities would be constructed at sites in the Curry Ridge area, adjacent to the Parks Highway, and along the Petersville Road.

Curry Ridge

Developments proposed for the Curry Ridge area include a Visitor Center, access road to the Visitor Center, and a trail system in the vicinity of the center and on Curry Ridge.

The access road associated with Alternative C would be about 3.5 miles long and impact about 20 acres of land. Soils along the proposed road alignment are mostly Kroto and Strandline silt loam complexes in the lower elevations, with Puntilla silt loam as the road gains elevation. The Strandline-Kroto Complex presents minimal potential frost action and subsidence issues, while the Puntilla silt loam poses possible frost action difficulties. Both types of soils have a high potential for water and wind erosion. Construction of an access road would create potential for erosion and subsidence along the access road corridor. These effects could last throughout the design life of the road, and may require some redesign of the access road. Specific BMPs would be determined as part of the engineering design process. Specific construction techniques and BMPs would be determined based on geotechnical investigation.

The proposed visitor center at the northern end of the access road is almost entirely within the Strandline-Kroto silt loam soil complex and would cover about 4 acres. The southeastern portion of the facility, which is proposed for bus turnaround and ranger parking, falls within Chuit and Nakochna silt loams. Similar to the Strandline Kroto complex, these silt loams have minimal subsidence issues; however frost action is a possibility. The trail system would impact about 70 acres in the vicinity of the visitor center. While no detailed information on soils potentially impacted by the trails system exists, due to the elevation and soils typically found in the area as characterized by the visitor center, it is likely that similar impacts would be associated with these trails.

Overall impacts on soils due to the visitor center and trail system would be localized to the immediate vicinity of the developments and could be mitigated with BMPs and construction techniques as described for Alternative B.

Visitation to the proposed facilities could affect soils by increasing use of areas located on undisturbed ground off of planned developments. New or expanded parking areas and/or trailheads at Kroto Creek, MP 12.8 and 16.3 of the Petersville Road, Forks Roadhouse area, Rabideux Creek, and Parks Highway MP 121.5 and 122 would increase winter and summer motorized use throughout the planning area. Motorized vehicle use would occur off of trails and paved areas. Impacts could include subsidence, erosion and compaction as vegetation is disturbed or removed and could be long-term. Mitigation measures would decrease, but not eliminate, impacts. These measures could include signage, fencing, revegetation and use of geotextiles. No department in the State of Alaska has citation authority to enforce existing regulations related to motorized use on general state land, so impacts from motorized use are expected to increase with the expected increase in use resulting from increased parking areas and trailheads proposed in this alternative.

Parks Highway

Effects on soils along the Parks Highway within the planning area would be the same as those described for Alternative B with the addition of a parking area and campground at MP 134.6 of the highway. The proposed transportation/parking area and campground facility at the MP 134.6 of the Parks Highway lies on 28.6 acres (of which about 20.3 acres would be disturbed) within two soil types: Strandline-Kroto Complex and Spenard Silt Loam. The vast majority of the facility is within the Strandline-Kroto complex, but the southern portion of the campground is in Spenard silt loam soils. The Strandline-Kroto Complex presents minimal potential frost action and subsidence issues, while the relatively small swale of Spenard Silt Loam poses possible frost action difficulties. As described for Alternative B, overall impacts on soil due to the Parks Highway developments would be localized to the immediate area of the developments and could be easily mitigated by BMPs and specific construction techniques. These would be determined after detailed soil testing as part of the engineering design phase.

Petersville Road

Effects on soils along the Petersville Road would also be the same as those described for Alternative B; however, there would be no parking/transportation center at MP 28, and Petersville Road would not be upgraded to MP 18.6. Therefore total area of soil impacted along the Petersville Road under Alternative C would be less than 17 acres. All other impacts would be the same and would be minor in magnitude and localized. They could be mitigated by specific BMPs and construction techniques as described for Alternative B.

Cumulative impacts

Past, present and future developments that would impact soil resources would be the same as those discussed for Alternative B. Cumulative impacts on soil resources resulting from past, present, and reasonably foreseeable future actions and the actions proposed under Alternative C would be moderate. The overall contribution of this alternative to the cumulative impacts on soils in the planning area would be noticeable due to indirect impacts from new or upgraded parking areas and trailheads, which would lead to increased cross-country ORV use throughout the South Denali region.

Conclusion

The direct and indirect impact on soils from development of Alternative C would result from developing facilities on approximately 150 acres of land and increasing opportunities for cross-country ORV use throughout the planning area. Direct impacts would be confined to soils in the immediate vicinity of the developments and could be easily mitigated with typical construction BMPs; however, indirect impacts from increased use would be more difficult to mitigate. For these reasons, impacts to soils would be considered moderate.

WATER QUALITY

Methodology

In order to determine impacts on water quality, impacts to nearby water bodies from construction activities, stormwater runoff, and sanitary wastes were considered.

To evaluate the potential for impacts to water quality during construction and operations, the results from the stormwater study for Anchorage (Municipality of Anchorage 2000a and 2000b) were used and extrapolated to the rural, low-traffic scenario anticipated for the South Denali Implementation Plan alternatives. These reports provided the typical components in stormwater for an urban area, but can be used as the worst-case scenario for a more rural area. The Alaska Department of Environmental Conservation (ADEC) Water Quality Standards (18 Alaska Administrative Code [AAC] 70) and the ADEC Alaska Water Quality Criteria Manual for Toxic and Other Deleterious Organic and Inorganic Substances were used to evaluate the magnitude of potential water quality impacts. These criteria for growth and propagation of fish, shellfish, and other aquatic life and wildlife are summarized in 18 AAC 70 and include total aqueous hydrocarbons less than 15 u/L, and turbidity not exceeding 25 NTU above natural conditions.

General Impacts

Construction runoff could introduce high sediment loads and pollutants such as fuel and lubricants from construction equipment. Trail construction could introduce sediments to small streams that may be crossed by the trails. During operations, stormwater runoff from access roads and facility parking areas could introduce vehicle-related pollutants into the streams and lakes from the use of the roads and parking lots. Sanitary wastes would be generated at the nature center, visitor center, turnouts and/or campgrounds under any of the action alternatives. Dispersed recreational activities utilizing powered equipment such as boats, ORVs, and snowmachines could introduce pollutants similar to those anticipated for passenger vehicles. Other recreational activities such as hiking or canoeing could also introduce litter and sanitary wastes.

Impact Level Definitions

Comparison of predicted water quality effects to regulatory limits was used to determine the magnitude of impact.

- Minor: Impacts are below water quality standards and/or regulatory limits.
- Moderate: Impacts are equal to water quality standards and/or regulatory limits.
- Major: Impacts exceed water quality standards and/or regulatory limits.

Alternative A - No Action

Alternative A would result in no direct or indirect effects to water resources. No new visitor centers and associated access roads or parking areas would be built under this alternative.

Cumulative impacts

Cumulative impacts include the effects of past, present and reasonably foreseeable future events, which could have or would be expected to impact water quality along the Parks Highway, Petersville Road, and in the Peters Hills region within the planning area. In the past, these impacts have mainly been due to road runoff and increased housing and businesses along the two highways producing sanitary and other household wastes, and increased sedimentation and pollutants such as hydrocarbons and metals from mining activities in the Peters and Dutch Hills area. Because water quality in the area is still very good and the magnitude of the past impacts has been below AWQS, past effects can be considered minor in magnitude.

Reasonably foreseeable future actions are described in detail at the beginning of this chapter. Actions that could impacts water quality include:

- Planned improvements to the Petersville Road, which would improve access to State, borough and private lands.

- Improved public recreation and tourism facilities such as continued improvements in the power and range in off-road vehicle transportation (snowmachines and ORVs) and boats, and new backcountry trails.

- The Boy Scouts of America plan to construct a new camp that would hold up to approximately 600 people per day in the summer, 300 on the property and 300 trekking and camping throughout the South Denali region. This activity, in addition to other backcountry users, could affect water quality by increasing turbidity at stream crossings and by human waste contamination from camping.

- Mining activities, already present in the Peters and Dutch Hills areas, would continue. Such activity could negatively impact water quality.

- Timber harvesting generally impacts water quality by increasing turbidity and sedimentation in streams. The Matanuska-Susitna Borough has several contracts for land in or near the planning area that have been harvested or are available for harvest ranging between 300 and 1280 acres.

- The number of residences and recreational cabins along the Petersville Road has been steadily increasing since the 1980s and as a result new roads and driveways have been developed. Land disposals along Parks Highway and Petersville Road planned for 2006 by the Matanuska-Susitna Borough and ADNR parcel sales could result in increased development.

Future improvements to backcountry areas, visitor/tourist access, and increased use of the region by large numbers of recreational users could impact water quality by increasing sedimentation and turbidity, especially if new trails or facilities are located near a stream, river or lake, or if user routes cross a water body. Introduction of pollutants from motorized vehicles and boats could occur in water bodies adjacent to ORV trails and new visitor access points. Increased backcountry use often results in human waste disposal issues. If human waste is left in the backcountry, it may result in added nutrients to streams near trails, which can result in an increased demand for dissolved oxygen by the plants and animals in the area. *Giardi lamblia* cysts have been found in watersheds on the south side of Denali, these cysts can be a result of improper human waste disposal (NPS 1997a). Additional impacts of litter, refuse, petroleum byproducts, and accelerated bank erosion from wave generation or trail use can be the result of increased recreational use. Increased runoff from semi-permeable (trails) or impermeable surfaces (roads and parking lots) could increase sedimentation, turbidity, conductivity, salts, and dissolved solids in local streams or water bodies.

Water quality in drainages such as Cache Creek, Dutch Creek, and Peters Creek would be impacted by increased sedimentation, turbidity, bank erosion, and the introduction of some metals as a byproduct of mining and timber activities.

Reasonably foreseeable future impacts to water quality from developments such as homes, recreational cabins, and hotels would be localized and intermittent. However, developments such as homes and hotels would require drilling for wells and septic tanks, if the area can support them. Although groundwater data are insufficient to determine the quality or quantity, spills or leaks from septic tanks, as well as earth-moving activities and equipment spills or leaks can impact both groundwater and surface water quality during construction.

Because all cumulative impacts have not exceeded water quality standards, or would not exceed standards, it is expected that existing water uses and, in general, water quality would be maintained and protected. Thus, the cumulative impacts on water quality resulting from past, present, and reasonably foreseeable future actions would be minor.

Conclusion

Alternative A would not have any direct or indirect impacts on water quality in the planning area because no new facilities or activities would be proposed under this alternative.

Alternative B - Peters Hills

Under Alternative B, recreational and visitor facilities would be constructed at sites in the Peters Hills area, adjacent to the Parks Highway, and along the Petersville Road. Construction activities (such as removing vegetation, blasting and earth-moving activities, and trampling of stream banks and upland soils in the vicinity of the new trails) would temporarily impact water quality adjacent to all of these areas by increasing sedimentation and turbidity in runoff to the nearby water bodies. Impacts to water quality could also result from spills and leaks of fuel and lubricating oil from heavy equipment and other motor vehicles.

Operations and maintenance of the proposed facilities could affect water quality by adding pollutants (from motor vehicles and sanitary waste removal), increasing the sediment load in adjacent water bodies, and altering water flow patterns.

Peters Hills

The Peters Hills facilities include a nature center and access road, trail system, backcountry facilities, and a cabin. The nature center would include a 9,100 square foot building situated on a 2.5 acres site. Because it is not known if sufficient groundwater would be available for facility use, water may need to be hauled to the nature center site in Peters Hills. Vaulted toilets or Porta-Johns would be designed for the facility; sanitary waste would be pumped from the facility into trucks and removed from the site. There is a lake just east of the nature center where human waste spills/leaks from vaulted toilets or Porta-Johns could introduce of fecal coliform bacteria and/or *Giardi lamblia* cysts to the water body. However, these spills would be minor in magnitude, localized and short-term. BMPs to minimize spills and leaks during pumping of sanitary facilities (checking hoses and equipment prior to pumping, ensuring connections are tight, using drip pans or absorbents at connection locations) and checking of holding tanks on a regular basis to ensure integrity would also serve to minimize spills of sanitary waste to nearby water bodies.

The Peters Hills access road would be about 7 miles long, would cross two anadromous streams, and would require two bridges. Culverts would be added for any small or intermittent stream crossings and would be designed such that flow is maintained and would not create a flood risk. The alignment for the access road runs perpendicular to the natural drainages. Therefore, it is not possible to avoid transverse encroachments of the two anadromous streams. In-water work (if necessary to facilitate bridge construction) would be limited to periods when anadromous fish are not present. However, construction of the access road would likely increase stream turbidity even if in water work is limited or deemed not necessary. Minor increases in sedimentation and turbidity in streams can be tolerated for short periods of time (NPS 1997a), and construction BMPs such as use of hay bales to block turbid runoff and timing to avoid construction during high flow periods and the presence of anadromous fish would lessen the magnitude of construction impacts. These measures would be important in minimizing impacts to the two anadromous stream crossings along the access road. Spills and leaks from construction machinery would also be mitigated by BMPs such as use of drip pans, maintenance and upkeep of equipment, and refueling at locations away from water bodies.

Accidental spills of asphalt during access road and parking area construction could potentially adversely affect water quality as it has many organic compounds that have varying toxicological properties that have caused health problems including petroleum, polycyclic aromatic hydrocarbons and oil (NPS 1997a). Asphalt can have persistent long-term environmental effects.

Because of the low levels of traffic anticipated for the access road and parking lot at the nature center, and the fact that access to the road and nature center would be controlled, it is unlikely that adverse impacts to water quality would occur in water bodies adjacent to the access road and nature center footprints. Results from stormwater research by the FHWA indicate that stormwater runoff from low to medium traffic volumes (under 30,000 vehicles per day) on rural highways exerts minimal to no impact on the aquatic components of most receiving waters (Municipality of Anchorage 2000). Studies conducted in Anchorage, Alaska, under the Municipality of Anchorage Watershed Management Program similarly concluded that street runoff has minimal impacts to the water quality of receiving waters from most potential pollutants (Municipality of Anchorage 2000). These studies showed dissolved concentrations of calcium, chromium, magnesium, and zinc to be below the Alaska Water Quality Standards (AWQS). Only dissolved concentrations of copper and lead were noted to be above their AWQSs; however, modest dilution would likely reduce these concentrations below their AWQS. Identified concentrations would not adversely impact streams with flow rates greater than 0.5 cubic foot per second (MOA, 2000e). Polynuclear aromatic hydrocarbons were at concentrations below the EPA water quality criteria.

Due to the rural setting of the planning area and the predicted low annual average daily traffic (120 vehicles per day), fewer impacts to water quality in the planning area would occur than were found in the Anchorage studies. Because the access road would not be maintained in the winter there would be no snow removal or use of de-icing chemicals or sanding. Potential runoff pollutants would not be concentrated in one area and runoff from the proposed access road would not exceed AWQS or adversely impact the water quality of receiving waters for the long term. Potential contamination from oil or hazardous substance spills would be low due to the rural setting of the road and the low predicted traffic volume. Contaminant concentrations in runoff from the access road would not exceed AWQS or adversely impact the water quality of receiving waters over the long term.

Thirty-one miles of trails would be constructed near the new nature center. Trail construction impacts would include trampling of vegetation in the vicinity of the trail and short-term increased sedimentation in streams that the trails may cross. Human waste from backcountry use may result in added nutrients to streams near trails, which can result in an increased demand for dissolved oxygen. *Giardi lamblia* cysts have been found in watersheds on the south side of Denali which can be a result of improper human waste disposal (NPS 1997a). Additional impacts of litter, refuse, and petroleum byproducts can be due to increased access and recreation.

Overall impacts to water quality in the vicinity of the Peters Hills developments due to construction, operations, and maintenance of the facilities would be localized to water bodies in the immediate area of the activities. However the duration of impact would be long-term, continuing through the planning period (2020). Visitation to the proposed facilities could affect water quality by increasing use of areas located near water. New or expanded parking areas

and/or trailheads at Kroto Creek, MP 12.8 and 16.3 of the Petersville Road, MP 28 transportation center on Petersville Road, Forks Roadhouse area, Rabideux Creek, and Parks Highway MP 121.5 and 122 would increase winter and summer motorized use throughout the planning area. Motorized vehicle use would occur off of trails and paved areas. Introduction of pollutants from motorized vehicles could occur in water bodies adjacent to ORV trails or routes. Impacts could be long-term. No department in the State of Alaska has citation authority to enforce existing regulations related to motorized use on general state land, so impacts from motorized use are expected to increase with the expected increase in use resulting from increased parking areas and trailheads proposed in this alternative.

Parks Highway

The Parks Highway facilities associated with Alternative B consist of parking areas at MP121.5-122 and Rabideux Creek, new access to the Chulitna River near MP 121.5, and new river access near the mouth of Troublesome Creek. The parking areas and river access would contribute to pollutant loads (such as gasoline and oils from motor vehicles and boats) in stormwater runoff to adjacent water bodies. The parking areas and river access would be designed to minimize stormwater flow and other pollutants directly into nearby creeks and ponds.

The parking areas at MP121.5 and Rabideux Creek would also have vaulted toilets. They would be adjacent to the Chulitna River and Rabideux Creek, respectively; human waste spills/leaks from vaulted toilets or Porta-Johns could introduce of fecal coliform bacteria and/or *Giardi lamblia* cysts to these water bodies. However, these spills would be minor in magnitude, localized, and short-term. BMPs to minimize spills and leaks during pumping of sanitary facilities (checking hoses and equipment prior to pumping, ensuring connections are tight, using drip pans or absorbents at connection locations) and checking of holding tanks on a regular basis to ensure integrity would also serve to minimize spills of sanitary waste to nearby waters. Human waste from backcountry use may result in added nutrients to streams near primitive trails, which can result in an increased demand for dissolved oxygen. *Giardi lamblia* cysts have been found in watersheds on the south side of Denali which can be a result of improper human waste disposal (NPS 1997a). Additional impacts of litter, refuse, and petroleum byproducts can be anticipated due to increased access and recreational use of the area.

Overall impacts to water quality in the vicinity of the Parks Highway developments would be localized to water bodies in the immediate area of the activities. However the duration of impact would be long-term, continuing through the planning period (2020).

Petersville Road

Petersville Road facilities under this alternative include a campground, turnouts at MP 12.8, MP 16.3, a parking area/transportation center at the base of the access road near MP 28 of the Petersville Road, an upgrade to MP 18.6, and a bike path from MP 0-7. As described above for parking areas on the Parks Highway, stormwater contaminated with oils and gasoline from motor vehicles using the turnouts and parking area/transportation center could contaminate nearby water bodies (see Chapter Three for a description of the streams that are crossed by the Petersville Road or are adjacent to the turnouts and parking/transportation area). In addition, the

parking/transportation area would have a septic drainfield for sanitary wastes. The drainfield would be designed such that impacts to adjacent waterbodies would not be expected.

The Petersville Road Campground would include restrooms, a camp host site, and tent and RV sites. It is unknown at this time whether the campground would have vaulted toilets, which are pumped out and the wastes disposed of at a publicly operated waste treatment facility (POTW), or an on-site septic system. There are two lakes in the vicinity and Peters Creek is adjacent to the campground; human waste spills/leaks from vaulted toilets or Porta-Johns could introduce of fecal coliform bacteria and/or *Giardi lamblia* cysts to these water bodies. However, these spills would be localized and short-term. BMPs to minimize spills and leaks (as described above for vaulted toilets at the Parks Highway parking areas) would also serve to minimize spills of sanitary waste to nearby water. If used instead of vaulted toilets, an on-site septic system would be designed specifically to avoid impacts to the nearby waters.

Overall impacts to water quality in the vicinity of the Petersville Road developments would be localized to water bodies in the immediate area of the activities. However the duration of impact would be long-term, continuing through the planning period (2020).

Cumulative impacts

Past, present and reasonably foreseeable effects would be the same as those discussed for Alternative A. It is expected that existing water uses and, in general, water quality would be maintained and protected. Thus, the cumulative impacts on water quality resulting from past, present, and reasonably foreseeable future actions and the actions proposed under Alternative B would be minor. The overall contribution of this alternative to the cumulative impacts on water quality in the planning area would be minimal.

Conclusions

The impact on water quality associated with developments along the Parks Highway and Petersville Road and in the Peters Hills under Alternative B would be minor in magnitude because it is unlikely that AWQs or other regulatory limits would be exceeded. Direct impacts would be localized to water bodies adjacent to the proposed facilities. Both direct and indirect impacts would be long-term, likely lasting through 2020, the life of the plan.

Alternative C - Parks Highway

Under Alternative C, recreational and visitor facilities would be constructed at sites in the Curry Ridge area, adjacent to the Parks Highway, and along the Petersville Road. Construction activities (such as removing vegetation, blasting and earth-moving activities, and trampling of stream banks and upland soils) would temporarily impact water quality by increasing sedimentation and turbidity in runoff to the nearby water bodies identified in Chapter Three. Impacts could also result from spills and leaks of fuel and lubricating oil from heavy equipment.

Curry Ridge

Developments proposed for the Curry Ridge area include a visitor center, access road to the visitor center, and a trail system in the vicinity of the center and on to Curry Lookout.

The new visitor center would be constructed on 4.1 acres. A septic system and well would be installed, and generators, fuel tanks and maintenance buildings would be included at the site. There are no streams or lakes in the immediate vicinity of the proposed center and therefore there would be no direct effects of operations and maintenance on water quality from this facility.

The access road has two stream crossings that would likely be crossed with culverts. In addition to increasing sedimentation from construction, vehicular traffic in areas previously inaccessible by road could impact water quality. As discussed for Alternative B, these activities could introduce metals, fuel, oil, and other potential contaminants to watercourses, principally through runoff. However, as discussed for Alternative B, runoff from the proposed access road would not exceed AWQS. Potential contamination from oil or hazardous substance spills would be low due to the rural setting of the road and the low predicted traffic volume.

Thirteen miles of trails would be constructed near the new visitor center. Trail construction impacts are the same as those discussed under Alternative B. As described in Chapter Three, there are numerous lakes and streams in the vicinity of the proposed trails. Human waste treatment and disposal would be a concern related to backcountry use, as discussed for Alternative B. Overall impacts to water quality in the vicinity of the Curry Ridge developments due to operations and maintenance of the facilities would be localized to water bodies in the immediate area of the activities. However the duration of impact would be long-term, continuing through the planning period (2020).

Parks Highway

Effects on water quality along the Parks Highway within the planning area would be the same as those described for Alternative B with the addition of a parking area and campground on 28.6 acres at MP 134.6 of the highway. Effects of the parking area and campground would be the same as those described for Alternative B for similar facilities (i.e., the campground at the Forks Roadhouse and the parking/transportation center at MP 28 of the Petersville Road). As described above for Alternative B, impacts of developments proposed along the Parks Highway would be minor in magnitude and extent, but long-term in duration (lasting throughout the planning period).

Petersville Road

Effects on water quality along the Petersville Road would also be the same as those described for Alternative B; however, there would be no parking/ transportation center at MP28, and no upgrade to MP 18.6. All other impacts would be the same and would be minor in magnitude and extent and long-term in duration.

Cumulative impacts

Past, present and reasonably foreseeable effects would be the same as those discussed for Alternative A. It is expected that existing water uses and, in general, water quality would be maintained and protected. Thus, the cumulative impacts on water quality resulting from past, present, and reasonably foreseeable future actions and the actions proposed under Alternative C would be minor. The overall contribution of this alternative to the cumulative impacts on water quality in the planning area would be minimal.

Conclusion

The impact on water quality associated with developments in the Curry Ridge area and along the Parks Highway and Petersville Road under Alternative C would be minor in magnitude because it is unlikely that AWQs or other regulatory limits would be exceeded. Direct impacts would be localized to water bodies adjacent to the proposed facilities. Both direct and indirect impacts would be long-term, likely lasting through 2020, the end of the life of the plan.

AQUATIC RESOURCES AND FISH

Methodology

A four-step process was used to determine the potential impacts on aquatic resources and fish.

1. Review existing information to determine the locations of anadromous streams relative to the locations of the various proposed project actions. Material reviewed included: ADF&G's interactive Fish Distribution Database (FDD) (ADF&G 2004) the *Catalog of the waters important for the spawning, rearing, or migration of anadromous fishes* (ADF&G 1991), and project scoping comments received from the Office of Habitat Management and Permitting (OHMP) (ADNR 2004). Information from a field study conducted in 2004 to confirm the presence of anadromous streams along Petersville Road was also considered (URS 2004c).

2. Consider the potential project effects on aquatic resources:

    - The survival and propagation of aquatic species depends on habitat, free migration, climate (flooding, severely early freezes), water quality, and quantity. Water quality can be affected by sediment and hydrocarbon runoff from roads and parking areas during both construction and use. The high use of dirt roads can produce a large amount of

airborne sediment that may deposit in adjacent waters. The improper design or lack of an adequate number of restroom facilities along the transportation route could lead to nutrient and bacterial contamination of adjacent waters.

- Clearing of vegetation adjacent to streams for campground or other facilities can result in the direct loss of riparian vegetation that provides fish habitat and indirect losses due to trail development along streams for fishing or boating launch points. All project features must be designed to provide access points to state resources that would not lead to direct or indirect impacts to water quality and fish habitat.
- Road construction that blocks or modifies the surface or subsurface movement of water can alter the quantity of water in small streams at certain times of the year, and fish passage. Small wetland streams provide important habitat for many fish species, but particularly rearing coho salmon. Improperly designed road crossing structures can modify water velocities and stream sediment transport rates, thereby affecting juvenile and adult fish migration and fish habitat.

3. Determine the environmental consequences of the proposed project alternatives on aquatic resources and fish.

4. Evaluate the impacts on fish and fish habitat. Consider magnitude of impact, the proximity to waters supporting anadromous fish, and potential for mitigation of effects.

General Impacts

General impacts include the mortality of anadromous and resident fish, disruption or disturbance of spawning and rearing behavior, and destruction of spawning and/or rearing habitat for both anadromous and resident fish. The mechanisms by which the proposed actions could affect these resources include: the placement of fill or trenching for the construction of roads and parking areas, sediment runoff into streams from improperly designed trails, sediment precipitation into waters from heavy dirt road use by vehicles, and disturbance to or mortality of fish.

Impact Level Definitions

- Minor: Few individuals have reduced survival or reproductive success, but there is no measurable change in the population; and/or there is a loss of a moderate amount of a common habitat.

- Moderate: There is a population change in most of the planning area, and/or there is some loss of rearing habitat.

- Major: An entire population within a stream or river is impacted, and/or there is a loss of habitat that is important to reproduction or survival.

Alternative A – No Action

Under the No Action alternative, there would be no change from the current management direction that represents the existing condition in the South Denali region. There would be no approved plan for local, state, and federal agencies to cooperatively improve and increase recreational opportunities and access to the South Denali region; therefore there would be no new construction and no new impacts on fish and aquatic resources.

Cumulative impacts

Cumulative impacts include the effects of past, present and reasonably foreseeable future events, which could have or would be expected to impact fish and aquatic resources along the Parks Highway, Petersville Road, and in the Peters Hills region within the planning area.

The following activities are identified as reasonably foreseeable within the temporal and geographical scope of this proposed project. Discussion of reasonable foreseeable activities is limited to those considered to have a potential impact to aquatic resources and fish within the proposed planning area.

Mining activity and development would occur on previously undeveloped land in and surrounding the planning area. Mining activity includes increased placer gold mining activity in the drainages of Dutch, Cache (anadromous), and Peters creeks (anadromous); and activation of the existing mining claims along Petersville Road when land is conveyed from the federal government. Placer gold mining can affect fish behavior, fish mortality, and habitat by damaging the substrate or smothering the fish eggs with sediment. However, OHMP restricts the use of certain equipment in anadromous streams (i.e., suction dredges) as well as the time of year the stream may be mined (allowed only during summer months) to prevent disturbance of spawning or rearing fish and/or destruction of habitat. The Alaska Administrative Code (11 AAC 12 and 11 AAC 20) specifies regulations regarding recreational gold panning, focusing on the protection of anadromous fish and eggs, stream substrate, stream banks, and vegetated areas. Based on the existence of these regulations, the impacts to fish behavior, fish mortality, and habitat should be minimal.

Boy Scouts of America plans include development of up to a 600 person per day camping facility that would involve day users who may hike and camp throughout the South Denali region and raft the Chulitna and/or Susitna rivers. Whiskers Creek (anadromous) runs through this area. Provided that the campground design accounts for vegetative buffers between the cleared site and these three anadromous streams (which would help filter runoff), there should be no impact to the Chulitna or Susitna Rivers or Whiskers Creek. Increased access to public lands within or near the planning area would necessitate improvements to the existing trail systems or the construction of new trails, which may cross anadromous streams, and if so, the design and construction of the trail systems considerations discussed above must be followed. River rafting would likely increase over time due to the increased accessibility mentioned above, and there is interest in transporting McKinley Princess Resort guests across the Chulitna River via jetboat. Rafting would likely not have an affect on fish behavior, fish mortality, and habitat aside from minimal stream bank damage from putting in and taking out of rafts. The ferryboat could impact

fish and habitat through an accidental fuel spill; however, the likelihood of a spill of consequence is low because the ferry would be inspected and maintained.

Improved public recreation and tourism facilities such as continued improvements in the power and range in snowmachines, ORVs, and boats would lead to the introduction of pollutants from motorized vehicles and boats. Pollutants that could affect individual organisms would be introduced in water bodies adjacent to ORV trails and routes and new visitor access points.

The actions discussed above would serve to increase access to and development of previously undisturbed areas near anadromous fish streams. However, with proper construction techniques to ensure proper fish passage and minimal impacts to stream habitat, the integrity of the anadromous streams within the planning area can be maintained. Therefore, cumulative impacts to fish and aquatic resources would be localized and minor because measurable changes to populations are not expected and only common habitat would be lost.

Conclusion

Alternative A would have no effects on aquatic resources and fish within the planning area.

Alternative B – Peters Hills

Under Alternative B, recreational and visitor facilities would be constructed at sites in the Peters Hills area and adjacent to the Parks Highway and Petersville Road.

Peters Hills

The Peters Hills facilities include a nature center and access road, trail system, backcountry facilities, and a cabin. The proposed nature center would be located on lands within the boundary of Denali State Park at around 3,000 feet in elevation. Any runoff from construction or operation of the building would flow down gradient. Provided that BMPs such as the use of silt curtains, hay bales and erosion control measures are followed during construction, there would be no effect on the anadromous Bunco or Cottonwood creeks, located on either side of the proposed location. Revegetation after construction would minimize additional silty runoff.

The proposed 7-mile access road to the Peters Hills nature center would cross two anadromous streams (Bunco Creek and an unnamed tributary to Bunco Creek). Runoff during construction and during use of the paved road could potentially contain sediment, petroleum hydrocarbons, and nutrients. Road access would be limited during the main summer season to buses and administrative vehicles. The estimated average daily traffic (ADT) would be low (120 vehicles) and there would be a buffer between the shoulders of the road and the original ground, which would filter out any pollutants. Therefore, none of these components would be expected to cause mortality or disturbance of anadromous and resident fish or destruction of their habitat.

Bridges would be required where the access road would cross two anadromous streams: Bunco Creek and the unnamed tributary to Bunco Creek. These crossings would be over gullies, not directly over the streams. Construction would be limited to building abutments on either side of

the gully and adding a span in between. There would be no in-stream work required, so there would be no impacts to fish or fish habitat.

The approximately 31 miles of trails that would be constructed in the vicinity of the nature center would collectively approach or cross anadromous Bunco Creek, Cottonwood Creek, Long Creek, Tokositna River, and/or the unnamed tributary to Bunco Creek. Brush would be cleared on either side of a 15-mile hiking trail. The design and construction of the trail systems would preserve the riparian areas along the riverbanks that provide habitat for anadromous and resident fish species. Erosion of the stream banks from a poorly designed trail can affect water quality through increased sedimentation, which can smother fish eggs deposited in the stream bottom.

Parks Highway

The Parks Highway facilities associated with Alternative B consist of parking areas at MP121.5-122 and Rabideux Creek, new access to the Chulitna River near MP 121.5, and new river access near the mouth of Troublesome Creek. The parking areas and river access would contribute pollutants and increase sediment loads (such as gasoline and oils from motor vehicles and boats) in stormwater runoff to adjacent water bodies that could subsequently impact fish and fish habitat. The parking areas and river access would be designed to minimize stormwater flow and other pollutants directly into nearby creeks and ponds (see Impacts to Water Quality section of this chapter).

Improvements at the existing paved parking area on the east side near MP 121.5 Parks Highway would occur within most of the existing footprint. Currently, there is a vegetated buffer between the parking area and the anadromous Chulitna River, as well as a bluff. Asphalt paving and use of 36 additional parking spaces should not increase the potential for sediment and accidental hydrocarbon runoff into the Chulitna River because design standards and BMPs would be followed. Providing that the planned restroom facilities are properly designed and adequate in number, no contamination of the Chulitna River should occur. Therefore, there should be no effects to fish behavior, fish mortality, and habitat from this action.

The Rabideux Creek parking area would be constructed near the confluence of Rabideux Creek and the Susitna River (both anadromous), near MP 105 of the Parks Highway. Depending on the topography of the location, the water quality of Rabideux Creek could be affected from sediment and hydrocarbon runoff from the 50-vehicle capacity parking area during both construction and operation and maintenance. However, through proper design and construction (including following an erosion control plan and BMPs to address sediment laden runoff), and the preservation of a vegetated buffer, contamination would be unlikely, and there should be no effect to fish behavior, mortality, or destruction of fish habitat. Provided that the planned restroom facilities are properly designed and adequate in number, no nutrient and bacterial contamination of Rabideux Creek should occur.

A proposed primitive trail system for the Chulitna Bluff/Rabideaux/106 Seismic Trail System, and a route to access recreational areas to the west excluding the use of Petersville Road would be developed. This trail system would run nearly parallel to the Parks Highway, between the highway and the Chulitna River, from approximately MP 131 south to where it would cross the

Parks Highway at MP 106, and then continue, heading west for another 12 miles. Based on the maps provided in the *2000 Matanuska-Susitna Borough Recreational Trails Plan* (Matanuska-Susitna Borough 2000) this trail system would not cross the Chulitna River, but would cross Trapper Creek, Rabideux Creek, Ninemile Creek, Queer Creek, Moose Creek and its tributaries, and tributaries to the Deshka River (all of which are anadromous). Use of the trails and rivers in winter would have no effect on fish and habitat.

Petersville Road

Petersville Road facilities under this alternative include a campground; turnouts at MP 12.8, MP 16.3, and Kroto Creek, a parking area/transportation center impacting 5.5 acres at the base of the access road near MP 28 of the Petersville Road, an upgrade to MP 18.6, and a bike path from MP 0-7.

The proposed campground near MP 18.6 (Forks Roadhouse) of Petersville Road would be located to the east of the road near a small lake that doesn't connect with a cataloged anadromous stream. It has not been determined whether or not the road around the campground would be paved. As long as the planned restroom facilities are properly designed and adequate in number, no contamination of the nearby lake should occur. A vegetative buffer placed or retained between the campsites and lake would help to filter out sediment and accidental hydrocarbon runoff into the nearby lake during both construction and use. This would protect resident fish species and habitat that may be present.

All turnouts are distant from the nearby anadromous streams (Kroto, Seventeenmile, Twentymile, and Kenny creeks) by about 0.5 miles in either direction, and because of this spatial separation, there should be no effects on fish behavior, fish mortality, and destruction of habitat from construction or operations and maintenance of these turnouts.

The proposed parking area/transportation center near the junction of Petersville Road and the proposed access road (MP 28 of Petersville Road) would not likely affect fish or fish habitat due to the spatial separation between the proposed lot and the closest anadromous streams (Peters Creek and Deep Creek). For this reason, there should be no potential for sediment and accidental hydrocarbon runoff into these streams during either construction or operations and maintenance.

The proposed road upgrade and bike path would require additional environmental compliance.

Visitation to the proposed facilities could affect aquatic resources by increasing use of areas located near water. New or expanded parking areas and/or trailheads at Kroto Creek, MP 12.8 and 16.3 of the Petersville Road, MP 28 transportation center on Petersville Road, Forks Roadhouse area, Rabideux Creek, and Parks Highway MP 121.5 and 122 would increase winter and summer motorized use throughout the planning area. ORV use would occur off of trails and paved areas. Introduction of pollutants from ORVs could occur in water bodies adjacent to ORV trails or routes. Impacts could be long-term. No department in the State of Alaska has citation authority to enforce existing regulations related to motorized use on general state land, so impacts from motorized use are expected to increase with the expected increase in use resulting from increased parking areas and trailheads proposed in this alternative.

In summary, developments associated with Alternative B would occur in the vicinity of streams that support anadromous and/or resident fish populations. Overall impacts to fish populations and fish habitat would be minor because only a few individuals would likely be impacted and habitat is not limited in the areas so only a loss of a modest amount of common fish habitat would likely occur, resulting in a minor impact. However the duration of impact would be long-term, continuing through the planning period (2020). As long as BMPs are followed during construction and operations of the facilities, additional impacts to anadromous streams and other waters are not expected.

Cumulative impacts

Past, present and reasonably foreseeable effects would be the same as those discussed for Alternative A. Those actions, in conjunction with Alternative B, would serve to increase access to and development of previously undisturbed areas near anadromous fish streams. However, with proper construction techniques to ensure proper fish passage and minimal impacts to stream habitat, the integrity of the anadromous streams within the planning area can be maintained. Therefore, cumulative impacts to fish and aquatic resources would be localized and minor because measurable changes to populations are not expected and only common habitat would be lost. The overall contribution of this alternative to the cumulative impacts on fish and aquatic resources in the planning area would be minimal.

Conclusion

Direct and indirect impacts on fish and aquatic habitat would occur from development of Alternative B. Direct impacts would be confined to water bodies in the immediate vicinity of the developments. Both direct and indirect impacts would not be expected to cause fish population level effects and would only affect common habitat, resulting in a minor impact. In addition impacts to fish habitat could be easily mitigated with typical construction BMPs to protect water quality as described in the Impacts to Water Quality section of this chapter.

Alternative C – Parks Highway

Under Alternative C, recreational and visitor facilities would be constructed in the Curry Ridge area and at sites adjacent to the Parks Highway and Petersville Road.

Curry Ridge

Developments proposed for the Curry Ridge area include a visitor center, access road to the visitor center, and a trail system in the vicinity of the center and on Curry Ridge.

The new visitor center would be constructed to the east of the Parks Highway, about 2 miles south of anadromous Troublesome Creek. There are no streams or lakes in the immediate vicinity of the proposed center and therefore there would be no direct effects of operations and maintenance on fish and aquatic resources from this facility.

The proposed 3.5 mile long access road, which would connect the visitor center with MP 134.6 of the Parks Highway, would not cross any anadromous fish streams. Road access would be limited during the main summer season mainly to buses and administrative vehicles. Runoff during construction and use of the paved road could potentially contain sediment, heavy metals, salts, organic molecules, ozone, and nutrients. However, none of these components are expected to cause mortality or disturbance of anadromous and resident fish or destruction of their habitat, due to the spatial separation between the proposed facility and anadromous streams, the low estimated average daily traffic (ADT) of 120 vehicles, and the buffer proposed between the shoulders of the road and the original ground, which would filter out any pollutants.

Parks Highway

Effects on fish and aquatic resources along the Parks Highway within the planning area would be the same as those described for Alternative B with the addition of a parking area and campground. The proposed campground would be constructed adjacent to the proposed parking area at MP 134.6 of the Parks Highway. The proposed toilet facilities would involve a septic system instead of vaulted toilets, which, if designed correctly, would eliminate the possibility of bacterial or nutrient contamination in nearby waters. Due to the distance between the Chulitna River and the Parks Highway, and the fact that a vegetative buffer would surround the parking area and campground, there would be no impact to fish or fish habitat in the Chulitna River from runoff of any kind. As described above for Alternative B, impacts of developments proposed along the Parks Highway would be minor in magnitude and extent, but long-term in duration (lasting throughout the planning period).

Petersville Road

Effects on fish and aquatic habitat along the Petersville Road would also be the same as those described for Alternative B; however, there would be no parking/ transportation center at MP28. All other impacts would be the same and would be minor in magnitude and extent and long-term in duration.

In summary, developments associated with Alternative C would occur in the vicinity of streams that support anadromous and/or resident fish populations. Overall impacts to fish populations and fish habitat would be minor because only a few individuals would likely be impacted and habitat is not limited in the area, so only a loss of a very modest amount of common fish habitat would likely occur, resulting in a minor impact. However the duration of impacts, both direct and indirect, would be long-term, continuing through the planning period (2020). As long as BMPs are followed during construction and operations of the facilities, additional impacts to anadromous streams and other waters are not expected.

Cumulative impacts

Past, present and reasonably foreseeable effects would be the same as those discussed for Alternative A, and would serve to increase access to and development of previously undisturbed areas near anadromous fish streams. However, with proper construction techniques to ensure proper fish passage and minimal impacts to stream habitat, and in combination with the

possibility of restricted access to some trails and roads, the integrity of the anadromous streams within the planning area can be maintained. Therefore, cumulative impacts to fish and aquatic resources would be localized and minor because measurable changes to populations are not expected and only common habitat would be lost. The overall contribution of this alternative to the cumulative impacts on fish and aquatic resources in the planning area would be minimal.

Conclusion

Direct and indirect impacts on fish and aquatic habitat would occur from development of Alternative C. Direct impacts would be confined to water bodies in the immediate vicinity of the developments. Direct and indirect impacts would not be expected to cause fish population level effects and would only affect common habitat resulting in a minor impact. In addition, impacts to fish habitat could be easily mitigated with typical construction BMPs to protect water quality as described in the Impacts to Water Quality section of this chapter.

WETLANDS

Methodology

To determine the potential impacts on wetlands, a review of existing information was performed to determine the locations and size of wetlands relative to the various proposed project actions. Material reviewed included the U.S. Fish and Wildlife Service (USFWS) National Wetland Inventory (NWI) maps (NWI 1979; NWI 1980a; NWI 1980b; NWI 1980c), satellite imagery (IKONOS 1996), and aerial photographs (Aeromap 1996) of the planning area, and existing GIS data (MSB 2001a; MSB 2001b; MSB 2001c). A field study was conducted in 2004 to confirm the presence and identification of wetlands along the Petersville Road, and along Alternative B and C proposed access roads and visitor/nature centers (URS 2004d).

The effects of the proposed project on wetlands are determined through the following steps:

- Determine the existing area of development that has impacted wetlands. This total acreage is called the "baseline" environment, or the environment as it is known in March 2005 (refer to Table 3-3).
- Discuss the potential loss of wetlands from recreational activities (i.e., trampling, introduction of exotic species). It is assumed that activities within the footprints of the developments would not impact additional wetlands. However, activities off-trail or outside of designated use sites could impact additional wetland areas. The discussion is qualitative because the actual extent of impact cannot be predicted or mapped.
- Calculate the acreage of wetlands affected by the alternatives.
- Determine the effects on the functions and values of the affected wetlands.
- Determine the magnitude of wetland impacts.

General Impacts

It was determined through review of the project information that the environmental consequences of the proposed project alternatives on wetlands would include: direct loss of wetlands due to placement of facilities and access roads, and loss of wetlands associated with increased recreational activities.

Impact Level Definitions

- Minor: Localized, but measurable, loss of wetlands that are not unique. Or, localized loss of common habitat moderately to highly rated for functions and values but commonly in the area.

- Moderate: Loss of unique or sensitive habitat in specific locations. Or, loss of non-sensitive habitat throughout the planning area.

- Major: Substantial fragmentation or isolation of unique or sensitive habitat. Or, substantial reduction in functions and values of unique or sensitive habitats.

Alternative A – No Action

Alternative A would result in no direct or indirect effects on wetlands. No new visitor centers and associated access roads or parking areas would be built under this alternative.

Cumulative Impacts

Past and on-going external events that have or continue to impact wetlands within the planning area include:

- MSB recreational trails – Motorized use of trails in the planning area occurs for recreational purposes and to access off-road properties. Snowmachine traffic can cause structural damage to plant tissues (compression, abrasion, stem breakage) (Neumann and Merriam 1974; Roland 2000), and in severely impacted areas, the creation of trails where vegetation has been eliminated. Indirect impacts from snowmobile use include changes in the distribution of snow cover and in the thermal properties of the snow from compaction (Pesant, Fernet et al. 1985). Studies have found that in low-lying areas of high ORV use (mainly summer use of 3- and 4-wheeled vehicles), braiding can occur which expands the average width of the trail up to an average of 35 feet (Connery 1984). There are approximately 68 miles of ORV trails in the planning area, directly impacting approximately 120 acres of wetlands (MSB 2001a).
- Cross-country travel by ORVs has occurred throughout the South Denali region. Repeated use causes compaction of soils, eliminates vegetation, and can increase erosion (Neumann and Merriam 1974; Roland 2000).
- Development of roads – Construction of the George Parks Highway between Trapper Creek and Healy occurred in the mid-1960s. Petersville Road was constructed in the 1930s and was upgraded in the mid-1980s. Subsequent increase in residential and commercial development along these main roads led to additional road development in the planning area. There is an

estimated 134 miles of roads in the planning area, directly affecting approximately 130 acres of wetlands (MSB 2001b).

- Residential, recreation cabins and commercial developments – Impacts from these developments have been estimated from private land ownership. There are approximately 18,547 acres of private land within the planning area (MSB 2001c), directly impacting approximately 2,873 acres of wetlands
- Mining activities – Active and inactive placer gold mining claim areas occur in the drainages of Cache, Dutch, and Peters creeks. There are approximately 5,535 acres of mining claims within the planning area, directly impacting approximately 864 acres of wetlands.

The acreage of wetlands impacts from these past and on-going activities has been extrapolated from available GIS layers (MSB 2001a; MSB 2001b; MSB 2001c), and aerial photographic and satellite imagery interpretation. These estimates are general and do not imply that the entire wetland or its functions and values were lost. The imagery indicates that past and present development since the late 1970s has altered about 4,000 acres of wetlands in the planning area of the project (see Table 4-2).

The following activities could occur within the planning and temporal scope of this proposed project. These activities are generally described at the beginning of this chapter and are described below as they pertain to wetlands:

- Recreational activities – Summer and winter visitation is expected to increase, along with snowmachine and ORV use, and other recreational activities. Implementation of the *2000 Matanuska-Susitna Borough Recreational Trails Plan* would also expand non-motorized and motorized trails within the planning area. Repeated use causes compaction of soils, eliminates vegetation, and can increase erosion (Neumann and Merriam 1974; Roland 2000). Cross-country travel by ORVs will continue throughout the South Denali region. Repeated use causes compaction of soils, eliminates vegetation, and can increase erosion (Neumann and Merriam 1974; Roland 2000).
- Residential, recreational cabin and commercial development – An increase in tourism and visitation is expected to lead to an increase in these developments in the planning area. Development on wetlands would be expected to be minimal because these lands are generally not suitable for development; however, some development on these habitats could occur.
- New access roads – A need for additional access roads would be expected with an increase in the residential population. Wetlands in the planning area would likely be directly and indirectly impacted as a result.
- Mining activities – Mining activity is expected to continue in the Peters Hills area; wetlands would be directly and indirectly affected by these activities.
- Boy Scouts of America – There are several hundreds of acres of wetlands that lie within the boundaries of the properties that the Boy Scouts own and hope to purchase for development of a Boy Scout camp. However, development on wetlands is likely to be minimal because these habitats are not generally suitable for such activities. Indirect impacts from this camp include compaction of soils from increased use of the South Denali region by as many as 300 Boy Scouts per week.

Approximately 176,000 acres of wetland exist in the planning area. Past and on-going activities have impacted about 4,000 acres of wetlands in the planning area. Reasonably foreseeable future external actions would be expected to directly impact an additional unknown acreage. The cumulative impacts on wetlands resulting from past, present, and reasonably foreseeable future actions would be moderate.

Conclusion
The No Action Alternative would have no effect on wetlands.

Alternative B – Peters Hills

Under Alternative B, recreational and visitor facilities would be constructed at sites in the Peters Hills area, and adjacent to the Parks Highway and Petersville Road. Construction and operation of these facilities would directly impact any wetlands present at the development sites. Table 4-1 shows the acres of wetland type directly affected by Alternative B.

Peters Hills
Direct effects to wetlands under this alternative would largely result from construction of the access road. Wetlands impacted by the access road were identified during the 2004 wetland survey (URS 2004d). Of the 8.8 acres of wetlands impacted by the access road, 4.2 acres are palustrine emergent wetlands and complexes, and 4.6 acres are palustrine scrub-shrub wetlands and complexes (Figure 4-1). These wetlands have been rated high for wildlife habitat, regional ecological diversity and the palustrine emergent wetlands are rated high for sediment and toxicant retention functions (URS 2004d).

No wetlands would be impacted at the location of the Nature Center (see Figure 4-2).

The proposed trail system under Alternative B would cross approximately 2.7 acres of wetlands, including palustrine emergent, scrub-shrub, and unconsolidated bottom wetland types. However, unless these trails require the placement of fill for construction, these impacts would not be direct loss.

As currently designed, no impacts to wetlands have been identified for the backcountry facilities.

New visitor facilities, parking, and trailheads proposed in this alternative would be expected to attract higher levels of use to the South Denali region. Indirect impacts would occur primarily from cross-country travel by hikers and ORVs. Repeated use of ORVs causes compaction of soils, eliminates vegetation, and can increase erosion (Neumann and Merriam 1974; Roland 2000).

Parks Highway
No wetlands would be impacted by constructing the turnout at MP 121.5 and MP 122 (see Figure 4-3). Construction of a parking area at Rabideux Creek would impact 0.5 acres of upper perennial river habitat at the end of the existing one-lane river access road (see Figure 4-3). These wetlands could be avoided by constructing a footbridge over the wetlands near the stream.

Petersville Road

A campground located near the Forks Roadhouse on Petersville Road would be developed on a 16-acre site, 2.6 acres of which would be cleared. The campground would impact 0.2 acres of wetlands (see Figure 4-4). In general, the palustrine emergent wetlands in the planning area are highly valued for their wildlife habitat function and regional ecological diversity.

The proposed turnouts at MP 12.8 and MP 16.3 of the Petersville Road would each impact 0.1 acre of palustrine emergent wetlands (see Figure 4-4). The Kroto Creek parking area improvements would occur within the existing footprint, so no additional wetlands would be directly impacted.

The proposed parking area/transportation center to be located near the junction of Petersville Road and the proposed access road would require the filling of approximately 1.4 acres of wetlands (Figure 4-4). Of the 1.4 acres of wetlands impacted by the parking area, 0.4 acres are palustrine scrub-shrub wetlands and complexes and 1.0 acre is a palustrine emergent wetland complex. Generally, these wetlands are rated high for wildlife habitat functions and regional ecological diversity.

Upgrading Petersville Road to a 24-foot gravel surface to MP 18.6 and constructing a bike path from MP 0-7 would require additional environmental compliance before construction.

Table 4-1 Impacts to Wetlands under Alternative B (acres)

Alternative Component	Cowardin Class					Total Acres
	Lacustrine System	Palustrine Emergent Wetlands	Palustrine Scrub-Shrub Wetlands	Palustrine Unconsolidated Bottom Wetlands	Riverine Upper Perennial	
Parks Highway						
MP 121.5-122 Parking Area	0.0	0.0	0.0	0.0	0.0	**0.0**
Rabideaux Creek Parking Area	0.0	0.0	0.0	0.0	0.5	**0.5**
Petersville Road						
Campground and Maintenance Facility	0.0	0.2	0.0	0.0	0.0	**0.2**
MP 12.8 Turnout	0.0	0.1	0.0	0.0	0.0	**0.1**
MP 16.3 Turnout	0.0	0.1	0.0	0.0	0.0	**0.1**
Parking /Trans. Center	0.0	1.0	0.4	0.0	0.0	**1.4**
Peters Hills						
Access Road	0.0	4.2	4.6	0.0	0.0	**8.8**
Nature Center	0.0	0.0	0.0	0.0	0.0	**0.0**
Trail System	0.0	0.6	1.8	0.3	0.0	**2.7**
Backcountry Facilities	0.0	0.0	0.0	0.0	0.0	**0.0**
Total Acres for Alternative B	**0.0**	**6.2**	**6.8**	**0.3**	**0.5**	**13.8**

In summary, the direct impacts resulting from the activities proposed under Alternative B would impact a total of 13.8 acres of wetlands, the majority of which consists of palustrine emergent wetlands and palustrine shrub-scrub wetlands. The loss would involve wetlands that are rated high for wildlife habitat, regional ecological diversity and for sediment and toxicant retention functions, and the impacts would be unavoidable and permanent at the paved and developed sites; however, the habitats affected are localized and relatively common in the area (see Table 4-1).

Potential indirect effects associated with the construction and operations of the access road, parking lots, turnouts, maintenance facility and campground could include introduction of sediments and pollutants from road runoff, and sanitary wastes to nearby wetlands and water bodies; these pollutants in the water could indirectly affect nearby wetlands. In addition, recreational visitor use and increased vehicular traffic could introduce invasive species, subsequently reducing ecological diversity. It is difficult to quantify the acreage that would be affected by cross-country use of ORVs. BMPs and design standards that can minimize contaminant introduction from road runoff, and monitoring and removal of invasive species would mitigate these effects. Indirect effects on wetlands associated with trampling due to off site or off trail use could be mitigated somewhat by education programs, signage, revegetation,

and use control (fences). Large areas of unique wetlands or sensitive habitats would not be affected, and mitigation efforts could reduce impacts.

Cumulative impacts

Past, present, and reasonable foreseeable actions and effects on wetlands are the same as those described for Alternative A.

Approximately 172,000 acres of wetland exist in the planning area. Alternative B would impact a total of about 14 acres of wetlands. Past and on-going activities have impacted about 4,000 acres of wetlands in the planning area (Table 4-2). Reasonably foreseeable future external actions would be expected to directly impact an additional unknown acreage. The cumulative impacts on wetlands resulting from past, present, and reasonably foreseeable future actions and the actions proposed under Alternative B would be moderate. The overall contribution of this alternative to the cumulative impacts on wetlands in the planning area would be noticeable.

Conclusion

The developments proposed for Alternative B would impact about 14 acres of wetlands in the Peters Hills and along the Petersville Road and Parks Highway. The impact on wetlands in the planning area from these developments and from associated recreational activities associated would be moderate because habitat would be lost throughout the planning area.

Table 4-2 Summary of Alternative B Cumulative Impacts to Wetlands.

Cowardin Class[1]	Planning Area[2] (acres)	Past/Present Impacts[3] (acres)	Future External Impacts[4]	Direct Impacts of Alternative B (acres)	Cumulative Impacts (Percent)
Lacustrine System	3,465	71	UNK	0	2%
Palustrine System					
Aquatic Beds and Complexes	214	5	UNK	0	2%
Emergent Wetlands and Complexes	104,597	2,364	UNK	6	2%
Forested Wetlands and Complexes	8,683	386	UNK	0	4%
Moss-Lichen Wetlands and Complexes	3	0	UNK	0	0%
Shrub-Scrub Wetlands and Complexes	35,469	1,085	UNK	7	3%
Unconsolidated Bottom Wetlands and Complexes	2,140	92	UNK	<1	4%
Unconsolidated Shore Wetlands and Complexes	294	0	UNK	0	0%
Riverine System					
Lower Perennial	1,114	<1	UNK	0	<1%
Upper Perennial	19,990	42	UNK	<1	<1%
Total Wetlands Impacted	175,969	4,045	UNK	14	N/A

Notes: [1] Classified by NWI maps (NWI 1979; NWI 1980a; NWI 1980b; NWI 1980c) and described according to the Classification of wetlands and deepwater habitats of the United States (Cowardin, Carter et al. 1979).

2 Acreage of unimpacted wetlands prior to the late 1970s (NWI 1979; NWI 1980a; NWI 1980b; NWI 1980c).

3 Past/Present Impacts to wetlands were determined from the GIS layers: MSB motorized and non-motorized trails (MSB 2001a); NPS motorized and non-motorized trails (provided by NPS); Parks Highway (MSB 2001b); MSB roads (MSB 2001b); MSB private lands (MSB 2001c); and mining claims (provided by NPS).

4 Future External Impacts to wetlands could occur from increased recreational activity (especially increase in ORV use), increase in housing developments, continuation and expansion of mining activities, development of MSB land disposals, Petersville Road upgrade (DOT&PF), and proposed developments by the Boy Scouts of America, Alaska Railroad and Princess. However, these plans are currently only conceptual therefore, areas of wetlands impacts are not available at the present time. A qualitative discussion of the potential wetland impacts as a result of these future external events is available in the cumulative impacts text.

UNK – Unknown acreage of impact

Alternative C – Parks Highway

Under Alternative C, recreational and visitor facilities would be constructed at sites in the Curry Ridge area and adjacent to the Parks Highway and Petersville Road. Table 4-3 summarizes the acres of wetland type potentially impacted at each facility.

Curry Ridge

The proposed access road would fill 0.3 acres of wetlands, 0.2 acres of which are palustrine emergent wetland complexes, and 0.1 acres are palustrine scrub-shrub wetland complexes (see Figure 4-6 and Table 4-3). These wetlands have been rated high for wildlife habitat functions, and regional ecological diversity (URS 2004d). The proposed trail system under Alternative C would cross approximately 4.5 acres of wetlands, including palustrine emergent, scrub-shrub, and unconsolidated bottom wetland types, and lacustrine and riverine habitats. As currently designed, no impacts to wetlands have been identified from the proposed visitor center.

New visitor facilities, parking, and trailheads proposed in this alternative would be expected to attract higher levels of use to the South Denali region. Indirect impacts would occur primarily from cross-country travel by hikers and ORVs. Repeated use of ORVs causes compaction of soils, eliminates vegetation, and can increase erosion (Neumann and Merriam 1974; Roland 2000).

Parks Highway

Effects on wetlands along the Parks Highway within the planning area would be the same as those described for Alternative B with the addition of a parking area and campground at MP 134.6 of the highway. The proposed parking area and campground facility lies on 28.6 acres of land. However, the facility would require the filling of less than 0.1 acres of a palustrine emergent wetland complex (see Table 4-3 and Figure 4-6). Generally, these wetlands are rated high for wildlife habitat functions and regional ecological diversity (URS 2004d).

Petersville Road

Effects on wetlands along the Petersville Road would also be the same as those described for Alternative B; however, there would be no parking/transportation center at MP 28 and no upgrade to MP 18.6. Therefore total area of wetlands cleared for facilities along the Petersville Road under Alternative C would be about 0.4 acres of palustrine emergent wetlands.

Table 4-3. Impacts to Wetlands under Alternative C (Acres)

Alternative Component	Cowardin Class[1]					Total Acres
	Lacustrine System	Palustrine Emergent Wetlands	Palustrine Scrub-Shrub Wetlands	Palustrine Unconsolidated Bottom Wetlands	Riverine Upper Perennial	
Parks Highway						
MP 121.5-122 Parking Area	0.0	0.0	0.0	0.0	0.0	**0.0**
Rabideaux Creek Parking Area	0.0	0.0	0.0	0.0	0.5	**0.5**
MP 134.6 Parking Area and Campground	0.0	<0.1	0.0	0.0	0.0	**0.1**
Petersville Road						
Campground	0.0	0.2	0.0	0.0	0.0	**0.2**
MP 12.8 Turnout	0.0	0.1	0.0	0.0	0.0	**0.1**
MP 16.3 Turnout	0.0	0.1	0.0	0.0	0.0	**0.1**
Curry Ridge						
Access Road	0.0	0.2	<0.1	0.0	0.0	**0.3**
Visitor Center	0.0	0.0	0.0	0.0	0.0	**0.0**
Trail System	0.1	2.6	1.4	0.2	0.2	**4.5**
Total Acres for Alternative C	**0.1**	**3.3**	**1.5**	**0.2**	**0.7**	**5.8**

Notes: [1] Classified by NWI maps (NWI 1979; NWI 1980a; NWI 1980b; NWI 1980c) and described according to the Classification of wetlands and deepwater habitats of the United States (Cowardin, Carter et al. 1979).

In summary, the direct impacts resulting from activities proposed under Alternative C would impact a total of 5.8 acres of wetlands (Table 4-3). The loss would involve wetlands that are rated high for wildlife habitat, regional ecological diversity and for sediment and toxicant retention functions, and the impacts would be unavoidable and permanent at the paved and developed sites.

Potential indirect effects associated with the construction and operations of the access road, parking lots, turnouts, and campgrounds could include introduction of sediments and pollutants from road runoff, and sanitary wastes to nearby wetlands and water bodies; these pollutants could indirectly affect nearby wetlands. In addition, recreational visitor use and increased vehicular traffic could introduce invasive species, subsequently reducing ecological diversity. It is difficult to quantify the acreage that would be affected by cross-country use of ORVs. BMPs and design standards that can minimize contaminant introduction from road runoff, and monitoring and removal of invasive species could mitigate these effects. Indirect effects on wetlands associated with trampling due to off site or off trail use could be somewhat mitigated by education programs, signage, revegetation, and use control (fences).

Cumulative impacts

Past, present, and reasonable foreseeable actions and effects on wetlands are the same as those described for Alternative A.

Approximately 172,000 acres of wetland exist in the planning area. The direct impacts resulting from activities proposed under Alternative C would impact a total of about 6 acres of wetlands. Past and on-going activities have impacted about 4,000 acres of wetlands in the planning area. Reasonably foreseeable future external actions would be expected to directly impact an additional unknown acreage of wetlands. Cumulative impacts to the lacustrine, palustrine and riverine systems are all under five percent, and are mainly a result of past and on-going activities (Table 4-4). The cumulative impacts on wetlands resulting from past, present, and reasonably foreseeable future actions and the actions proposed under Alternative C would be moderate. The overall contribution of this alternative to the cumulative impacts on terrestrial vegetation in the planning area would be noticeable.

Conclusion

The developments proposed for Alternative C would impact about 6 acres of wetlands in the Curry Ridge area and along the Petersville Road and Parks Highway. The impact on wetlands from these developments and from associated recreational activities throughout the entire planning area would be moderate because habitat would be lost throughout the planning area.

Table 4-4. Summary of Alternative C Cumulative Impacts to Wetlands

Cowardin Class[1]	Planning Area[2] (acres)	Past/Present Impacts[3] (acres)	Future External Impacts[4]	Direct Impacts (acres)	Cumulative Impacts (Percent)
Lacustrine System	3,465	71	UNK	<1	2%
Palustrine System					
Aquatic Beds	214	5	UNK	0	2%
Emergent	104,597	2,364	UNK	3	2%
Forested	8,683	386	UNK	0	4%
Moss-Lichen	3	0	UNK	0	0%
Shrub-Scrub	35,469	1,085	UNK	1	3%
Unconsolidated Bottom	2,140	92	UNK	<1	4%
Unconsolidated Shore	294	0	UNK	0	0%
Riverine System					
Lower Perennial	1,114	<1	UNK	0	<1%
Upper Perennial	19,990	42	UNK	<1	<1%
Total Wetlands Impacted	175,969	4,045	UNK	6	N/A

Notes: [1] Classified by NWI maps (NWI 1979; NWI 1980a; NWI 1980b; NWI 1980c) and described according to the Classification of wetlands and deepwater habitats of the United States (Cowardin, Carter et al. 1979).
[2] Acreage of unimpacted wetlands prior to the late 1970s (NWI 1979; NWI 1980a; NWI 1980b; NWI 1980c).
[3] Past/Present Impacts to wetlands were determined from the GIS layers: MSB motorized and non-motorized trails (MSB 2001a); NPS motorized and non-motorized trails (provided by NPS); Parks Highway (MSB 2001b); MSB roads (MSB 2001b); MSB private lands (MSB 2001c); and mining claims (provided by NPS).
[4] Future External Impacts to wetlands could occur from increased recreational activity (especially increase in ORV use), increase in housing developments, continuation and expansion of mining activities, development of MSB land disposals, Petersville Road upgrade (DOT&PF), and proposed developments by the Boy Scouts of America, Alaska Railroad and Princess. However, these plans are currently only conceptual therefore, areas of wetlands impacts are not available at the present time. A qualitative discussion of the potential wetland impacts as a result of these future external events is available in the cumulative impacts text.
UNK – Unknown acreage of impact

VEGETATION

Methodology

To determine the potential impacts on terrestrial vegetation, a review of existing information was performed to determine the locations and size of vegetation communities relative to the various proposed project actions. Material reviewed included existing GIS vegetation layers (Shasby and Carneggie 1986; USGS 1987; Fitzpatrick-Lins, Doughty et al. 1989; BLM 2002), satellite imagery (IKONOS 1996), and aerial photographs (Aeromap 1996) of the planning area, and existing GIS data (MSB 2001a; MSB 2001b; MSB 2001c). A field study was conducted in 2004 to confirm the presence and identification of vegetation communities along Alternatives B and C proposed access roads and visitor/nature centers (URS 2004c).

The direct effects of the proposed project on terrestrial vegetation were determined through the following steps:

- Determine the acreage of terrestrial vegetation affected by proposed alternatives by overlaying the alternative footprints over the existing vegetation maps completed last summer and provided in the *Vegetation Report* (URS 2004c).
- Discuss the potential loss of vegetation from recreational activities (i.e., trampling, introduction of exotic species). It is assumed that recreational activities within the footprints of the developments would not impact additional vegetation. However, activities off-trail or outside of designated use sites could impact additional vegetation. The discussion is qualitative because the actual extent of impact cannot be predicted or mapped.
- Determine the percentage of terrestrial vegetation impacted in the planning area.
- Determine the magnitude of the loss of the vegetation type.

General Impacts

The environmental consequences of the proposed project alternatives on terrestrial vegetation could include the direct loss of vegetation from land clearing of vegetation or placement of fill for project facilities, loss of vegetation from recreational activities (i.e., trampling), and invasive species introduction resulting from increased human use of the area.

Impact Level Definitions

- Minor: Localized but measurable loss of vegetation that is not unique or part of a change in unique or sensitive habitat.

- Moderate: Loss of unique vegetation contributing to sensitive habitats in specific locations. Or, widespread loss of vegetation that it not unique.

- Major: Substantial fragmentation or isolation of unique vegetation or sensitive habitats.

Alternative A – No Action

Alternative A would result in no direct or indirect effects to terrestrial vegetation. No new visitor centers and associated access roads or parking areas would be built under this alternative.

Cumulative Impacts

Past and on-going activities that have impacted or would continue to impact vegetation within the planning area include:

- MSB recreational trails – Motorized use on trails in the planning area occurs for recreational purposes and to access off-road properties. Snowmachine traffic can cause structural damage to plant tissues (compression, abrasion, stem breakage) (Neumann and Merriam 1974; Roland 2000), and in severely impacted areas, the creation of trails where vegetation has been eliminated. Indirect impacts from snowmobile use include changes in the distribution of snow cover and in the thermal properties of the snow from compaction (Pesant, Fernet et al. 1985). Studies have found that in low-lying areas of high ORV use (mainly summer use of 3- and 4-wheeled vehicles), braiding can occur which expands the average width of the trail up to an average of 35 feet (Connery 1984). There are approximately 68 miles of ORV trails in the planning area, directly impacting approximately 502 acres of terrestrial vegetation (MSB 2001a).
- Cross-country travel by ORVs occurs throughout the South Denali region. Repeated use causes compaction of soils, eliminates vegetation, and can increase erosion (Neumann and Merriam 1974; Roland 2000).
- Development of roads – Construction of the George Parks Highway between Petersville and Healy occurred in the mid-1960s. Petersville Road was constructed in the 1930s and was upgraded in the mid-1980s. Subsequent increase in residential and commercial development along these main roads led to additional road development in the planning area. There is an estimated 134 miles of roads in the planning area, directly affecting approximately 848 acres of terrestrial vegetation. (MSB 2001b).

- Residential and commercial developments – Impacts from residential and commercial developments have been estimated from private land ownership. There are approximately 18,547 acres of private land within the planning area (MSB 2001c), directly impacting approximately 18,387 acres of terrestrial vegetation.
- Mining activities – Active and inactive placer gold mining claim areas occur in the drainages of Cache, Dutch, and Peters creeks. There are approximately 5,535 acres of mining claims within the planning area, directly impacting approximately 5,505 acres of terrestrial vegetation.
- Forest management activities – The MSB has one timber contract containing just over 300 acres for MP 108 of the Parks Highway that has just completed harvesting.

The acreage of vegetation impacts from these past and on-going activities has been extrapolated from existing GIS vegetation coverage (USGS 1987; Fitzpatrick-Lins, Doughty et al. 1989), existing GIS layers (ADNR, ADF&G et al. 1985; MSB 2001a; MSB 2001b; MSB 2001c), and aerial photographic and satellite imagery interpretation of the planning area. These numbers are estimates and indicate the area of vegetation that has been manipulated by humans within the planning area by past and/or on-going external activities. The imagery indicates that past and present development since the late 1980s has altered about 26,000 acres of terrestrial vegetation in the planning area of the project (see Table 4-6).

The following activities could occur within the geographic and temporal scope of this proposed project. These activities are described at the beginning of this chapter and are described below as they pertain to vegetation impacts:

- Recreational activities –Summer and winter visitation is expected to increase, along with snowmachine and other ORV use, and other recreational activities. Implementation of the *2000 Matanuska-Susitna Trails Master Plan* would also expand non-motorized and motorized trails within the planning area. Although trails are not under the jurisdiction of the USACE because fill is not necessarily utilized to create these trails, repeated use causes compaction of soils, eliminates vegetation, and can increase erosion. Snowmachine traffic can cause structural damage to plant tissues (compression, abrasion, stem breakage) (Neumann and Merriam 1974; Roland 2000), and in severely impacted areas, the creation of trails where vegetation has been eliminated. Indirect impacts from snowmobile use include changes in the distribution of snow cover and in the thermal properties of the snow from compaction (Pesant, Fernet et al. 1985). Studies have found that in low-lying areas of high ORV use (mainly summer use of 3- and 4-wheeled vehicles), braiding can occur which expands the average width of the trail up to an average of 35 feet (Connery 1984).
- Cross-country ORV use would continue to grow. ORV use primarily causes loss of productivity (loss of vegetation cover), erosion, compaction, rutting, and displacement. Ruts from ORV use can be seen from the air throughout general state land in the planning area. This trend would be expected to continue.
- Residential and commercial development – An increase in tourism is expected to lead to an increase in commercial and residential developments in the planning area. These developments would impact an unknown amount of terrestrial vegetation.
- New access roads – A need for additional access roads would be expected with an increase in the residential population. Terrestrial vegetation in the planning area would likely be impacted as a result.

- Mining activities – Mining activity is expected to continue in the Peters Hills area; terrestrial vegetation would be directly and indirectly affected by these activities.
- Boy Scouts of America – Development of, and activities associated with, a Boy Scout camp would impact terrestrial vegetation.
- Timber Management – The MSB currently has a 640-acre timber contract between MP 115 and 118 of the Parks Highway, which could add an additional 1,280 acres. It is probable the MSB would execute contracts for between 3,000 and 5,000 acres within the next five years. It is assumed that these impacts would be focused on closed mixed forest habitats.

  The baseline vegetation acreage within the planning area is about 460,000 acres (see Table 3-5 in Chapter Three). Reasonably foreseeable future external actions would be expected to directly impact between 1,920 and 6,920 acres of closed mixed forest from forest management activities, and an additional unknown acreage of terrestrial vegetation from other reasonable activities listed above. Past and on-going activities have impacted about 26,000 acres of terrestrial vegetation in the planning area since the late 1980s. Cumulative impacts to the closed broadleaf and needleleaf forest, tall/low shrubland, dwarf scrub and related communities, dry or moist herbaceous communities, sparsely vegetated and non-vegetated habitats are all under ten percent, and are mainly a result of past and on-going activities (Table 4-6). Cumulative impacts to closed mixed forests could be between 11 and 22 percent, depending on the amount of timber harvests that are to occur in the next five years. Forest management activities are considered long-term, but reversible if selective harvest practices are employed, and forest regeneration is implemented. Thus, cumulative impacts on terrestrial vegetation resulting from past, present, and reasonably foreseeable future actions would be moderate because widespread loss to non-sensitive vegetation would occur.

Conclusion

The No Action Alternative would have no effect on terrestrial vegetation.

Alternative B – Peters Hills

Under Alternative B, recreational and visitor facilities would be constructed at sites in the Peters Hills area and adjacent to the Parks Highway and Petersville Road. Construction and operation of these facilities would directly impact vegetation at the development sites. Table 4-5 shows the acres of terrestrial vegetation type directly affected by clearing under Alternative B.

Peters Hills

A total 37.9 acres of terrestrial vegetation would be affected by construction of the proposed access road (Figure 4-7). The majority of the vegetation within the road alignment consists of tall/low scrubland with small areas of dwarf scrub and related communities and dry or moist herbaceous communities.

Only 0.5 acres of terrestrial vegetation would be directly impacted by the proposed Peters Hills nature center (Figure 4-8). The impacted vegetation consists entirely of ericaceous dwarf scrub and wet graminoid herbaceous communities.

The proposed trail system under Alternative B would in total require the clearing of 38.8 acres of terrestrial vegetation consisting of all vegetation types shown on Table 4-5. However, within the forest types the trails are likely to require only the clearing of the understory vegetation. Therefore, impacts to the closed broadleaf forest, closed mixed forest, and closed needleleaf forest types (which comprise a total of 15 acres of the impacted area) would be less than effects to the tall/low scrubland (17.8 acres) and dwarf shrub, dry or moist herbaceous, or sparsely vegetated areas (6 acres total).

Based on preliminary location and design, the construction of a public use cabin and picnic shelter would require the clearing of 1.4 acres of terrestrial vegetation consisting of closed broadleaf forest and closed mixed forest with a small area of closed needleleaf forest.

Visitation to the proposed facilities could affect vegetation by increasing use of areas located on undisturbed ground off of planned developments. New or expanded parking areas and/or trailheads at Kroto Creek, MP 12.8 and 16.3 of the Petersville Road, Forks Roadhouse area, Rabideux Creek, and Parks Highway MP 121.5 and 122 would increase winter and summer motorized use throughout the planning area. Motorized vehicle use would occur off of trails and paved areas. Impacts could include trampling and loss of vegetation. Mitigation measures would decrease, but not eliminate, impacts. These measures could include signage, fencing, revegetation and use of geotextiles. No department in the State of Alaska has citation authority to enforce existing regulations related to motorized use on general state land, so impacts from motorized use are expected to increase with the expected increase in use resulting from increased parking areas and trailheads proposed in this alternative.

In summary, the direct impacts resulting from the activities proposed under Alternative B would impact a total of 117 acres of terrestrial vegetation, the majority of which consists of closed broadleaf forest and tall/low scrubland. The loss of vegetation would be unavoidable and permanent at the paved and developed sites. Compared to the baseline vegetation acreage within the planning area (about 460,000 acres), Alternative B directly affects less than 0.1 percent of the baseline March 2005 vegetation and no unique vegetation or sensitive habitats would be impacted. Acreage affected from indirect impacts from increased use is more difficult to quantify; linear impacts (from ORV use) would likely occur throughout the planning area.

Parks Highway

Direct effects to terrestrial vegetation from the improvement and construction of the parking areas near MP 121.5 and 122 of the Parks Highway would affect about 20.7 acres of closed broadleaf forest. Construction of a parking area at Rabideaux Creek would require the clearing of 3.7 acres of vegetation consisting of closed broadleaf forest, closed mixed forest and tall/low scrubland.

Based on preliminary location and design of an access road from the Parks Highway to the Chulitna River near Troublesome Creek, 2.4 acres of closed broadleaf forest and closed mixed forest would be impacted.

Petersville Road

A campground located near the Forks Roadhouse on Petersville Road would be situated on a 16-acre site, 2.6 acres of which would be cleared. Terrestrial vegetation types impacted by these developments would include mostly closed broadleaf forest with small areas of closed needle leaf forest and tall/low scrubland.

The proposed turnouts at MP 12.8 and MP 16.3 of the Petersville Road would impact 1.0 acre (closed broadleaf forest, tall/low scrubland, and dry or moist herbaceous communities) and 0.7 acres (tall/low scrubland), respectively. The Kroto Creek parking area improvements would occur within the existing footprint, so no additional vegetation would be directly impacted.

The proposed parking area/transportation center to be located near the junction of Petersville Road and the proposed access road would require clearing 6.8 acres of vegetation (Figure 4-9). Vegetation types directly impacted would include mostly tall/low scrubland with a small area of dry or moist herbaceous communities.

Upgrading Petersville Road to a 24-foot gravel surface to MP 18.6 and constructing a bike path from MP 0-7 would require additional environmental compliance before construction.

Potential indirect effects associated with the construction and operations of the access road, parking lots, turnouts, maintenance facility and campground include introduction of sediments and pollutants from road runoff, and sanitary wastes to local water bodies; these pollutants in the water could indirectly affect nearby vegetation by degrading their water supply and causing either direct mortality or reduced growth to maturity. In addition, recreational visitor use and increased vehicular traffic could introduce invasive species, subsequently reducing ecological diversity. BMPs and design standards that can minimize contaminant introduction from road runoff, and monitoring and removal of invasive species would mitigate these effects.

Cumulative impacts

The direct impacts resulting from all activities proposed under Alternative B would impact a total of about 117 acres of terrestrial vegetation. Reasonably foreseeable future external actions (as described under Alternative A) would be expected to directly impact between 1,920 and 6,920 acres of closed mixed forest from forest management activities, and an additional unknown acreage of terrestrial vegetation from other reasonable activities listed above. Past and on-going activities have impacted about 26,000 acres of terrestrial vegetation in the planning area since the late 1980s. Cumulative impacts to the closed broadleaf and needleleaf forest, tall/low shrubland, dwarf scrub and related communities, dry or moist herbaceous communities, sparsely vegetated and non-vegetated habitats are all under ten percent, and are mainly a result of past and on-going activities (Table 4-6). Cumulative impacts to closed mixed forests could be between 11 and 22 percent, depending on the amount of timber harvests that are to occur in the next five years. Forest management activities are considered long-term, but reversible if selective harvest practices are employed, and forest regeneration is implemented. Thus, cumulative impacts on terrestrial vegetation resulting from past, present, and reasonably foreseeable future actions would be moderate. The overall contribution of this alternative to the cumulative impacts on terrestrial vegetation in the planning area would be noticeable due to indirect impacts from

new or upgraded parking areas and trailheads, which would lead to increased cross-country ORV use throughout the South Denali region.

Conclusion

The developments proposed for Alternative B would impact about 117 acres of terrestrial vegetation in the Peters Hills and along the Petersville Road and Parks Highway. Acreage affected from indirect impacts from increased use is more difficult to quantify; linear impacts (from ORV use) would likely occur throughout the planning area. The impact on terrestrial vegetation in the planning area from these developments and from recreational activities associated with these developments would be moderate because widespread loss to non-sensitive vegetation would occur.

Table 4-5. Impacts to Vegetation Communities under Alternative B (Acres)

Vegetation Community	MP 121.5 and 122	Rabideaux Creek Parking Area	Chultina Bluffs River Access	Petersville Road Campground	MP 12.8	MP 16.3	Parking/Transport Center (MP 28 Petersville Road)	Access Road	Nature Center	Trail System	Backcountry Facilities	TOTAL
Closed Broadleaf Forest	20.5	0.9	1.4	2.4	0.1	<0.1	0.0	0.0	0.0	11.1	0.8	**27.2**
Closed Mixed Forest	0.0	2.0	1.0	0.0	0.0	<0.1	0.0	0.0	0.0	3.0	0.5	**6.5**
Closed Needleleaf Forest	0.2	0.0	0.0	0.1	<0.1	0.0	0.0	0.0	0.0	0.9	0.1	**1.3**
Tall/Low Shrubland	0.0	0.4	0.0	0.1	0.6	0.7	6.7	23.0	0.0	17.8	0.0	**49.3**
Dwarf Shrub and Related Communities	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.7	0.5	0.3	0.0	**9.5**
Dry or Moist Herbaceous	0.0	0.0	0.0	0.0	0.3	0.0	0.1	6.2	0.0	4.8	0.0	**11.4**
Sparsely Vegetated	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9	0.0	**1.3**
TOTAL	**20.7**	**3.7**	**2.4**	**2.6**	**1.0**	**0.7**	**6.8**	**37.9**	**0.5**	**38.8**	**1.4**	**116.5**

Table 4-6 Summary of Alternative B Cumulative Impacts to Terrestrial Vegetation within the Planning Area

Alaska Vegetation Classification[1]	Planning Area[2] (acres)	Past/Present Impacts[3] (acres)	Future External Impacts[4] (acres)	Direct Impacts (Alternative B) (acres)	Cumulative Impacts (Percent)
Closed Broadleaf Forest	**206,330**	**12,973**	**UNK**	**36**	**6%**
Closed Needleleaf Forest	**32,176**	**1,521**	**UNK**	**4**	**5%**
Closed Mixed Forest	**47,599**	**3,443**	**1,920 to 6,920[8]**	**7**	**11 TO 22%**
Tall/Low Shrubland	**161,406**	**6,835**	**UNK**	**50**	**4%**
Dwarf Scrub and Related Communities[5]	**10,092**	**98**	**UNK**	**10**	**1%**
Dry or Moist Herbaceous	**29,132**	**1,143**	**UNK**	**11**	**4%**
Sparsely Vegetated	**3,389**	**107**	**UNK**	**1**	**3%**
TOTAL VEGETATED AREA	**490,124**	**26,120**	**unk**	**119**	**n/a**
Non-Vegetated	**14,286**	**82**	**UNK**	**2**	**<1%**
Clear and/or Deep Water	**3,062**	**85**	**UNK**	**0**	**3%**
Turbid and/or Shallow Water	**4,186**	**59**	**UNK**	**<1**	**1%**
Ice, Snow, and Clouds[6]	**104**	**1**	**UNK**	**0**	**1%**
Shadow[7]	**4,910**	**NA**	**NA**	**2**	**NA**

Notes: [1] As described by Fitzpatrick-Lins and others (1989), adapted from Viereck and others (1992).

[2] Acres of unimpacted vegetation prior to late 1980s

[3] Past/Present Impacts to vegetation communities were determined from the GIS layers: MSB motorized and non-motorized trails (MSB 2001a); NPS motorized and non-motorized trails (provided by NPS); Parks Highway (MSB 2001b); MSB roads (MSB 2001b); MSB private lands (MSB 2001c); mining claims (provided by NPS) and recent forestry activities along Parks Highway.

[4] Future External Impacts to wetlands could occur from increased recreational activity (especially increase in ORV use), increase in housing developments, continuation and expansion of mining activities, development of MSB land disposals, Petersville Road upgrade and enhancements (DOT&PF), and proposed developments by the Boy Scouts of America, Alaska Railroad and Princess. However, these plans are currently only conceptual therefore, areas of wetlands impacts are not available at the present time. A qualitative discussion of the potential wetland impacts as a result of these future external events is available in the cumulative impacts text.

[5] This class may also consist of communities dominated by lichens (Fitzpatrick-Lins, Doughty et al. 1989).

[6] This class may consists of bright reflective surfaces and various amounts and types of cloud cover (Fitzpatrick-Lins, Doughty et al. 1989).

[7] This class represents those areas obscured from remote sensors by mountainous terrain; vegetation may or may not occur in these areas (Fitzpatrick-Lins, Doughty et al. 1989).

[8] The MSB currently hold a timber contract for 640 acres between MP 115-118 of the Parks Highway to be harvested in March 2005, with potential for 1,280 additional acres; between 3,000 and 5,000 acres of timber contracts could be executed in the next five years.

UNK – Unknown acreage of impact

Alternative C – Parks Highway

Under Alternative C, recreational and visitor facilities would be constructed at sites in the Curry Ridge area and adjacent to the Parks Highway and Petersville Road. Table 4-7 summarizes the acres of vegetation type potentially impacted at each facility.

Curry Ridge

The proposed access road under this alternative would require the clearing of 20.4 acres of mostly low/tall scrubland with closed mixed forest and a small area of dry or moist herbaceous communities (Figure 4-10).

Approximately 0.7 acres of closed needleleaf forest and tall/low scrubland would need to be cleared to construct the proposed visitor center under Alternative C (Figure 4-11).

The proposed trail system under Alternative C would require the clearing of 69.9 acres of terrestrial vegetation consisting of mostly closed broadleaf forest and tall/low scrubland with areas of closed mixed forest, closed needleleaf forest, dwarf scrub related communities and dry or moist herbaceous communities. However, within forest habitat, the pathway might only require clearing of the understory vegetation, so impacts to the closed broadleaf forest, closed mixed forest, and closed needleleaf forest types (about 36 acres total) would be less than impacts to the tall/low scrubland (about 27 acres) and the other vegetation types (totaling about 6 acres).

Visitation to the proposed facilities could affect vegetation by increasing use of areas located on undisturbed ground off of planned developments. New or expanded parking areas and/or trailheads at Kroto Creek, MP 12.8 and 16.3 of the Petersville Road, Forks Roadhouse area, Rabideux Creek, and Parks Highway MP 121.5 and 122 would increase winter and summer motorized use throughout the planning area. Motorized vehicle use would occur off of trails and paved areas. Impacts could include trampling and loss of vegetation. Mitigation measures would decrease, but not eliminate, impacts. These measures could include signage, fencing, revegetation and use of geotextiles. No department in the State of Alaska has citation authority to enforce existing regulations related to motorized use on general state land, so impacts from motorized use are expected to increase with the expected increase in use resulting from increased parking areas and trailheads proposed in this alternative.

Parks Highway

Effects on vegetation along the Parks Highway within the planning area would be the same as those described for Alternative B with the addition of a parking area and campground at MP 134.6 of the highway. The proposed transportation/parking area and campground facility at the MP 134.6 of the Parks Highway lies on 28.6 acres of land, of which about 20.3 acres would be cleared or disturbed (see Figure 4-12). Terrestrial vegetation types directly impacted would include mostly closed broadleaf forest and tall/low scrubland with smaller areas of closed mixed forest and closed needleleaf forest.

Petersville Road

Effects on vegetation along the Petersville Road would also be the same as those described for Alternative B; however, there would be no parking/transportation center at MP 28 and no upgrade to MP 18.6. Therefore total area of vegetation cleared for facilities along the Petersville Road under Alternative C would be about 4.3 acres consisting mostly of closed broadleaf forest and closed needleleaf forest.

In summary, the direct impacts resulting from the activities proposed under Alternative C would impact a total of about 143 acres of terrestrial vegetation, the majority of which consists of closed broadleaf forest and tall/low scrubland (see Table 4-7). The loss of vegetation would be unavoidable and permanent at the paved and developed sites. Compared to the baseline vegetation acreage within the planning area (about 460,000 acres), Alternative C would directly affect less than 0.1 percent of the baseline March 2005 vegetation and no unique vegetation or sensitive habitats would be impacted.

Potential indirect effects associated with the construction and operations of the access road, parking lots, turnouts and campground include introduction of sediments and pollutants from road runoff, and sanitary wastes two local water bodies; these pollutants could indirectly affect nearby vegetation by degrading water quality. In addition, visitor use and increased vehicular traffic could introduce invasive species, subsequently reducing ecological diversity. BMPs and design standards that can minimize contaminant introduction from road runoff, and monitoring and removal of invasive species would mitigate these effects.

Cumulative impacts

Past, present, and reasonable foreseeable actions and effects are the same as those described for Alternative A.

The direct impacts resulting from all activities proposed under Alternative C would impact a total of about 143 acres of terrestrial vegetation. Reasonably foreseeable future external actions would be expected to directly impact between 1,920 and 6,920 acres of closed mixed forest from forest management activities, and an additional unknown acreage of terrestrial vegetation from other reasonable activities listed above. Past and on-going activities have impacted about 26,000 acres of terrestrial vegetation in the planning area since the late 1980s. Cumulative impacts to the closed broadleaf and needleleaf forest, tall/low shrubland, dwarf scrub and related communities, dry or moist herbaceous communities, sparsely vegetated and non-vegetated habitats are all under ten percent, and are mainly a result of past and on-going activities (Table 4-8). Cumulative impacts to closed mixed forests could be between 11 and 22 percent, depending on the amount of timber harvests that are to occur in the next five years. Forest management activities are considered long-term, but reversible if selective harvest practices are employed, and forest regeneration is implemented. Thus, cumulative impacts on terrestrial vegetation resulting from past, present, and reasonably foreseeable future actions, and the actions proposed under Alternative C, would be moderate. The overall contribution of this alternative to the cumulative impacts on terrestrial vegetation in the planning area would be noticeable due to indirect impacts from new or upgraded parking areas and trailheads, which would lead to increased cross-country ORV use throughout the South Denali region.

Conclusion

The developments proposed for Alternative C would impact about 143 acres of terrestrial vegetation in the Curry Ridge area and along the Petersville Road and Parks Highway. Acreage affected from indirect impacts from increased use is more difficult to quantify; linear impacts (from ORV use) would likely occur throughout the planning area. The impact on terrestrial vegetation from these developments and from recreational activities associated with these developments throughout the entire planning area would be moderate because widespread loss to non-sensitive vegetation would occur.

Table 4-7. Impacts to Vegetation Communities under Alternative C (Acres)

Vegetation Community	MP 121.5 and 122	Rabideaux Creek Parking Area	Chultina Bluffs	Parking Area and Campground at MP 134.6	Petersville Road Campground	MP 12.8	MP 16.3	Access Road	Visitor Center	Trail System	TOTAL
Closed Broadleaf Forest	20.5	0.9	1.4	9.5	2.4	0.1	<0.1	0.0	0.0	26.2	**51.0**
Closed Mixed Forest	0.0	2.0	1.0	2.5	0.0	0.0	<0.1	4.4	0.0	2.3	**12.2**
Closed Needleleaf Forest	0.2	0.0	0.0	0.3	0.1	<0.1	0.0	0.0	0.2	7.8	**8.6**
Tall/Low Shrubland	0.0	0.4	0.0	7.9	0.1	0.6	0.7	15.6	0.5	27.3	**53.1**
Dwarf Shrub and Related Communities	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	**0.7**
Dry or Moist Herbaceous	0.0	0.0	0.0	0.1	0.0	0.3	0.0	0.4	0.0	5.5	**6.3**
Sparsely Vegetated	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	**0.6**
TOTAL	**20.7**	**3.7**	**2.4**	**20.3**	**2.6**	**1.0**	**0.7**	**20.4**	**0.7**	**69.9**	**142.5**

Table 4-8. Summary of Alternative C Cumulative Impacts to Terrestrial Vegetation within the Planning Area

Alaska Vegetation Classification[1]	Planning Area[2] (acres)	Past/Present Impacts[3] (acres)	Future External Impacts[4] (acres)	Direct Impacts (acres)	Cumulative Impacts (Percent)
Closed Broadleaf Forest	**206,330**	**12,973**	**UNK**	**60**	**6%**
Closed Needleleaf Forest	**32,176**	**1,521**	**UNK**	**11**	**5%**
Closed Mixed Forest	**47,599**	**3,443**	**1,920 to 6,920[8]**	**13**	**11 TO 22%**
Tall and Low Scrub	**161,406**	**6,835**	**UNK**	**54**	**4%**
Dwarf Scrub and Related Communities[5]	**10,092**	**98**	**UNK**	**<1**	**1%**
Dry or Moist Herbaceous	**29,132**	**1,143**	**UNK**	**6**	**4%**
Sparsely Vegetated	**3,389**	**107**	**UNK**	**<1**	**3%**
TOTAL VEGETATED AREA	**490,124**	**26,120**	**unk**	**145**	**n/a**
Non-Vegetated	**14,286**	**82**	**UNK**	**2**	**<1%**
Clear and/or Deep Water	**3,062**	**85**	**UNK**	**<1**	**3%**
Turbid and/or Shallow Water	**4,186**	**59**	**UNK**	**<1**	**1%**
Ice, Snow, and Clouds[6]	**104**	**1**	**UNK**	**0**	**1%**
Shadow[7]	**4,910**	**NA**	**UNK**	**1**	**NA**

Notes: [1] As described by Fitzpatrick-Lins and others (1989), adapted from Viereck and others (1992).

[2] Acres of unimpacted vegetation prior to late 1980s.

[3] Past/Present Impacts to vegetation communities were determined from the GIS layers: MSB motorized and non-motorized trails (MSB 2001a); NPS motorized and non-motorized trails (provided by NPS); Parks Highway (MSB 2001b); MSB roads (MSB 2001b); MSB private lands (MSB 2001c); mining claims (provided by NPS) and recent forestry activities along Parks Highway.

[4] Future External Impacts to wetlands could occur from increased recreational activity (especially increase in ORV use), increase in housing developments, continuation and expansion of mining activities, development of MSB land disposals, Petersville Road upgrade and enhancements (DOT&PF), and proposed developments by the Boy Scouts of America, Alaska Railroad and Princess. However, these plans are currently only conceptual therefore, areas of wetlands impacts are not available at the present time. A qualitative discussion of the potential wetland impacts as a result of these future external events is available in the cumulative impacts text

[5] This class may also consist of communities dominated by lichens (Fitzpatrick-Lins, Doughty et al. 1989).
[6] This class may consists of bright reflective surfaces and various amounts and types of cloud cover (Fitzpatrick-Lins, Doughty et al. 1989).
[7] This class represents those areas obscured from remote sensors by mountainous terrain; vegetation may or may not occur in these areas (Fitzpatrick-Lins, Doughty et al. 1989).
[8] The MSB currently hold a timber contract for 640 acres between MP 115-118 of the Parks Highway to be harvested in March 2005, with potential for 1,280 additional acres; between 3,000 and 5,000 acres of timber contracts could be executed in the next five years.
UNK – Unknown acreage of impact.

WILDLIFE

Methodology

Hundreds of bird and mammal species have been documented in the South Denali planning area that could be affected to some degree by construction and operation of the proposed facilities. A subset of these species has been selected for analysis. The selected species occur regularly in the planning area and are either listed on federal or state agency conservation plans or are regularly hunted/trapped and are thus of high public interest.

Baseline conditions for selected wildlife species are described in Chapter Three. The selected species described in that chapter represent many other species that would have similar types of impacts from the proposed alternatives, although the intensity of the effects could vary substantially between species. The intensity of impacts on the various biological resources are estimated based on their baseline abundance and the calculated loss of their preferred habitat types within the planning area as well as the sensitivity of each species to disturbance. The assessments attempt to distinguish between changes in resources that naturally fluctuate over time and changes that would be related to development of the different alternatives. Although specific mitigation factors have not been determined, the potential for commonly used mitigation practices to decrease impacts on wildlife is discussed.

General Impacts

Direct effects of the alternatives arise from their construction, operation, and maintenance as well as their replacement of various habitat types with a road/trail surface and/or visitor facilities. For the biological resources considered, potential direct effects include:

- Loss of habitat from the cut and fill for the roadbed, visitor facilities, and associated construction sites (i.e. material pits, storage yards, etc.).
- Habitat fragmentation and edge effects
- Disturbance from construction activities
- Disturbance from road maintenance activities
- Disturbance from road traffic associated with normal operation of the facility
- Mortality from land-clearing activities and burial with construction material
- Mortality from collisions with vehicle traffic
- Displacement from visitor use of the area.

Indirect effects may occur as a result of the project but happen at a different time or place than direct effects. These could include project-induced changes in habitat that eventually lead to changes in prey availability for a given species, or secondary development facilitated by the proposed action. The effects of secondary development could include loss of habitat, increased access for hunters, disturbance from additional recreational activity, and other impacts on wildlife.

Each activity or event may affect wildlife through several mechanisms that can be considered as indicators of potential impact.

Impact Level Definitions

- Minor: Causes population change in a specific location, and/or causes some loss of common habitat, and/or causes noticeable change in wildlife distribution at a specific location.

- Moderate: Causes population change in most of the planning area, and/or causes some loss of important habitat, and/or causes noticeable change in the distribution of wildlife throughout planning area.

- Major: Impacts regional population, and/or causes substantial loss of habitat important to reproduction or survival, and/or causes a shift in regional distribution of wildlife.

Alternative A – No Action

Under the No Action alternative, there would be no change from the current management direction that represents the existing condition in the South Denali region. There would be no approved plan for local, state, and federal agencies to cooperatively improve and increase recreational opportunities and access to the South Denali region; therefore there would be no new construction and no new impacts on wildlife.

Cumulative impacts

Increasing human settlement in the South Denali area has resulted in two major types of effects on wildlife: changes in habitat brought about by resource extraction, land development, wildfire suppression, and road construction; and greatly improved access to wild lands for hunting, fishing, and a host of other recreational activities.

The general effect of habitat loss and fragmentation has been to reduce the carrying capacity for most wildlife species, although there has been no effort to quantify this effect. Table 4-6, found in the Vegetation section of this chapter, lists the cumulative impacts to different vegetation communities within the planning area. This table indicates that most habitat changes have taken place or are likely to take place in closed canopy broadleaf forests (approximately 13,000 acres), tall and low scrub (about 6,900 acres), closed mixed forests (3,450 acres), closed needleleaf forests (1,500 acres), and herbaceous habitats (1,150 acres). Except for the case of closed mixed forests, these changes in habitat represent much less than ten percent of what existed under pristine conditions before substantial human settlement. Similar changes in wildlife habitat are likely to continue in the foreseeable future as more people settle in the area and seasonal use continues to grow. This degree of habitat change has affected the local distribution of various wildlife species, especially around the most developed areas near the Parks Highway, but there is no evidence that the regional populations of any bird or mammal species have declined as a direct result of habitat loss in the area.

Impacts from increased cross-country ORV use are more difficult to quantify. ORV use primarily causes loss of productivity (loss of vegetation cover), erosion, compaction, rutting, and displacement. Ruts from ORV use can be seen from the air throughout general state land in the planning area. Noise from ORV use could displace individuals and stress wildlife. This trend would be expected to continue, and impacts would occur throughout the planning area.

For large mammals, the great increase in access and numbers of hunters over the last twenty years has strongly affected the survival rates, sex ratios, and local densities of popular game species, especially moose and caribou. The Alaska Board of Fish and Game and ADF&G have had to change hunting regulations a number of times in order to reduce hunter success and maintain sustainable populations of these species. Recent management actions have been taken to reduce the populations of wolves and brown bears in the area in order to promote increased populations of moose for human consumption (Tobey 2003). Active game management policies that promote the increase of some species and decreased populations of other species are likely to continue in the foreseeable future.

For birds, development in forest and shrub habitats would decrease the options for foraging and nesting, especially for species that are less tolerant of disturbance. However, given the generally low densities of nesting birds in central Alaska and the abundance of alternative, undisturbed habitats in the area, it is unlikely that the regional populations of any species have declined as a result of decreased carrying capacity on their breeding grounds. Most of the species of conservation concern are migrants that are facing much more serious challenges to their winter habitats in the south. However, some of the wetland nesting species such as the Tule goose and trumpeter swans are fairly sensitive to human disturbance on their nesting grounds. Increased human encroachment in these areas, especially by loud riverboats that service the tourist industry, could cause enough disturbance to reduce reproductive success or abandonment of nesting grounds. Growth of these types of tourist services could be facilitated by the proposed project and other access improvements that are in the planning stages. There are a number of potential mitigation measures such as limiting public access to known nesting areas, limiting the use of loaded river boats, and monitoring populations to assess impacts could be pursued to help alleviate this cumulative adverse impact on riverine habitat birds.

Thus, the cumulative impacts on wildlife resulting from past, present, and reasonably foreseeable future actions would be moderate.

Conclusion

The No Action alternative would not affect wildlife in the planning area.

Alternative B – Peters Hills

Under Alternative B, recreational and visitor facilities would be constructed at sites in the Peters Hills area and adjacent to the Parks Highway and Petersville Road. Construction and operation of these facilities would directly impact wildlife habitat at the development sites. Table 4-5 (found in the Vegetation section of this chapter) shows the acres of habitat type that would be directly affected by implementing Alternative B. The impacts on wildlife related to the loss of habitat and the indirect effects of increased disturbance from human activity in areas presently with little human activity are discussed as applicable for each site.

Peter Hills

Loss of wildlife habitat from construction and operation of facilities in the Peters Hills alternative involve both the direct loss of habitat from clearing vegetation during construction and operation of the facilities, and the indirect effects of increased disturbance from human activity in areas presently with little human activity. Development proposed for this area includes an approximately 7-mile access road from MP 28 of the Petersville Road to a new nature center, trail system, and backcountry facilities including a cabin.

The Peters Hills access road, the nature center at the top of Peters Hills, and the trail network and backcountry facility would result in the direct loss of approximately 79 acres of wildlife habitat. Approximately half of this total, about 40 acres, would be tall and low shrub communities. Broadleaf, needleleaf, and mixed forest habitats make up about 16 acres with the remaining habitat consisting of meadow (dry or moist herbaceous; 11acres) and dwarf shrub communities (9.5 acres). The actual value of this habitat to different wildlife species would depend to some degree on its location.

All of these vegetation communities are common within the planning area and most of the losses due to clearing would be in linear features such as roads and trails, which would minimize the impacts to wildlife in any specific area. However, because the area is not developed at present, direct and indirect impacts with respect to specific mammals and birds in the Peters Hills area are discussed in general in the following paragraphs.

The permanent loss of mammal habitat within the cut and fill limits of the parking facility, road corridor, visitor facility, and associated trails would be relatively small compared to the amount of similar habitat in the planning area. Human noise and activity in the planning area, both during construction and under normal operations, is likely to cause some animals to avoid the road and nature center and would effectively cause additional habitat loss. The size of this "avoidance zone" would depend on the type and intensity of the disturbance as well as many animal behavior variables. The effective loss of habitat for each species would therefore fluctuate over time but could be substantially larger than the footprint of the project.

Roadways can sometimes function as a barrier to animal movements due to a combination of avoidance behavior and physical features such as steep cutbanks, guardrails, or retaining walls. This may deter animals from accessing particular areas and resources and thus decrease the value of the habitat (USDA Forest Service 2000). Another major concern with wildlife having to cross a road is the danger of collisions with vehicles, although the traffic volume and speed of buses on the proposed road is such that road kill mortality should be minimal.

Noise from cross-country ORV use and increased snowmachine use, due to improvements in parking areas and trailheads proposed in this alternative, is likely to cause some animals to avoid areas where these vehicles are used. The size of these "avoidance zones" would depend on the type and intensity of the disturbance as well as many animal behavior variables.

Brown bears tend to avoid using habitats near roads, sometimes regardless of traffic volume (McLellan and Shackleton 1988; Kasworm and Manley 1990; Mace, Waller et al. 1996). Black bears appear to be more tolerant of roads and vehicles. However, the proposed facilities are not near any critical bear habitat such as anadromous fish streams so any behavioral loss of habitat is likely to have minor effects on the ability of bears to obtain important resources. Bears typically avoid humans but are attracted to human garbage and food supplies, which sometimes brings them into conflict with humans and results in bears being shot in defense of life or property (Suring, Barber et al. 1998). BMPs, such as controlling waste disposal and food storage, can be incorporated into construction procedures and visitor facility operations to minimize this potential problem.

Under this alternative, private vehicle use would be restricted on the new road during the main visitor season, and ORVs would not be allowed on the new trails. Although parking areas along the Petersville Road would be improved, hunter access to the Peters Hills area would remain similar to the present conditions so the project would not be expected to result in increased hunting mortality of bears.

Caribou occasionally pass through the Peters Hills area during their seasonal movements but they have not been observed to calve or spend appreciable time in the area. The loss of habitat due to the footprint of the project and disturbance is therefore unlikely to affect their reproduction or survival. As noted above, access of hunters to caribou in the area is not expected to change from present conditions and mortality from vehicle collisions is unlikely. Disturbance from human activity could disrupt normal behavior during the short time that caribou are in the area but the effects are likely to be temporary.

Moose could be present in the planning area during construction and during normal operations in the visitor season. Noise from construction activities is likely to disturb moose and temporarily displace them from the immediate vicinity but is unlikely to keep them from acquiring critical resources for survival or reproduction. Because of their keen sense of hearing, moose are typically able to detect the presence of people from a distance and are able to avoid being seen or having adverse interactions. In many urban areas in Alaska, moose habituate to the presence of humans and are able to successfully forage and even have calves nearby. This is often considered a positive experience from a visitor's perspective and is generally safe unless visitors behave inappropriately and try to approach the moose. Visitor education about appropriate behavior around wildlife is proposed to be an important emphasis at all visitor facilities. The potential for increased mortality on moose through vehicle collisions and increased hunter access are considered to be minor.

There are a variety of small mammals that are likely to be affected by loss of habitat and disturbance from the proposed project. Some species, such as voles and ground squirrels, could

also experience some direct mortality from construction activities. However, given the relatively small amount of habitat involved, the affected numbers of individuals of each species is likely to be small and any reduction in survival or reproduction is likely to be temporary. After construction, small mammals are likely to adjust their territories to accommodate the new facilities and trails. Some predators, such as lynx, red fox, and wolves, could benefit from the project by utilizing the new recreational trails for easy access to their own territories. No species of mammal is likely to experience a substantial increase in mortality due to vehicle collisions or improved hunter/trapper access. The magnitude of potential effects on other mammals is considered to be minor.

For many terrestrial bird species in Alaska, conservation concerns are the result of landscape-scale loss of habitat due to fire or commercial logging (Boreal Partners in Flight 1999). Habitat loss due to the proposed project would be relatively small (approximately 119 acres) in comparison and would primarily affect species that are likely to nest in the area. Most of the bird species of conservation concern described in Chapter three are either uncommon to rare in the South Denali area or nest in other habitat types than the uplands directly affected by the project. Species that potentially nest in the area affected by the alternative include rock ptarmigan, olive-sided flycatcher, northern shrike, varied thrush, arctic warbler, blackpoll warbler, golden-crowned sparrow, and white-winged crossbill.

Loud noises and sudden movements from construction activities, vehicle traffic, or pedestrian traffic are likely to disturb birds in nearby areas. If the birds are feeding or resting, they would likely fly away from the disturbance and resume their normal behavior in another location. Outside of the nesting season, such short-term displacements would cost birds a minor amount of energy and time but would be unlikely to affect their survival. Disturbance of nesting birds would decrease their chances of reproductive success for the season or could cause them to abandon their nests. For this reason, the Migratory Bird Treaty Act prohibits disruption of nesting activities. The most effective way to assure compliance with this law is to schedule land-clearing and excavation activities outside the nesting season. After construction, most birds would likely nest some distance away from the road and trails in order to avoid chronic disturbance from vehicles and pedestrians. However, some species, such as gray jays, are attracted to campgrounds and other human habitations and receive some benefits in the form of food gleaned from picnic tables.

Traffic on the road to the visitor facility and pedestrian traffic on hiking trails would be infrequent so the zone of avoidance around these developments is likely to be small and temporary. Because the type of habitat lost to the proposed project is very common in the South Denali area, the amount of foraging and nesting habitat lost due to construction and disturbance would be unlikely to affect the long-term survival or reproductive success of any of the species considered.

Parks Highway

Project components that would be built along the Parks Highway would result in the direct loss of some wildlife habitat. These components include: MP121.5 and 122 parking areas, Rabideux Creek parking area, and Chulitna River access. About 17 acres would be lost from clearing and development of these facilities. Some of the major vegetation types affected by these developments include about 15 acres of closed broadleaf and closed mixed forest, about 1 acre of shrub habitat and less than an acre of dry or moist herbaceous habitats. These habitats are common in the planning area and wildlife populations are not likely to be impacted by the loss. Since the Parks Highway corridor is already developed, indirect effects due to increased disturbance from human activity would not be a factor at most of these sites.

Petersville Road

Components along the Petersville Road that would contribute to the loss of wildlife habitat include a campground near the Forks Roadhouse, turnout at MP 12.8, turnout at MP 16.3, upgrade of Kroto Creek parking area, and parking area/transportation center at MP 28. These developments would result in the loss of about 11 acres of habitat. The majority of habitats impacted include broadleaf forest and shrublands; these habitats are common in the planning area and wildlife populations are not likely to be impacted by the loss. Impacts would be permanent and last throughout the life of the plan.

Cumulative impacts

Past, present and future developments that would impact wildlife would be the same as those discussed for Alternative A. Increasing human alteration of the South Denali environment is a reasonably foreseeable cumulative effect, especially in the summer tourist season, and the wild character of the surrounding area would be degraded as this occurs. Although these cumulative impacts have changed the population status of some wildlife species (i.e. big game and their major predators) and affected the distribution of most birds and mammals in the area, no species appear to be exhibiting long-term declines in their regional populations as a result of human changes in the local environment. The presence of Denali National Park and Preserve as well as Denali State Park assures that there would continue to be an abundance of diverse and excellent wildlife habitats in the region in the foreseeable future, even with expanded developments on private, state, and borough lands.

Alternative B would increase development and visitor usage of the South Denali region, particularly the Petersville Road area, by thousands of people per day in the summer and would thus contribute substantially to the cumulative impacts of increasing human influence on wildlife in the area. The contribution of this alternative to habitat loss would be minimal relative to both external developments and the pristine condition. Cumulative impacts on wildlife would be considered moderate in magnitude, and the overall contribution of this alternative to the cumulative impacts on wildlife in the planning area would be minimal.

Conclusion

Development of new visitor facilities under Alternative B is likely to have minor direct and indirect impacts on local wildlife. Although construction activities may cause temporary displacement of wildlife due to disturbance, the proposed mode of operation with buses and pedestrian trails is likely to cause minimal disturbance so that resident birds and mammals are likely to remain in the vicinity of the visitor facilities and access road. Increased ORV and snowmachine use would displace individuals but is not expected to cause population-level changes throughout the planning area.

Alternative C – Parks Highway

Under Alternative C, recreational and visitor facilities would be constructed in the Curry Ridge area and at sites adjacent to the Parks Highway and Petersville Road. Table 4-7 (found in the Vegetation section of this chapter) shows the acres of habitat type directly affected by clearing under Alternative C. The impacts on wildlife related to the loss of habitat and the indirect effects of increased disturbance from human activity in areas presently with little human activity are discussed as applicable for each site.

Curry Ridge

The access road from the Parks Highway, the visitor center at the top of access road, and the trail network would result in the direct loss of approximately 91 acres of wildlife habitat. Approximately half of this total, 41 acres, would be forest (broadleaf, needleleaf and mixed). Tall and low shrub communities would make up another 43 acres. The remaining area would consist of 6 acres of meadow habitat (dry or moist herbaceous), and less than 1 acre of dwarf shrub. The actual value of this habitat to different wildlife species would depend to some degree on its location.

All of these vegetation communities are common within the planning area and most of the losses due to clearing would be in linear features such as roads and trails, which would minimize the impacts to wildlife at any specific location. Construction of the trail system, while covering about 70 acres total, would only likely result in the removal of understory species (about 33 acres). The remaining forest species would not be affected by the trails.

Under Alternative C, the permanent loss of wildlife habitat within the clearing limits of the different developments is relatively small (about 143 acres) compared to the amount of similar habitat in the planning area. Although this alternative would impact wildlife in a different location, the types and magnitude of effects would be essentially the same as described for Alternative B. These potential effects primarily involve a minor amount of permanent habitat loss and several sources of disturbance that would be mostly temporary in nature. The Curry Ridge area is generally known to support a high number of bears. Development at this site would likely displace some individuals, but these and other effects are unlikely to impact more than a small number of individual animals or adversely affect regional populations of any species. Mitigation measures (that are listed in the Mitigation section in Chapter Two) would mitigate impacts to bear populations.

Parks Highway

Effects on wildlife habitat along the Parks Highway within the planning area would be the same as those described for Alternative B with the addition of a parking area and campground at MP 134.6 of the highway. The proposed transportation/parking area and campground facility at the MP 134.6 of the Parks Highway lies on 28.6 acres of land, of which about 20 acres would be cleared or disturbed. Terrestrial vegetation types directly impacted would include mostly closed broadleaf forest and tall/low scrubland. Since the Parks Highway corridor is already developed, indirect effects due to increased disturbance from human activity would not be a factor at most of these sites.

Petersville Road

Effects on wildlife along the Petersville Road would also be the same as those described for Alternative B; however, there would be no parking/transportation center at MP 28. Therefore, total area of vegetation cleared for facilities along the Petersville Road under Alternative C would be about 4 acres consisting mostly of closed broadleaf and needleleaf forest.

Noise from cross-country ORV use and increased snowmachine use, due to improvements in parking areas and trailheads proposed in this alternative, is likely to cause some animals to avoid areas where these vehicles are used. The size of these "avoidance zones" would depend on the type and intensity of the disturbance as well as many animal behavior variables.

Cumulative Impacts

The cumulative impacts on wildlife would be dominated by factors external to the proposed project and would be the same as those described for the Alternative B. Alternative C would likely promote ancillary visitor service development along the main highway corridor rather than along a secondary road, which might concentrate future development in a smaller area, but the overall contribution of this alternative to the cumulative increase in human influence on the area's wildlife would be similar to that of the Peters Hills alternative. The two major cumulative impacts on wildlife of increasing human settlement in the South Denali region are changes in habitat and greatly improved access to wild areas. The degree of habitat change and human disturbance/consumption has likely affected the local abundance and distribution of various wildlife species and is considered to have had moderate impacts on the regional populations of the species considered.

Thus the cumulative impacts on wildlife resulting from past, present, and reasonably foreseeable future actions and the actions proposed under Alternative C would be moderate. The overall contribution of this alternative to the cumulative impacts on wildlife in the planning area would be minimal.

Conclusion

Development of new visitor facilities at the Parks Highway site would likely have minor direct and indirect impacts on local wildlife. Construction activities may cause temporary displacement

of wildlife due to disturbance but the operation of the facilities and pedestrian trails is likely to cause minimal disturbance of birds and mammals. Increased ORV and snowmachine use would displace individuals but is not expected to cause population-level changes throughout the planning area.

CULTURAL RESOURCES

Methodology

To determine potential impacts of the proposed alternatives on cultural resources within the planning area, cultural resources inventories that occurred within the planning area were reviewed. The records of the Alaska Heritage Resources Survey (AHRS) were examined to locate information on known sites in the vicinity of the proposed project area and previous investigations conducted in the area. A literature review was also conducted to assist in generating a historic context for evaluating cultural resources identified in the project area. This included the mining history for the area, as it was felt that the remains of mining activities would likely be found in the Peters Hill location.

The access road routes proposed for Alternative B and C were walked by two to four people from the Alaska Office of History and Archeology, spaced 10m to 15m apart. High probability areas adjacent to the access road route were also inspected. Surface exposure was very good at the Peters Hills area, as there was little soil development and little vegetation. Two personnel accessed the project area of potential effect from the northwest side and surveyed the pad and route leading south. Two other personnel accessed the area of potential effect from approximately the middle of the route and surveyed the route southward. The Parks Highway location was densely vegetated, and surface visibility was very low. Several shovel tests were excavated along the route in areas judged to have high archaeological potential.

No new cultural resources were identified in the Peters Hills area, other than the mining ditch feature (TAL-115) located west of the access route. Fairly complete survey was possible due to the area of potential effect being primarily above treeline, and soil development was minimal resulting in high surface visibility. Much of the area immediately adjacent to the area of potential effect was investigated in hopes that the high surface visibility would allow identification of surface scatters of artifacts. None were identified. The area of potential effect for this alternative does not appear to affect any cultural resources.

The Parks Highway site consists of heavily vegetated kettle and kame topography cut
by steep and deep ephemeral stream channels. Although the proposed area of potential effect was surveyed and no cultural resources identified, the adjacent areas were not as thoroughly investigated. As stated, no cultural resources were identified along the proposed area of potential effect. We would recommend that if the route is developed, additional survey of the adjacent area should be conducted to assure that no cultural resources outside the identified area of potential effect exist that might be subjected to secondary affects resulting from increased use of the area.

General Impacts

In general, the potential for increased pressure on cultural sites increases as the number of visitors increases. Impacts from visitor use can include modification, defacement, displacement, or removal of objects from cultural sites. Management actions to manage visitor use could also result in adverse impacts (for example, disturbing sites during trail construction). When specific actions are taken within any alternative further analysis could be required to comply with the requirements of Section 106 of the National Historic Preservation Act (NHPA) in accordance with the Advisory Council on Historic Preservation's regulations implementing Section 106 (36 CFR Part 800, "Protection of Historic Properties").

Impact Level Definitions

While each conclusion reflects a judgment call about the relative importance of the various factors involved, the following descriptors provide a general guide for how those conclusions are reached.

- Minor: Impacts affect cultural resources that are not eligible for the National Register of Historic Places (NRHP).

- Moderate: Impacts affect cultural resources that are eligible for or are already listed in the NRHP if no mitigation measures are implemented.

- Major: Impacts affect cultural resources that are listed in the NRHP, regardless of mitigation measures.

Alternative A- No Action

The actions proposed under this alternative would have no impact on cultural resources within the planning area because no new developments are proposed under this alternative.

Cumulative Impacts

Resident population growth and visitor use are expected to continue to increase in the south side planning area regardless of the outcome of this development concept plan. New housing and commercial development has occurred along the Petersville Road and throughout the South Denali region. This development has resulted in minor expansion of local road networks or improvements of existing roads. This gradual development spreading out from the Parks Highway corridor is likely to continue, creating increased access to the state and federal park lands. Resort lodges, motels, RV parks, cabins, and campgrounds would likely be developed in the region independent of developments considered under the proposed action. These developments would correspond with increased use in the region. Increases in use and improved access to the region increase exposure to cultural resources and increase the potential for disturbance or damage to cultural resources.

The combination of impacts from other activities that directly affect cultural resources and the provisions under Alternative A would result in major impacts overall, since some of the

resources that could be impacted could include resources of national importance. The actions proposed under Alternative A would not contribute to the overall cumulative impacts to cultural resources.

Conclusion

There would be no adverse impacts to cultural resources under this alternative because no new developments would be planned.

Alternative B - Peters Hills

Eighteen historic and prehistoric cultural resources are reported in the vicinity of the Peters Hills development site (Table 3-8). Only one site (TAL-080), the Peters Creek Bridge, has been formally evaluated for listing in the National Register of Historic Places. Several types of resources are represented in the immediate area; including prehistoric and Dena'ina archaeological sites (buried archaeological materials, cache pits, house depressions); gold mining habitation and work sites; transportation features (trails, wagon roads, bridges, landing fields, construction camps, shelter cabins); and cabin sites associated with trapping, homesteading, and other historic activities. These resource types are situated in reasonably predictable locations within the landscape.

Early prehistoric archaeological sites along the middle Susitna Valley are generally located on well-drained conspicuous promontories near fresh water (Seager-Boss 2004:61). Cache and house pits are common throughout the Susitna River basin and are most often located near the confluence of streams or rivers, and along lake margins. Historic gold mining habitation and work sites are located within gold-producing stream and river valleys in the Peters and Dutch Hills. Associated ditch and penstock features were often constructed in the uplands between placer creeks. Although most major trails and roads in the region are documented in historic literature, the location of smaller opportunistic trails are largely unknown. Shelter cabins, mining cabins, construction camps, and homesteads are typically clustered along trail, roads, and river corridors.

The historic integrity of the Petersville Road (TAL-117) could be damaged by proposed upgrades and widening of the road. Enhancements may alter the setting, location, workmanship, and feeling of the road. These aspects of integrity are significant elements in National Register eligibility. Cabins or archaeological sites located along its route may be directly impacted by road improvements.

Improving Petersville Road would facilitate and increase access to the Peters and Dutch Hills. Improved access would increase visitation and the potential for artifact collecting and vandalism of cultural resources.

Construction of an access road to the proposed Peters Hills nature center would directly bisect a mining ditch feature (TAL-115). Ground disturbance would be short-term and unlikely to denigrate the overall National Register eligibility of the feature. The ditch is a conspicuous landscape feature that may attract visitation and hiking of its route. Mining-related artifacts, such as shovels, picks, and other antiques are often found along the path of mining ditch features and

would be vulnerable to artifact collecting. The new access road would improve access to this ditch, increasing visitation and the potential for artifact collecting and vandalism of cultural resources.

Hiking trail development at the Peters Hill site would have the highest potential to affect historic resources. Reported mining-era sites (TAL-072,TAL-073,TAL-074) in the region consist of surface features and artifacts representing habitations and work sites. Shovels, tinware, and other historic mining-era artifacts are scattered throughout the Dutch and Peters Hills. A proposed 15-mile hiking trail from mile 30.5 to Home Lake could directly affect cultural resources along the mining and native trail (K'enuqak 'itnetant) that extended from Cache Creek to Home Lake. Prior to the construction of the Petersville Road, Home Lake was the site of early prospecting and logistical camps for miners of the Yentna District. Construction of a public use cabin at Home Lake could disturb unreported buried or surface cultural resources at the site. Hiking trails would increase pedestrian access and the illicit collecting of portable artifacts important to the history of the region.

Campground development near the Forks Roadhouse has a high potential to directly affect historic properties. Built in the late 1920s, the Forks Roadhouse (TAL-116) was important to regional history and is likely eligible for listing in the National Register of Historic Places. Campground construction would directly disturb surface artifacts, archaeological deposits, and historic building ruins in the vicinity. Construction of a campground could directly impact artifacts or historic building remains related to road and mining development after the 1920s. Lands at the Forks have not been archaeologically surveyed and probably contain cabins, cabin ruins, mining equipment, tinware, bottles, horseshoes, sleds, and transportation-related artifacts. Effects of construction would be short-term but could destroy the integrity of surface and subsurface resources. Changes in the spatial relationship of artifacts and features would compromise the research potential and National Register eligibility of these properties.

The campground would increase visitation along the adjacent Cache Creek Trail (TAL-118) between the Forks and Cache Creek. The trail has not been surveyed and may possess significant historic artifacts along its route. Mining-era artifacts are highly valued by collectors and would likely disappear with increased access and use (Carley 1981; Sweeney 2000).

Construction of a bike path and turnouts on the Petersville Road has the potential to affect significant cultural resources. Potential historic properties along the route include Alaska Road Commission construction camps, shelter cabins, homestead cabins or cabin sites, the Petersville Road (TAL-117), and scattered artifacts associated with the mining history of the region. The route also holds potential for prehistoric and Dena’ina archaeological sites near streams, ponds, and along well-drained prominent landforms. Impacts from bike path construction would be acute and short-term. Effects from sustained pedestrian use of the route would be long-term and may include artifact collecting from nearby archaeological sites or historic structures. These impacts have a high potential to damage the integrity and National Register eligibility of sites along the route.

Cumulative Impacts

External impacts affecting cultural resources would be the same as described in Alternative A.

The combination of impacts from other activities that directly affect cultural resources and the provisions under Alternative B would result in major impacts overall, since some of the resources that could be impacted could include resources of national importance. The actions proposed under Alternative B would appreciably add to the overall cumulative impacts to cultural resources.

Conclusion

Alternative B would have moderate adverse impacts to cultural resources because of increases in the number of visitors in areas where cultural resources exist. Many of these resources are eligible or could be eligible for the NRHP; however if the mitigation measures listed in Chapter Two are implemented, then impacts to these cultural resources would be avoided.

Alternative C - Parks Highway

In addition to the impacts described under alternative B from campground construction near the Forks, and pullouts and a bike path along Petersville Road, the following impacts would also occur.

Three historic and prehistoric cultural resources are reported in the vicinity of the Parks Highway development site (Table 3-9). Reported at TAL-114 is a scatter of lithic flakes on a hill overlooking Byers Lake. Historic sites include cabins and cabin remains at Byers Lake (TAL-119), and an historic building at Curry Lookout (TAL-001). The Curry Lookout cabin is listed in the National Register of Historic Places. Curry Ridge (K'esugi Ken) and Troublesome Creek (Nelnikda Ey'unt) were locations frequented by Dena'ina bear and caribou hunters. A native steambath and possible campsite were reported by Shem Pete along the east bank of Troublesome Creek (Kari and Fall 2003).

Proposed trail enhancements near the Parks Highway site could affect these prehistoric sites. Prehistoric sites in the region tend to cluster around lakes, the confluence of rivers and streams, and promontories with water access. Hiking trails and a 3.5-mile visitor access road would bring direct visitation to Lake 1787 and other smaller ponds. Ground-disturbance from trail construction, erosion, and artifact collecting could negatively affect the historic significance and potential eligibility of these sites to the National Register of Places. Lithic artifacts vulnerable to collecting may include projectile points, bifaces, and waste flakes.

The proposed trail to Lake 1787 has the potential to directly and indirectly effect cultural resources. A high probability exists for unreported cultural resources at Lake 1787 and small ponds along the trail route. Archaeological resources at these discrete sites may include pit features and surface lithic [stone] artifacts. Trail construction, artifact collecting, and erosion from increased visitor-use would adversely affect these resources. Collection of artifacts and ground-disturbing activities would diminish the research potential and eligibility of these archaeological properties to the National Register of Historic Places.

A proposed hiking trail connecting the visitor center to Curry Lookout would increase visitation to the National Register listed Curry Lookout building (TAL-001). Increased visitation could

negatively impact this resource. However, measures listed in the Mitigation section of Chapter Two would mitigate impacts to this resource by ensuring that the building is in stable and good condition. Historic resources in the vicinity of the lookout may be present and could be adversely impacted by trail development, erosion from pedestrian traffic, or artifact collecting. The Curry Ridge Trail and associated features would be evaluated for potential eligibility for listing on the National Register of Historic Places.

Cumulative Impacts

In addition to the external impacts affecting cultural resources that are described in Alternative A, developments at Curry could include a pedestrian bridge across the Susitna River and a trail from Curry to the Curry Lookout. This action would generate additional potential for disturbance to the historic Curry Lookout.

The combination of impacts from other activities that directly affect cultural resources and the provisions under Alternative C would result in major impacts overall, since some of the resources that could be impacted include resources of national importance. The actions proposed under Alternative C would appreciably add to the overall cumulative impacts to cultural resources.

Conclusion

Alternative C would have moderate adverse impacts on cultural resources because of increases in the number of visitors in areas where cultural resources exist. Some of these affected resources are eligible or could be eligible for the NRHP; however if the mitigation measures listed in Chapter Two are implemented, then impacts to these cultural resources would be avoided. For example, repairing the Curry Lookout and providing education and interpretation for that resource would mitigate potential adverse impacts to it.

SOCIOECONOMICS

Methodology

The social environment of the planning area includes the areas identified on the planning area map (Figure 2-1) as well as the local communities of Talkeetna, Trapper Creek, Petersville and the Y community. Six socioeconomic elements were analyzed including: population and demographics; industry, employment, and income; housing and real estate; borough and municipal revenues and expenditures; quality of life; and land use.

Methodologies for each socioeconomic element are described below. Whenever possible, effects are identified in quantitative or numerical terms (such as number of jobs, additional income, or housing units). Some impacts are more difficult to evaluate numerically, either because of a lack of quantifiable properties or a lack of background information, and so are described in a qualitative or narrative manner.

A visitor projection was also developed to provide additional context for evaluation of impacts to the socioeconomic environment. This information is provided in Appendix E.

Population and Demographics

Impacts to population and demographics are observed throughout the planning area, although they are concentrated primarily in populated areas where data is readily available. The communities in the planning area for which population and demographic information is available are Petersville, Talkeetna, Trapper Creek, and the Y community.

Population data are available for 1990 and 2000 and come from the 1990 Census and 2000 Census (U.S. Census Bureau 1990; U.S. Census Bureau 2000). The geographic extent of the Talkeetna Census Designated Place (CDP) changed in 2000. The 1999 population for the Talkeetna CDP from the Alaska Department of Labor & Workforce Development was used to estimate the growth rate and 2000 population for the area comparable to the 1990 CDP.

Population changes are based on job impacts estimated using IMPLAN (Minnesota Implan Group) and the average household size of the planning area communities. IMPLAN is discussed in more detail in the following section.

Population changes are based on the type of activity that creates a demand for workers. Construction workers are assumed to come to the planning area alone, so population changes are equal to the potential number of jobs filled by nonlocal workers. Workers involved in operations and maintenance are more likely to bring families to the planning area, so population changes are based on the potential number of jobs created and the average household size.

Impact level criteria were developed for each socioeconomic element (Table 4-9). The magnitude criterion for population and demographics is based on growth rates experienced in the planning area communities from 1990 to 2000. The average historic growth rate was 6.0%; the upper limit was 7.7% in the Y community and the lower limit was 3.6% in Trapper Creek. The growth rates are influenced by boundary changes that occurred between 1990 and 2000, and may be slightly different than what is indicated. The two changes that influence the growth rates are the designation of the Petersville CDP, which was new in 2000, and the expansion of the Talkeetna CDP in 2000 from 1990.

Industry, Employment, and Income

An input-output model of the regional economy of the Matanuska-Susitna Borough was created using the IMPLAN model and software. The Borough was used because that is the most detailed level of analysis available in IMPLAN. IMPLAN is an input-output modeling system that measures the multiplier effects of changes in the level of economic activity in a particular sector. It is based on the theory that when new money enters a community through investment, revenues, or income, some of it is re-spent one or more times in the local economy, creating multiplier effects of additional economic impacts. IMPLAN estimates those impacts using specific data on the inputs needed to produce the products or services (outputs) for over 500

industries or economic sectors, and community-specific data on industries that are present to purchase those inputs. The Matanuska-Susitna Borough has 141 economic sectors. The data are based on secondary sources analyzed by Minnesota Implan Group, Inc.

The IMPLAN data used for this study are for 2001. Employment and unemployment data is discussed in Section 3.3.3 and comes from the 2000 Census (U.S. Census Bureau 2000).

The magnitude criterion for industry, employment, and income (Table 4-9) was based on a comparison of the planning area's unemployment rate to the Matanuska-Susitna Borough's rate. Impacts were evaluated based on how the planning area's unemployment level would approach or recede from the Borough's level. The Borough's unemployment rate in 2000 was 6.8%. The average unemployment rate for the planning area communities was 18.7%, with a lower limit of 8.1% in Trapper Creek and an upper limit of 50% in Petersville.

Housing and Real Estate

This study uses the number of vacant housing units to measure the impacts of the alternatives on the planning area's housing and real estate. As with population, impacts to housing and real estate are primarily observed in existing communities where data is readily available. However, housing developments are possible virtually anywhere in the planning area, wherever the developer owns land.

Housing data are available from the 2000 Census (U.S. Census Bureau 2000). Additional data for this study were gathered from area realtors (Alaska Multiple Listing Service 2005; Stinson 2005) and are discussed in the Socioeconomics section in Chapter Three.

Housing and real estate impacts are based on job impacts estimated using IMPLAN. Construction workers are assumed to require temporary housing that could potentially be located proximate to the construction site. Workers that bring their families to the construction area are assumed to need to rent or purchase housing where it is available.

The magnitude criterion for housing and real estate is based on available housing in the planning area and the magnitude criterion for population impacts. Since area realtors indicated that available housing is limited, the magnitude of changes was based on foreseeable population growth rates that drive the demand for housing.

Borough and Municipal Revenues and Expenditures

This study uses information about population changes to determine what changes might take place in borough and municipal revenues and expenditures. Since limited data are available about the local and regional fiscal situations, the analysis is qualitative.

Borough and municipal fiscal effects are evaluated based on the potential need for infrastructure improvements (such as roads, schools, and government offices), provision of public services, and collections of additional revenues.

The magnitude criterion for borough and municipal revenues and expenditures (Table 4-9) is based on three levels of expenditures that could be required to accommodate population growth in the planning area: additional operations and maintenance spending (minor), construction of new roads and other limited infrastructure (moderate), or construction of schools and other major infrastructure (major).

Quality of Life

Quality of life information was gathered from existing data sources, including recent plans for projects in the vicinity of the South Denali planning area, public scoping comments, as well as documents from recent community meetings in Talkeetna, Trapper Creek, Petersville, and the Y community (Reed Hansen and Associates 1995; Matanuska-Susitna Borough Planning Department 1998; Matanuska-Susitna Borough Planning Department 1999; Trapper Creek Steering Committee 2003; Y Community Council Board 2003; NPS 2003a). These data sources were reviewed, using open coding techniques (Strauss and Corbin 1998). The qualitative data were analyzed by an open coding process, where concepts in the data were sought and sorted into categories. The categories were identified by grouping related concepts; these categories became the quality of life indicators for the planning area. The characteristics of the categories were further defined by their properties and dimensions.

Eight quality of life indicators were identified for the planning area: rural character, pace of life, community image, self-sufficient lifestyle, community cohesiveness, economic characteristics, government interaction, and recreation opportunities. These indicators were described in more detail in Chapter Three. The magnitude criterion was based on a qualitative analysis of change to the quality of life indicators. An action that impacts one or two of the eight indicators would have a minor impact, affecting three or four of the indicators would be a moderate impact, and if more than half of the indicators were affected there would be a major impact to the quality of life.

Land Ownership and Use

To determine potential impacts on land ownership, proposed locations for actions planned under the alternatives were compared with land ownership data provided by the Matanuska-Susitna Borough and other land ownership information provided in Chapter Three.

To determine potential impacts on land use, the proposed alternatives were then compared with land use plans described in applicable documents such as the *Susitna Area Plan* (ADNR, ADF&G et al. 1985), *Petersville Road Corridor Plan* (Matanuska-Susitna Borough Planning Department 1998), *Denali State Park Master Plan* (ADNR 1989) *and Amendment* (2006), *2000 Matanuska-Susitna Borough Recreational Trails Plan* (Matanuska-Susitna Borough 2000), and with the ADNR publication *Generally Allowed Uses on State Land Fact Sheet.*

Land ownership and use impacts were analyzed within the planning area, shown on Figure 2-1. In order to assess impacts four indicators were considered:

- Change in land ownership
- Change in land use
- Coordination among government entities.
- Consistency of proposed plans with existing applicable land use plans

The indicators were used to determine potential impact levels on land ownership and use according to the criteria provided in Table 4-9.

Table 4-9 Criteria for Determining Magnitude of Effects on Socioeconomics

ASSESSMENT CATEGORY									
Effect	**Population and Demographics**			**Industry, Employment , and Income**			**Effects on Housing and Real Estate**		
Impact Level	Minor	Moderate	Major	Minor	Moderate	Major	Minor	Moderate	Major
Magnitude	<3% change in planning area population	3% - 6% change in planning area population	>6% change in planning area population	<3% change in planning area employment	3% - 6% change in planning area employment	>6% change in planning area employment	<3% change in planning area housing units required to meet demand	3% - 6% change in planning area housing units required to meet demand	>6% change in planning area housing units required to meet demand

Table 4-9 Criteria for Determining Magnitude of Effects on Socioeconomics, continued

ASSESSMENT CATEGORY									
Effect	**Effects on Borough and Municipal Revenues and Expenditures**			**Quality of Life**			**Land Ownership and Use**		
Impact Level	Minor	Moderate	Major	Minor	Moderate	Major	Minor	Moderate	Major
Magnitude	Would generate additional revenues and require additional maintenance spending to support operational impacts of the project	Would require new construction (separate from the project) to support moderate to major changes in the population due to operational impacts of the project	Would require a new school and other major public infrastructure to support operational impacts of the project	One or two quality of life indicators are affected	Up to half of the quality of life indicators are affected	More than half of the quality of life indicators are affected	Little or no change in land ownership, land use, or levels of government coordination; actions are consistent with existing land use plans	Little or no change in land ownership or levels of government coordination; land uses change, but changes are consistent with existing land use plans	Change in land ownership that allows changes in land use; changes in land use controls or levels of government coordination; and/or inconsistent with existing land use plans

Alternative A - No Action

Population and Demographics

Under Alternative A, there would be no direct or indirect effects to population and demographics because no actions are proposed under this alternative. The area would continue to be popular for seasonal and recreational use, but the permanent population would continue to grow at rates similar to those experienced during the last several years.

Cumulative Impacts

The planning area population could change as a result of other developments in the planning area, though these would occur without agency coordination. These developments are assumed to be of small scale and spread over time so that there would be no impacts to the planning area population outside of historic limits and trends.

Other activities planned in the planning area could have some population impacts, particularly the disposal of state land. These properties would likely be acquired by individuals residing outside the planning area for purposes of building recreational properties for seasonal use. Newly developed recreational properties may increase the planning area's winter population, although the remoteness of the parcels would limit access. Over time, these recreational developments would have only a minor effect on the permanent population. The overall effect on population of all other activities would be minor.

Conclusion

Alternative A would not have an impact on the planning area's population or demographics

Industry, Employment, and Income

Under Alternative A, there would be no direct or indirect effects to industry, employment, and income because no actions are proposed under this alternative. There would be no new employment or business opportunities. The area would continue to provide goods and services to local residents, highway travelers, and visitors to the area. Seasonal and recreational use would also continue. These activities would continue to grow over time.

Cumulative Impacts

The planning area population could change as a result of other developments in the planning area, though these would occur without agency coordination. These developments are assumed to be of small scale and spread over time so that there would be minimal impacts to the planning area. Overall, the level of impact would depend on the extent to which local labor and materials would be used.

Other activities planned in the planning area could have some employment and income impacts, particularly the plans to develop a river float trip from Curry to the McKinley Princess Lodge. Riverboat services would see an increase in sales from this activity and could potentially hire new employees. The McKinley Princess Lodge could see an increase in hotel occupancy from visitors that stay at the lodge following the float trip. However, the additional hotel stays would have little to no effect on the planning area's employment and income since existing hotel staff

would be sufficient to handle higher occupancy rates, and the overall impact on industry, employment, and income would be minor.

Conclusion
Alternative A would not have an impact on the planning area's industry, employment, and income.

Housing and Real Estate
Under Alternative A, there would be no direct or indirect effects to housing and real estate because no actions are proposed under this alternative. The area would continue to be popular for seasonal and recreational use, which is reflected in housing information from the U.S. Census Bureau.

Cumulative Impacts
The planning area's housing and real estate would likely not change as a result of other developments in the planning area since these are assumed to be of small scale and spread over time so that there would be no impacts to planning area housing and real estate, outside of historic limits and trends.

Other activities planned in the planning area could have some housing and real estate impacts, particularly the land disposal sales. These properties would likely be acquired by individuals residing outside the planning area for purposes of building recreational properties for seasonal use. Over time, the number of housing units could increase, but the seasonal and recreational use would be similar to existing housing stock. The overall impact on housing and real estate would be minor.

Conclusion
Alternative A would not have an impact on the planning area's housing and real estate

Borough and Municipal Revenues and Expenditures
Under Alternative A, there would be no direct or indirect effects to borough and municipal revenues and expenditures because no actions are proposed under this alternative. There would be no new property tax revenues associated with new tourism-related development. No change would take place in local or regional governments' fiscal situation under Alternative A.

Cumulative Impacts
Land disposal sales would increase private ownership in the planning area, which could increase property tax collections. However, due to the anticipated use of these properties, their remoteness, and the limited access, it is unlikely that the local or regional governments would build any infrastructure in the foreseeable future to support them. The overall impact on borough and municipal revenues and expenditures would be minimal.

Conclusion
Alternative A would not have an impact on the planning area's borough and municipal revenues and expenditures.

Quality of Life
Under Alternative A, there would be no direct or indirect effects to quality of life because no actions are proposed under this alternative.

Cumulative Impacts
Existing and potential projects in the vicinity of the South Denali planning area are described at the beginning of this chapter. The quality of life indicators, as described in the Socioeconomics section in Chapter Three would not abruptly change from the existing condition. However, quality of life indicators could change over time if uncoordinated development and road improvements continue in the planning area. There would be no plan that would commit agencies to preserving the quality of life in the rural communities in the South Denali area. Issues of concern (trespass, vandalism, access, development, damage by cross-country ORV use, etc.) would be addressed separately by land management agencies within the constraints of jurisdictional boundaries and financial resources. Implementation of the *Susitna Area Plan* (ADNR, ADF&G et al. 1985), *Petersville Road Corridor Plan* (Matanuska-Susitna Borough Planning Department 1998), *Denali State Park Master Plan* (ADNR 1989), *2000 Matanuska-Susitna Borough Recreational Trails Plan* (Matanuska-Susitna Borough 2000), and/or other applicable plans would proceed at the discretion of the individual land management agencies.

Indicators that could be affected by uncoordinated development and road improvements throughout the planning area could include: pace of life, community image, community cohesiveness, recreation opportunity, and economic characteristics. Uncoordinated development could redirect typical traffic patterns in the area and road improvements could increase traffic levels; these changes could affect the pace of life indicator. Uncoordinated developments could also change the historic identity of the area; the community image indicator could be affected. Population changes associated with unplanned development could affect community cohesiveness. Increases in recreational use of the area could exacerbate existing conflicts between motorized and non-motorized users, and noise from motors could continue to degrade the quality of the experience for non-motorized recreational users and for remote recreational cabin owners who value natural sounds. Economic characteristics of the area could also be affected by an influx of unplanned development, with economic stimuli as well as economic demand on existing community services and infrastructure.

Developments would likely be clustered around existing transportation infrastructure. With developments potentially occurring throughout the planning area, the extent of the impacts would be considered moderate. The duration of impacts could be long-term, but would likely be intermittent (due to the seasonal nature of businesses in the area).

Up to five quality of life indicators could be affected (including pace of life, community image, community cohesiveness, recreation opportunity, and economic characteristics), which would be

a major-level magnitude. Based on prior development in the region, the extent of potential uncoordinated development could be throughout the planning area.

Conclusion
Alternative A would not have an impact on the planning area's quality of life.

Land Ownership and Use
Land ownership and use in the planning area could change under Alternative A but would likely be in a manner similar to historic patterns. Implementation of the *Susitna Area Plan* (ADNR, ADF&G et al. 1985), *Petersville Road Corridor Plan* (Matanuska-Susitna Borough Planning Department 1998), *Denali State Park Master Plan* (ADNR 1989) *and Amendment* (2006), *2000 Matanuska-Susitna Borough Recreational Trails Plan* (Matanuska-Susitna Borough 2000), and/or other applicable plans would proceed at the discretion of the individual land management agencies, and it is likely that development would be consistent with these plans. Issues of concern regarding land use would be addressed separately by land management agencies within the constraints of jurisdictional boundaries and financial resources. However, there would be no official agreements for coordination among agencies to guide development and potentially lessen impacts.

Cumulative Impacts
Direct and indirect effects on land ownership and use would likely mimic historic patterns. Other existing and potential projects in the vicinity of the South Denali planning area are described at the beginning of this chapter. These projects could also contribute to changes in land ownership and use in the planning area, but as long as land use controls remain in place, and existing land use plans are followed, cumulative impacts are likely to be within historic patterns.

However, land use impacts would be greater in the absence of continued effort by local and state agencies to protect the natural features along road corridors in the area. Without land use controls, haphazard strip development along the Petersville Road and Parks Highway would be likely to occur (NPS 1997a). In that case, the cumulative impacts on land use could be considered major.

Conclusion
Alternative A would not have an impact on the planning area's land ownership and use.

Alternative B - Peters Hills

Under Alternative B, several actions are likely to produce both construction and ongoing impacts on the planning area. Actions affecting socioeconomic indicators include construction of a nature center, access road, parking area, trail system and related improvements. The operations and maintenance activities associated with these improvements would also have an impact.

Other actions affecting socioeconomic indicators include the construction of trails, roadway improvements along Petersville Road and the Parks Highway, and a campground. These actions could produce temporary effects in the planning area due to construction, separate from normal

trends. Once construction is complete, spending on operations and maintenance could have a minor impact on the planning area.

Several of the elements described at the beginning of this section have been combined for analysis of Alternative B. These include the sections for population and demographics; industry, employment, and income; housing and real estate; and borough and municipal revenues and expenditures. The social and economic impacts on these indicators are related.

Population and Demographics; Industry, Employment, and Income; Housing and Real Estate; and Borough and Municipal Revenues and Expenditures

Parks Highway and Petersville Road Improvements

Based on economic models for the planning area (Minnesota Implan Group), the enhancements to the Parks Highway and Petersville Road (waysides, parking areas, campground, for example) would create roughly 16 to 26 jobs and additional economic activity of $250,000 to $480,000 in the planning area per $1 million of construction activity, including both direct and indirect effects. Ongoing maintenance of these enhancements would create between 17 and 22 jobs and additional economic activity of $425,000 to $440,000 in the planning area per $1 million of maintenance spending. The actual construction and operating impacts would depend on the amounts spent on the various improvements and the degree to which local labor was used.

Construction workers would need housing for the duration of the construction. The analysis assumes that the contractor would seek to maximize the number of local workers hired and provide an area at the construction site for temporary housing. Construction workers moving from outside the planning area would come alone. Under these assumptions, the impact on population and housing and real estate in the planning area would be minor during the construction phase.

The effect on borough and municipal revenues and expenditures would be minor unless local governments were expected to cover a substantial portion of the costs for these improvements. Construction of these improvements would boost economic activity in the region, but there would be only minor effects overall from these activities due to the lack of a sales tax. There would, however, be potential for hotel/motel tax increases.

Peters Hills

Economic models for the planning area (Minnesota Implan Group) predict that the combined impact from constructing a nature center at Peters Hills, an access road, and a parking area is 403 part-time and full-time jobs, including both direct and indirect jobs, and additional economic activity of $8.9 million. Construction on a Peters Hills facility is expected to last 2 years (ADNR 2005c).

The projected population increase in the planning area and additional demand for housing would depend on the number of local workers that are used. Because of the short duration of the construction and the potential for work delays if housing is unavailable, the contractor would

likely maximize use of local labor and set up a temporary camp area where workers could stay on site. If nonlocal construction workers were used, they would likely come alone and live on-site.

The construction schedule would affect the magnitude of population and housing impacts. For example, a three-year construction schedule would have a smaller magnitude of impact than a two-year schedule, with the total number of workers held constant, because the number of jobs would be spread over time. This differs from other resources for which the duration of impacts would be independent of the magnitude.

Construction of the nature center and other improvements would have a minor impact on borough and municipal revenues and expenditures. The construction would boost economic activity in the region, but the affected governments do not have a sales tax that could generate revenues from that activity. Bed tax collections are unlikely to be affected, unless some construction workers seek lodging instead of living on site.

Operation of the nature center would create about 28 seasonal jobs and $689,000 of additional economic activity per $1 million spent on operations, based on economic models for the planning area (Minnesota Implan Group). It is likely that many of the workers would come from outside the planning area for seasonal work opportunities. Maintenance of the nature center, shuttle bus, access roads, and parking area would create indirect economic activity of $190,000 and 8 seasonal jobs. Maintenance of other Alternative B improvements, including the campground and turnouts along Petersville Road, would create 17 to 22 seasonal jobs and $425,000 to $440,000 of additional economic activity per $1 million spent.

The local population would most likely increase by 25 to 70 persons, due to projected job creation by operations and maintenance of the nature center and associated facilities (Minnesota Implan Group). The population increase would depend on the household size for the incoming population. Demand for housing in the planning area would most likely increase by 13 to 18 housing units, since most of the workers would come from outside of the planning area for seasonal work and the average household size could be substantially higher than the average of 2.5 persons (Minnesota Implan Group). This analysis assumes that the seasonal workers would seek roommates, resulting in an average household size of 4 persons.

Operations of the nature center and other improvements may have minor impacts on borough and municipal revenues and expenditures. If any new housing developments take place, the Matanuska-Susitna Borough (MSB) would receive additional property tax revenues. Bed tax collections could increase from more visitors staying in the area at hotels, lodges, and bed and breakfasts. It is unlikely that any additional public infrastructure would be required to support the population increase estimated for the project.

Cumulative Impacts

External actions could impact the planning area's socioeconomic resources, as discussed under Alternative A.

Land disposal sales could increase the planning area's seasonal population but would have little effect on the permanent population. This could have a moderate to major impact to housing and real estate over the long term, although the development primarily would be limited to remote areas. Over time, the number of housing units could increase, but most would be for seasonal and recreational use only. Sales would increase private ownership in the planning area, boosting property tax collections by the MSB. The effect on property tax collections would be positive but minor for the foreseeable future.

The Boy Scouts of America purchase of land north of Talkeetna could have additional impacts on borough revenues depending on the land's tax status. Additional visitors to the area could also increase the number of nights spent at local hotels and bed and breakfasts, increasing the amount collected from the MSB's bed tax. Additional sales to a riverboat service would be minor and seasonal, and would have few impacts.

Thus the cumulative impacts on socioeconomic resources resulting from the past, present and reasonably foreseeable future actions and the actions proposed under Alternative B would be minor to moderate. The overall contribution of this alternative to the cumulative impacts on socioeconomics in the planning area would be significant.

Conclusion

The total economic impact of Alternative B construction would be $30 to $32 million, creating approximately 400 to 430 jobs (Minnesota Implan Group). The total economic impact of Alternative B operations would be $4 to $5 million, creating approximately 50 to 70 seasonal jobs.

The construction impacts on planning area population and demographics would be minor, because it is likely that most of the workforce would be local and the construction would be of a short duration and limited to one location. The operations impacts on planning area population and demographics would be minor to moderate, but the impacts would be focused in specific locations in the planning area and would occur only during the summer.

Housing impacts would likely be minor if on-site housing were provided. If on-site housing were limited, the impacts would be moderate to major. The operations impacts on housing and real estate would be minor.

The construction impacts on borough and municipal revenues and expenditures would be minor because the construction would be of a short duration and largely untaxed. The operations impacts would be minor because most activities that would take place would not be taxed, nor would they require additional infrastructure from local or regional governments.

Construction effects would be considered a major beneficial impact on industry, employment, and income in the planning area. However, the impacts on all of these resources would be temporary, lasting only during periods of construction. Therefore, the overall effects of Alternative B's construction phase would be considered a minor impact on population and

demographics, housing and real estate, and borough and municipal revenues and expenditures in the planning area.

Alternative B's operations would have a minor to moderate impact on population and demographics. Operations effects would be considered a major impact on industry, employment, and income; a minor impact on housing and real estate; and a minor impact on borough and municipal revenues and expenditures. Operating impacts would be seasonal, with peak impacts occurring between May and September.

Quality of Life

There could be a variety of direct and indirect impacts to quality of life indicators due to Alternative B. These effects could be most directly associated with the Petersville area, followed by Trapper Creek, the Y community, and Talkeetna.

Rural Character

Feelings of remoteness could be altered with increased development and visitation in the area. The legacy value of the area, or the ability for future generations to enjoy the area essentially unchanged from its present condition, would be diminished. Visual resources would be negatively affected with a new access road and visitor facilities constructed in a currently undeveloped part of the Peters Hills. New or improved parking areas and trailheads proposed in this alternative would lead to higher levels of snowmachine and ORV use, and consequently a higher occurrence of noise from motors. Frequent occurrence of noise from motors would impact rural character as such noise is more readily associated with urban areas. Cabin owners who value natural sounds would be negatively affected by the increase in motorized use on general state land in the planning area.

Pace of Life

Traffic levels on the Petersville Road would be expected to increase, changing the perceived pace of life in the area.

Community Image

There could be perceptions of decreased levels of community safety with a projected increase in visitors to the area.

Self-Sufficient Lifestyle

This indicator would not likely be directly affected by proposed developments.

Community Cohesiveness

An increase in visitors or seasonal residents to the area could change the perceptions of familiarity with others in the community.

Economic Characteristics

There could be an increase in the availability of seasonal jobs. With increased visitors to the area, there could be an increase in services provided in the area. These factors are also discussed above under, Industry, Employment and Income.

Government Interaction
While there would not be a direct change to local control or levels of regulation, there would be a collaborative approach between local, state, and federal agencies to manage the physical, biological, and human environments in the planning area.

Recreation Opportunities
There would be an increase in developed recreation opportunities in the area, additional trails, and improved access. Opportunities for undeveloped, dispersed recreation would decrease in the Peters Hills area. Constructing or improving parking areas and trailheads would lead to increases in recreational use in the planning area. Increased use on general state land would exacerbate existing conflicts between motorized and non-motorized users, and noise from motors would continue to degrade the quality of the experience for non-motorized recreational users and for remote recreational cabin owners who value natural sounds.

Cumulative Impacts
Other existing and potential projects in the vicinity of the South Denali planning area are described at the beginning of this chapter. These projects could also contribute to changes in quality of life indicators in the planning area, but effects are generally expected to be within historic trends and limits. The cumulative impacts on quality of life resulting from past, present and reasonable foreseeable future actions, along with the proposed actions under Alternative B would be major. Overall, the contribution of this alternative to the cumulative impacts on quality of life, particularly in the Petersville Road area would be substantial.

Conclusion
Alternative B would have a major impact on the planning area's quality of life indicators, particularly in the Petersville area. A majority of the quality of life indicators could be affected by developments proposed in Alternative B; in fact, all indicators except self-sufficient lifestyle could be affected.

Land Ownership and Use

Parks Highway Improvements
Land ownership along the Parks Highway is divided among federal, state, University of Alaska, borough, Native corporations, and private interests. See Chapter Three for details regarding general land ownership and use along the highway.

In the vicinity of the proposed parking areas at MP 121.5, MP 122, and Rabideaux Creek, land is owned by the Matanuska-Susitna Borough. The planned minimal development at these sites is consistent with land uses described in the *Susitna Area Plan*. The informational kiosk to be located at the junction of the Parks Highway and the Petersville Road, would likely be located within the state-owned right-of-way for the highway. Development of informational kiosks is recommended in the *Petersville Road Corridor Plan* as a way to enhance the visitor experience. The trail easement and construction of primitive trails for the Chulitna Bluff/Rabideaux /106

Seismic Trail System would occur on a combination of state and borough lands. The plans for this trail system are consistent with the *2000 Matanuska-Susitna Borough Recreational Trails Plan*.

Other actions along the Parks Highway include grooming winter trails in the South Denali region and enhancing access to the Chulitna River near the mouth of Troublesome Creek. These actions would occur on either general state lands or on Denali State Park lands designated Recreation Development or Natural area (see the *Denali State Park Master Plan Amendment*). Development of improved campsites, visitor information facilities and foot trails is compatible with these land use designations as long as they are developed and maintained with the concurrence of the Alaska Department of Natural Resources (ADNR), Department of Parks and Outdoor Recreation. The planned uses for these areas are also consistent with the ADNR publication *Generally Allowed Uses on State Land Fact Sheet.* This publication applies to general state lands but not to lands included in Denali State Park.

Development along the Parks Highway corridor would increase pressure to develop land in this area, particularly for tourism-related businesses.

Petersville Road Enhancements

Land ownership along the Petersville Road is in private, borough, state, and University of Alaska ownership. West of approximately MP 3.5, the majority of the land is state- and borough-owned and a small amount is owned by the University of Alaska. Present land uses occurring along the Petersville Road corridor are residential, agricultural, recreational, small-scale scattered commercial, and small-scale mineral/material extraction.

The campground planned for MP 18.6 of the Petersville Road would be located on borough and state land near the privately owned Forks Roadhouse. Development of the campground would be consistent with the *Petersville Road Corridor Plan* for enhancing the visitor experience. Other actions along Petersville Road that are part of the proposed action and could impact land ownership and use include development of turnouts at MPs 12.8 and 16.3. These sites are located on state-owned lands outside of Denali State Park, and are recommended in the *1998 Petersville Road Management Plan.* The redesign of the Kroto Creek parking lot would occur on the existing footprint and would not affect land use or ownership. This redesign is also specifically recommended in the *Petersville Road Corridor Plan.*

Peters Hills

The Peters Hills nature center would be located on state lands within the boundary of Denali State Park. The center would occur on state park land designated Recreation Development under Alternative B in the *Denali State Park Master Plan Amendment.*

The seven-mile access road would cross state-owned lands in Denali State Park and general state lands south of the park boundary. Present land uses in the area include mining and backcounty recreation.

There are several private mining claims in the area, which the access road would avoid; the road would be located primarily on general state lands, with a small portion crossing into Denali State Park lands. There would be no direct impact on private land ownership or general land use due to the access road. The access road would not be open to private vehicles or ORVs during the main season. The effect on land use is therefore consistent with acceptable uses.

The parking area for the nature center (MP 28 of the Petersville Road) would be located on state-owned land.

Alternative B also proposes that approximately 31 miles of hiking trails be constructed in the vicinity of the new nature enter. Some of these trails would be contained entirely on Denali State Park lands. Their construction and use would be compatible with land use designations prescribed in Alternative B of the *Denali State Park Master Plan Amendment.* The proposed Four Lakes Loop Trail would be constructed on general state lands and is consistent with the ADNR *Susitna Area Plan.*

Two backcountry facilities are also included in Alternative B. A picnic shelter would be situated at Long Point and a public use cabin would be constructed near Home Lake. Both facilities are situated on Denali State Park land and designated Natural Area under Alternative B in the *Denali State Park Master Plan Amendment.*

Cumulative Impacts

The background and assumptions for the cumulative impacts analysis is provided at the beginning of this chapter. Past and present changes in land ownership and use, such as the development of the Princess Hotel near Blair Lake south of Denali State Park, has likely increased visitor related development on private lands in the planning area. Settlement and home building has progressed steadily on easily accessible private lands along the Petersville Road and near the Parks Highway. Several subdivisions have developed along the shores of lakes and streams within the highway corridor. These activities have increased service-related developments in the planning area in the past, and have contributed to the present-day land use status described in Chapter Three.

Reasonably foreseeable future actions in the planning area are identified and described in detail at the beginning of this chapter. The following actions could contribute to cumulative impacts on land ownership and use in the planning area:

- Land disposals along the Petersville Road and Parks Highway from MP 117-131 would change land ownership from public to private. Any disposals and subsequent development along the Petersville Road would comply with the *Petersville Road Corridor Plan* and *State-Borough MOU* and would be set back from the Petersville Road to protect scenic qualities.

- Land sales by ADNR would also change land ownership from public to private. There is a proposal to sell 6 parcels comprising 25 acres, located 15 miles north of the intersection of the Parks Highway and Petersville Road, about 1 mile south of the Denali State Park Boundary. The land is located within the Denali View and Swan Lake ADNR subdivisions.

Land ownership would change, but the development of subdivisions in this area is consistent with the *Susitna Area Plan*.

- Timber harvesting could occur on state and borough lands in the planning area. There would be no change in ownership; harvesting timber in this area is a land use consistent with the *Susitna Area Plan* and the *Susitna Forest Guidelines,* as long as all conditions of these plans are met.

- Mining would continue in the planning area on general state lands. Land ownership would not change and prospecting or mining using light portable field equipment is allowed on general state lands.

- The additional purchase of 2,000 acres of MSB land between the Susitna and Chulitna Rivers by the Boy Scouts of America would change land ownership and use of the parcel. Planned scouting activities would be consistent with uses identified in the *Susitna Area Plan* and with the *Denali State Park Master Plan Amendment* when their activities include "adventuring" on adjacent lands. In January 2005 the MSB began a land management plan for this area. Any private development or use of and access to these lands would need to comply with the MSB's management plan.

The reasonably foreseeable actions described above, in combination with the proposed actions for Alternative B, could all lead to continued growth and change in land use patterns in the planning area. As long as land use controls remain in place and proposed changes to land use remain consistent with applicable plans, the magnitude and extent of the cumulative impacts on land use would be moderate and long-term (lasting through the design life of 2020). The contribution of Alternative B to the cumulative impacts on land use would also be modest.

However, land use impacts would be greater in the absence of continued effort by local and state agencies to protect the natural features along road corridors in the area. Without land use controls and enforcement, haphazard strip development along the Petersville Road and Parks Highway would be likely to occur (NPS 1997a). In that case, the cumulative impacts on land use could be considered major.

Conclusion
The magnitude and extent of the direct and impacts of Alternative B on land ownership and use would be moderate. The duration of change would be permanent.

The effects of the proposed developments for Alternative B (including those actions along the Petersville Road and George Parks Highway) would not cause a change in land ownership. However, land use would shift in some areas from undeveloped land to recreational and visitor use. Land use on private land in the planning area would change to respond to additional visitor use in the area including additional lodging, food service, and retail sales outlets, as well as associated employee housing and support development (NPS 1997a). The land use shift would be permanent and would occur throughout the planning area. However, the *Petersville Road Corridor Plan* identifies land use guidelines and recommends implementation measures along Petersville Road, thereby providing land use controls. A Scenic Highway designation is also

consistent with the *Petersville Road Corridor Plan.* The State-Borough MOU would also mitigate impacts on the scenic resources along the Petersville Road and Parks Highway.

Alternative C - Parks Highway

Under Alternative C, several actions are likely to produce both construction and ongoing impacts to socioeconomic indicators in the planning area. These actions include construction of a visitor center, access road, parking area, trail system, and a campground, as well as the operations and maintenance activities required for these improvements.

Several of the socioeconomic elements have been combined for analysis of Alternative C. The sections for population and demographics; industry, employment, and income; housing and real estate; and borough and municipal revenues and expenditures have been combined. The social and economic impacts on these indicators are related.

Population and Demographics; Industry, Employment, and Income; Housing and Real Estate; and Borough and Municipal Revenues and Expenditures

Parks Highway and Petersville Road Enhancements

Refer to Alternative B for a discussion of effects from Parks Highway and Petersville Road Improvements.

Curry Ridge

The combined impact from construction of the visitor center on the Parks Highway, an access road, and a parking area would be 624 part-time and full-time jobs, including both direct and indirect jobs, and additional economic activity of $13.9 million (Minnesota Implan Group). Other developments planned for the Petersville Road such as the campground and turnouts would create 26 jobs and $480,000 of additional economic activity per $1 million of construction spending. Construction on a Parks Highway facility is expected to last 3.25 to 3.5 years (ADNR 2005c).

The projected population increase in the planning area and additional demand for housing would depend on the number of local workers that are used. Because of the short duration of the construction and the potential for work delays if housing is unavailable, the contractor would likely maximize use of local labor and set up a temporary camp area where workers could stay on site. If non-local construction workers were used, they would likely come alone and live on-site.

The construction schedule would affect the magnitude of population and housing impacts. For example, a four-year construction schedule would have a smaller magnitude of impact than a three-year schedule, with the total number of workers held constant, because the number of jobs would be spread over time. This differs from other resources for which the duration of impacts would be independent of the magnitude.

Construction of the visitor center, campground, transportation facility, and turnouts would have a minor impact on borough and municipal revenues and expenditures. The construction would boost economic activity in the region, but the affected governments do not have a sales tax that could generate revenues from that activity. Bed tax collections are unlikely to be affected, unless some construction workers seek lodging instead of living on site.

Economic models for the planning area (Minnesota Implan Group) predict that operation of the visitor center would create about 28 seasonal jobs and $689,000 of additional economic activity per $1 million spent on operations. It is likely that many of the workers would come from outside the planning area for seasonal work opportunities. Maintenance of the visitor center, shuttle buses, access roads, and parking area would create indirect economic activity of $290,000 and 12 seasonal jobs. Maintenance of other Alternative C improvements such as the turnouts along the Petersville Road and Parks Highway would create 17 to 22 seasonal jobs and $425,000 to $440,000 of additional economic activity per $1 million spent.

The local population would most likely increase by 40 to 100, due to projected job creation by operations and maintenance of the visitor center and associated facilities (Minnesota Implan Group). The population increase would depend on the household size for the incoming population. Demand for housing in the planning area would most likely increase by 20 to 25 housing units, since most of the workers would come from outside of the planning area for seasonal work and the average household size could be substantially higher than the average of 2.5 persons. This analysis assumes that the seasonal workers would seek roommates, resulting in an average household size of 4 persons.

Operations of the visitor center and campground may have minor impacts on borough and municipal revenues and expenditures. If any new housing developments take place, the MSB would receive additional property tax revenues. Bed tax collections could increase from more visitors staying in the area at hotels, lodges, and bed and breakfasts. It is unlikely that any additional public infrastructure would be required to support the population increase estimated for the project.

Cumulative Impacts

External actions could impact the planning area's socioeconomic resources, as discussed under Alternative A.

Land disposal sales could increase the planning area's seasonal population but would have little effect on the permanent population. This could have a moderate to major impact to housing and real estate over the long term, although the development primarily would be limited to remote areas. Over time, the number of housing units could increase, but most would be for seasonal and recreational use only. Sales would increase private ownership in the planning area, boosting property tax collections by the MSB. The effect on property tax collections would be positive but minor for the foreseeable future.

The Boy Scouts of America purchase of land north of Talkeetna could have additional impacts on borough revenues depending on the land's tax status. Additional visitors to the area could also increase the number of nights spent at local hotels and bed and breakfasts, increasing the amount

collected from the MSB's bed tax. Additional sales to a riverboat service would be minor and seasonal, and would have few impacts.

Cumulative impacts on socioeconomic resources resulting from the past, present and reasonably foreseeable future actions and the actions proposed under Alternative C would be minor to moderate. The overall contribution of this alternative to the cumulative impacts on socioeconomics in the planning area would be significant.

Conclusion
The total economic impact of Alternative C construction would be $47 to $49 million, creating approximately 620 to 650 jobs. The total economic impact of Alternative C operations would be $5 to $6 million, creating approximately 80 to 100 seasonal jobs (Minnesota Implan Group).

The construction impacts on planning area population and demographics would be minor because it is likely that most of the workforce would be local and the construction would be of a short duration and limited to one location. The operations impacts on planning area population and demographics would be minor to moderate, but the impacts would be focused in specific locations in the planning area and would occur only during the summer.

Housing impacts would likely be minor to moderate if on-site housing were provided. If on-site housing were limited, the impacts would be moderate to major. The operations impacts on housing and real estate would be minor.

The construction impacts on borough and municipal revenues and expenditures would be minor because the construction would be of a short duration and largely untaxed. The operations impacts would be minor because most activities that would take place would not be taxed, nor would they require additional infrastructure from local or regional governments.

The effects of Alternative C's construction phase would be considered a minor impact on population and demographics in the planning area. Construction effects would be considered a major impact on industry, employment, and income; a minor to moderate impact on housing and real estate; and a minor impact on borough and municipal revenues and expenditures. The impacts on all of these resources would be temporary, lasting only during periods of construction.

The effects of Alternative C's operations, would be considered a minor to moderate impact on population and demographics. Operations effects would be considered a major impact on industry, employment, and income; a minor to moderate impact on housing and real estate; and a minor impact on borough and municipal revenues and expenditures. Operating impacts would be seasonal, with peak impacts occurring between May and September.

Quality of Life
Alternative C would focus development in the vicinity of the Parks Highway, near Curry Ridge. Destination developments would not be located in the immediate vicinity of local communities. In addition, development would also occur along the Parks Highway and the Petersville Road.

There could be a variety of direct and indirect impacts to quality of life indicators due to Alternative C, as summarized below. These effects could be most directly associated with Trapper Creek and the Y community, followed by Talkeetna and the Petersville area.

Rural Character
Most properties of this indicator would not be directly affected by proposed developments. However, new or improved parking areas and trailheads proposed in this alternative would lead to higher levels of snowmachine and ORV use, and consequently a higher occurrence of noise from motors. Frequent occurrence of noise from motors would impact rural character as such noise is more readily associated with urban areas. Cabin owners who value natural sounds would be negatively affected by the increase in motorized use on general state land in the planning area.

Pace of Life
While projects would occur on the Petersville Road up to MP 18.6 (Forks Roadhouse), the remainder of the road would not be altered. The perceived pace of life in the area would not likely change dramatically.

Community Image
Properties such as community centers, historic identity, and safety would not likely be directly affected by proposed developments.

Self-Sufficient Lifestyle
This indicator would not likely be directly affected by proposed developments.

Community Cohesiveness
An increase in visitors or seasonal residents to the area could change the perceptions of familiarity with others in the community.

Economic Characteristics
There could be an increase in the availability of seasonal jobs. With increased visitors to the area, there could be an increase in services provided in the area.

Government Interaction
While there would not be a direct change to local control or levels of regulation, there would be a collaborative approach between local, state, and federal agencies to manage the physical, biological, and human environments in the planning area.

Recreation Opportunities
There would be an increase in developed recreation opportunities in the area, additional trails, and improved access. Opportunities for undeveloped, dispersed recreation would decrease in the Curry Ridge area. Constructing or improving parking areas and trailheads along the Parks Highway and Petersville Road would lead to increases in recreational use in the planning area. Increased use on general state land would exacerbate existing conflicts between motorized and non-motorized users, and noise from motors would continue to degrade the quality of the experience for non-motorized recreational users and for remote recreational cabin owners who value natural sounds.

Cumulative Impacts
Other existing and potential projects in the vicinity of the South Denali planning area are described at the beginning of this chapter. These projects could also contribute to changes in quality of life indicators in the planning area, but effects are generally expected to be within historic trends and limits. The cumulative impacts on quality of life resulting from past, present and reasonable foreseeable future actions, along with the proposed actions under Alternative C would be major. Overall, the contribution of this alternative to the cumulative impacts on quality of life, particularly in the Parks Highway Corridor would be noticeable.

Conclusion
Alternative C would have major impacts on the planning area's quality of life indicators. Five quality of life indicators could be affected, although all not negatively, by developments proposed in Alternative C, including rural character, community cohesiveness, economic characteristics, government interaction, and recreation opportunities. The effects would be long-term.

Land Ownership and Use

George Parks Highway and Petersville Road Improvements
The Land Ownership section under Alternative B provides a discussion of the actions along the Parks Highway and Petersville Road. All proposed actions would be consistent with applicable land use plans.

Parks Highway (Curry Ridge)
The visitor complex would be located about 2 miles directly east of the Parks Highway on land in Denali State Park. A 3.5-mile access road would connect the Parks Highway (near MP 134.6) to the visitor center. A parking lot and campground would be situated near the highway. Alternative C also includes plans for approximately 13 miles of trails. All proposed developments would occur on Denali State Park lands designated Recreation Development or Natural Area (see the *Denali State Park Master Plan Amendment*). The proposed developments are near areas Designated Wilderness that include portions of Curry Ridge and Kesugi Ridge. The Matanuska-Susitna Borough has adopted land use regulations within the boundaries of the Denali State Park, which are consistent with the recommendations in the *Denali State Park Master Plan Amendment*. Development of improved campsites, visitor information facilities and foot trails is compatible with these land use designations as long as they are developed and maintained with the concurrence of the Alaska Department of Natural Resources, Division of Parks and Outdoor Recreation.

As described for Alternative B, the effects of the proposed developments for Alternative C (including those actions along the Petersville Road and George Parks Highway that are common to both alternatives) would not cause a change in land ownership. However, land use would shift in some areas from undeveloped land to recreational and visitor use. Land use on private land in the planning area could change to respond to additional visitor use in the area including additional lodging, food service, and retail sales outlets, as well as associated employee housing

and support development (NPS 1997a). Development along the Parks Highway corridor would increase pressure to develop land in this area, particularly for tourism-related businesses. The land use shift would likely be permanent and would occur throughout the planning area. The *Denali State Park Master Plan Amendment* identifies land use guidelines on the state park lands impacted by this project and provides for methods to implement these guidelines in the planning area. That plan, along with the *Petersville Road Corridor Plan*, provides for land use controls in the planning area.

Cumulative Impacts
The past, present, and reasonable foreseeable future actions described for Alternative B also apply for Alternative C. While it is likely that changes in land use patters have occurred or would occur in the future as a result of the actions described above, the anticipated uses would be consistent with applicable land use plans for the area. The reasonably foreseeable actions described above, in combination with the proposed actions for Alternative C, could all lead to continued growth and change in land use patterns in the planning area. As long as land use controls remain in place and proposed changes to land use remain consistent with applicable plans, then the magnitude and extent of the cumulative impacts on land use would be moderate. The overall contribution of Alternative C to the cumulative impacts on land use in the planning area would be modest.

Land use impacts would be greater in the absence of continued effort by local and state agencies to protect the natural features along road corridors in the area. Without land use controls, haphazard strip development along the Petersville Road and George Parks Highway would be likely to occur (NPS 1997a). In that case, the cumulative impacts on land use could be considered major.

Conclusion
The magnitude of the impacts of Alternative C on land ownership and use would be moderate because the land uses would shift, but the proposed changes would be consistent with existing plans or controlled by land use restrictions.

VISITOR OPPORTUNITY

The first part of this section provides an overview of the methodology used to evaluate impacts to visitor opportunity, including a literature review of the types of impacts that could result from actions proposed in the plan. The second part is an analysis of the impacts likely to occur under each alternative. These impacts are also summarized in the Summary Table of Environmental Consequences (at the end of Chapter Two).

For the purpose of this plan, visitor is defined as the Alaskan resident, independent traveler, and package tour traveler who use public land in the South Denali region for an activity other than subsistence.

Visitor opportunity includes the following:

- The type of experience provided for in the South Denali region;
- The type of access that is possible;
- The quality of the experience;
- The extent of facilities and services provided;
- Visitor safety.

Methodology

Analysis of impacts of proposed actions on visitor opportunities in the South Denali region has relied primarily on a literature review of the types of impacts that can occur and on consultation with land managers.

General Impacts

While there are inherent risks in backcountry use, several decades of park management experience in Denali National Park and Preserve demonstrates the value of education to the safety of park visitors. The park has seen considerable benefits from educating backcountry visitors about hazards and proper behavior prior to trips. A good example is the instruction given on how to avoid bear encounters and prevent the habituation of bears to human food. The educational message is delivered at the backcountry desk at the main park visitor center, and it is required as a condition of obtaining a backcountry permit in the park. Along with bear-resistant food and garbage storage, education is one of the most significant parts of Denali's bear-human conflict management program. This program was successful in reducing the number of backcountry incidents between bears and people at Denali from 26 in 1982 – when Denali had more such backcountry incidents than any national park in the country – to 3 in 1987, which was the first year that bears obtained no human food in the park (Dalle-Molle and Van Horn 1989).[1] Altogether, visitor education greatly enhanced visitor safety in the backcountry.

Excellent success has also been reported from the increased level of information provided to climbers on Mount McKinley and Mount Foraker. Information provided during the advanced reservation process and at the Talkeetna Ranger Station prior to climbers traveling to the mountain has had a significant impact in reducing climber injuries and fatalities (NPS 2000f). Mountaineering rangers believe the present educational and rescue services could accommodate up to 1,500 climbers on Mount McKinley (Miller 2004).

Denali State Park has reduced the number of negative bear-human encounters in the park by increasing public education about bear safety, installing bearproof garbage containers and food storage lockers in Byers Lake Campground, and encouraging the use of free bearproof food canisters in the backcountry of the state park (Heikes 2005).

Unsafe situations or conditions caused by other trail users can keep visitors from achieving their desired trail experiences. This goal interference due to safety concerns is a common source of

[1] Methodology for collecting information on bear-human encounters and incidents changed in the 1990s, so recent reported figures are now higher than in the 1980s but the numbers are not comparable.

conflicts on trails. There are a number of threats to user safety that can occur on trails. Some of these include:

- Collisions and near misses among users and/or their vehicles
- Reckless and irresponsible behavior
- Poor user preparation or judgment
- Unsafe conditions related to trail use (*e.g.*, deep ruts, tracks on snow trail, etc.)
- Unsafe conditions not related to trail use (*e.g.*, obstacles, terrain, weather, river crossings, etc.)
- Poor trail design, construction, maintenance or management.
- Other hazards (*e.g.*, bears, lightning, cliffs, crime, etc.) (McKown 2004).

A recent National Park Service study of backcountry recreation management provided information related to conflicts on backcountry trails in 93 national parks (Marion, Roggenbuck and Manning 1993). Nine percent of the parks reported that conflicts between horses and hikers were a problem in many or most backcountry areas. Three percent of the parks reported that conflicts between hikers and mountain bikers were a problem in many or most areas. Day users (apparently due to their large numbers), overnight users, horse users, and mountain bikers were all felt to cause visitor conflicts. Day users, overnight users, ORV users, horse users, and mountain bikers were also reported to create problems through inconsiderate behavior.

Information gathered by Wildlands CPR through a 1988 Freedom of Information Act request showed that 66% of the responding national forests identified user conflicts as a result of ORV use. Types of conflicts included noise, safety, and resource disturbances (Wildlands CPR 2004). “Participants in activities that use different levels of technology often experience conflict with one another. Examples include cross-country skiers and snowmobilers, hikers and motorcyclists, canoe paddlers and motor boaters, and non-motorized raft users and motorized raft users” (McKown 2004).

Impact Level Definitions

- Minor: There would be a detectable change in recreational opportunities or visitor safety; however, it would affect relatively few visitors.

- Moderate: There would be substantial changes in recreational opportunities or visitor safety; however, these changes would not affect the majority of one or more user groups.

- Major: There would be substantial changes in recreational activities or visitor safety that would affect opportunities for the majority of one or more user groups.

Alternative A - No Action

This alternative represents no change from current management direction and therefore represents the existing condition in the South Denali region. However, it does not ensure a similar future condition, which could be affected by factors unrelated to this planning effort.

Recreational Opportunities

Existing opportunities would continue for ORV use, birding, motorized boating, non-motorized boating, cycling, general sightseeing, hiking and camping, hunting and fishing, skiing and snowshoeing, skijoring and dog mushing, and snowmachine use.

Visitor Safety

Visitor safety would be addressed at the discretion of the lead agency.

Cumulative Impacts

Resident population growth and visitor use are expected to continue to increase in the south side planning area. River rafting and boating, snowmobile use, ORV use, hiking, hunting, and fishing would continue to be popular recreational activities in the South Denali region and their popularity would increase over time due to the easy accessibility offered by the road system. Increases in population and use in the planning area would have adverse impacts on visitor opportunities in much of the planning area due to increased encounters, noise, and user conflicts associated with increased use of the area.

The Boy Scouts of America plan to purchase 2,000 acres of Mat-Su Borough land located between the Susitna and Chulitna Rivers and run an adventure camp would contribute large numbers of visitors to the South Denali region. At full capacity, 300 campers at a time would be "adventuring" and may be on a trek in the south side of the national park, hiking in the state park, or rafting on the adjacent river systems. Curry Ridge in particular could see a tremendous increase in use since the Boy Scout camp would be adjacent to Curry Ridge. This increase would cause adverse impacts to primitive recreation on Curry Ridge as visitors would be very likely to encounter groups of people on Curry Ridge.

Princess would charter their Denali Express trains from their new docking location in Whittier. This new service would allow visitors to go from Whittier to Denali National Park in one day. The ARR is interested in reactivating Curry. There is also interest in a boat service that could bring Princess guests across the river to the McKinley Princess via the Boy Scout property. These changes would bring additional visitors to the South Denali region.

Primitive recreation opportunities throughout the planning area would be preserved in the short term; however, current trends indicate that population and recreational use of the South Denali region will continue to increase (see Background and Assumptions sections at the beginning of this chapter). If this is the case, increased use of the region could create user conflicts in the long-term as increased use and different types of use in the same areas could create conflicts between users, as has been widely demonstrated throughout the United States. For example, increasing cross-country travel by ORVs throughout the South Denali region would continue to increase,

creating damage to natural resources and scenery, and diminishing the quality of recreational opportunities. Existing motorized versus non-motorized use conflicts would be exacerbated in both summer and winter by increasing use on public lands.

New housing and commercial developments, timber sales, and land disposals along Petersville Road could create undesirable views, which would diminish the quality of recreational and sightseeing opportunities along the Petersville Road corridor.

Continued mining activity in the Peters and Dutch Hills could create undesirable views, which would diminish the quality of recreational and sightseeing opportunities in areas where active mining is visible. Mining would, however, have beneficial impacts on the opportunity to experience part of the local culture and history.

Improvements to Petersville Road would improve access to the Petersville Road corridor and Peters Hills area. Improved access would attract more use to this area. This would have a positive effect on opportunities to access the Peters Hills for a variety of recreational purposes, but it would have a negative impact on the quality of the experience due to increased encounters, noise, and user conflicts associated with increased use of the area.

Helicopter landings in Denali State Park could increase under the new policy of allowing helicopter landings in all areas of the park at the discretion of the Director of Alaska State Parks.

These actions would create moderate adverse impacts on the quality of visitor opportunities in the South Denali region and on visitor safety.

Conclusion

This alternative would have no impact on opportunities for self-reliant recreation throughout the planning area. This alternative would have no effect on visitors who require services and facilities, as none are proposed under this alternative.

This alternative would not affect visitor safety as there would be no education or outreach to visitors in the South Denali region outside of the state and national parks.

Alternative B - Peters Hills

This alternative would provide additional opportunities for individuals who require assistance with access, facilities, and services, but it would diminish opportunities for primitive, self-reliant activities in much of the planning area.

Birding

While access to birding opportunities in the Peters Hills would increase with the addition of 31 miles of trails, increased noise and increases in types and levels of use would diminish opportunities for birding as birds may be displaced from areas with loud noise and high use levels.

Additional birding opportunities would also be provided by improving access to the Chulitna River.

Boating – Motorized

Determining the feasibility of a docking facility on the Chulitna River could eventually lead to additional opportunities for motorized boating.

Boating – Non-motorized

Constructing access for non-motorized watercraft on the Chulitna would increase opportunities for non-motorized boaters; however, increases in motorized boating on the Chulitna River would adversely affect the primitive recreational opportunities on the Chulitna.

Cycling

Providing a map of recreational routes in the Peters Hills area would enhance the mountain biking experience in the Peters and Dutch Hills because cyclists would know where to ride. The opportunity to bike on Petersville Road would be maintained, and constructing a bike path along Petersville Road would enhance the cycling experience by separating cyclists from vehicular traffic. The quality of the experience on Petersville Road beyond MP 7 (where the bike path would end) would be diminished because bikers would have to contend with significant increases in traffic associated with the new visitor facilities in the Peters Hills.

General Sightseeing

Constructing a new nature center and access road to the Peters Hills would afford visitors additional opportunities for general sightseeing. Developments would provide access to backcountry areas, and programs and facilities at and around the nature center would provide opportunities for visitors to get a feel for the place. Opportunities for interpreting the Alaska Range, glaciers, alpine ecosystem, and alpine lakes would be enhanced. Interpretive information at waysides along Petersville Road, at the parking area, on the shuttle buses, and at the nature center would help visitors interpret their surroundings. These actions would have positive

impacts on opportunities to view and learn about the Peters Hills and the western portion of Denali State Park.

The land south of the park is general state land, designated in the Susitna Area Plan as primarily for mineral development, public recreation and wildlife habitat. Adjacent to the visitor facility, visitors could encounter four-wheelers, hunters, and mining activities outside the park, which are all legal activities on general state lands *(Note: hunting is allowed within the state park, though summer off-road vehicle use is prohibited. Firearms use on parkland is prohibited within a half mile of developed areas such as what is proposed at this site)*. The lack of a visual or sound screen at this elevation would prevent nature center visitors from being assured a more wild and primitive experience, void of other development. Long-term scars on alpine vegetation from ORVs would be visible from the road and nature center. This would create adverse impacts to opportunities for a quality sightseeing experience.

Hiking and Camping

This alternative would provide additional opportunities for hiking, backpacking, and camping because approximately 31 miles of trails and a picnic shelter would be constructed in the Peters Hills. These trails would provide opportunities for short walks and longer hikes on established and marked trails. Longer hikes would necessitate descending 3,400 feet off the Peters Hills ridge and ascending the same amount of elevation in order to complete a loop hike. Because the Peters Hills are typically snow-covered through June, trails would provide additional hiking opportunities only for a small part of the year. Constructing a new public use cabin on Home Lake would provide an opportunity for an overnight experience. The quality of the hiking experience in the Peters Hills would be improved for the visitor who prefers hiking on trails rather than cross-country because 31 miles of new trails would be constructed in the planning area. Trails would be marked and maintained, which would require less self-reliance and backcountry skills than cross-country travel.

While new trails in the Peters Hills would provide additional opportunities for visitors to hike on trails, it would diminish opportunities for primitive, cross-country hiking and backpacking because trails and additional developments like a nature center and access road would bisect most cross-country routes. New trails would detract from a sense of discovery and enjoyment of a primitive scene. The quality of the hiking experience in the Peters Hills would be diminished for the visitor who prefers an unimproved, primitive experience.

Constructing a campground along Petersville Road near the Forks would provide an opportunity for drive-up camping. Currently drive-up camping exists only along pullouts on Petersville Road. The quality of the experience would be improved as visitors could expect to camp at a clean, safe, and well-maintained facility instead of in a pullout along Petersville Road.

In general, constructing facilities in the Peters Hills would provide many additional visitor opportunities. However, new facilities would attract more users. More people and more vehicular traffic would create more noise and more visual intrusions (a road, visitor center, buses, trails in a tundra environment where facilities would be in open view and very difficult to conceal). Increased noise and visual intrusions would detract from the remote feel and quality of the hiking

experience. Users in the Four Lakes region and in the vicinity of the new nature center would contend with bus loads of visitors, compared to the current summer experience where visitors are unlikely to encounter many other people. Increases in types and levels of use throughout the planning area would create or exacerbate user conflicts, especially on general state land in the Peters Hills region where there are few restrictions on use. Focusing development in the Peters Hills, however, would preserve primitive recreation opportunities (primarily for hikers) in the Curry Ridge area.

Hunting and Fishing

While access for hunting would remain the same, the experience would be diminished by increases in types and levels of recreational use associated with new facilities in the Peters Hills. Hunters would compete for space with other user groups like hikers, backpackers, bikers, and birders. Increases in use, facilities, and vehicular traffic would displace wildlife and reduce hunting success rates in the planning area, which would diminish the quality of the experience. Hunting opportunities in the eastern part of the planning area would likely remain unchanged.

Fishing in the South Denali region would continue to be popular. Increased recreational use of the area would result in increased competition among anglers.

Off-road Vehicle (ORV) use

While opportunities for ORV use would continue throughout the planning area where use is allowed, users could expect to encounter additional users and developments associated with the new nature center and access road. In general, increases in types and levels of use throughout the planning area would create or exacerbate user conflicts, especially on general state land in the Peters Hills region where all generally allowed uses on general state land are permitted. It is likely that ORV users would experience increased encounters with ORV users, cyclists, hikers, and birders, as more visitors would be attracted to new facilities in this region. Higher encounter rates, increased noise from road traffic on Petersville Road and the new access road, and new facility developments would diminish the quality of the experience. ORV use would be prohibited on the new access road during the main summer season, thus limiting ORV access and use along the 7-mile access road.

Skiing and Snowshoeing

Constructing an access road in the Peters Hills would provide an additional access route to the Peters Hills and would facilitate skiers and snowshoers getting into the high country as the road would alleviate the need to contend with thick brush in the lowland areas.

While 31 miles of new trails in the Peters Hills could provide additional opportunities for skiers and snowshoers, most of the trails are on tundra so would be unrecognizable in the winter.

The quality of the experience would be diminished by the visual intrusion of an access road and nature center located on the Peters Hills ridgeline. The quality of the experience would also be degraded throughout general state land by an increase in motorized use resulting from the

addition or improvement of winter parking areas and trailhead on the Petersville Road and Parks Highway. Existing motorized versus non-motorized use conflicts would be exacerbated by increasing opportunities for access to public lands.

Opportunities for skiing and snowshoeing in the eastern part of the planning area (in Denali State Park east of the highway) would likely remain unchanged.

Skijoring and Dog Mushing

Additional opportunities for dog mushing and skijoring would be provided by marking and grooming winter trails in the South Denali region and grooming Petersville Road from Kroto Creek to the Forks Roadhouse.

Marking and grooming winter trails in the South Denali region and grooming Petersville Road from Kroto Creek to the Forks Roadhouse would improve the quality of the experience by providing groomed surfaces that are more desirable than the washboard conditions that typically develop on Petersville Road.

The quality of the experience would be degraded throughout general state land by an increase in motorized use resulting from the addition or improvement of winter parking areas and trailhead on the Petersville Road and Parks Highway. Existing motorized versus non-motorized use conflicts would be exacerbated by increasing opportunities for access to public lands.

Opportunities for skijoring and mushing in the eastern part of the planning area (in Denali State Park east of the highway) would likely remain unchanged.

Snowmachine Use

Opportunities for snowmachine use would continue throughout the planning area. Additional opportunities would be provided through marking and grooming winter trails in the South Denali region and grooming Petersville Road from Kroto Creek to the Forks Roadhouse. Marking and grooming winter trails in the South Denali region and grooming Petersville Road from Kroto Creek to the Forks Roadhouse would improve the quality of the snowmachine experience because riders would be able to follow marked routes and ride on groomed surfaces that are more desirable than the washboard conditions that typically develop on Petersville Road.

Seeking a dedicated trail easement and constructing a primitive trail for the regionally significant Chulitna Bluff/Rabideux/106 Seismic Trail System would allow for the continuation of a north/south corridor on the east side of the Parks Highway, and a route to access recreational areas to the west. This would increase opportunities for snowmachine use in the planning area.

Enhancements to Petersville Road proposed under this alternative would enhance the experience for snowmachine users. Turnouts at MP 12.8 and 16.3 would provide additional parking for snowmachine users. Redesigning the Kroto Creek parking lot and providing a ramp for snowmachine users to load and unload their machines would enhance the snowmachine experience by facilitating parking and loading of machines. In addition, improving the parking

area at MP 121.5 of the Parks Highway to accommodate 50 vehicles with trailers, constructing a parking area on the west side of the highway near MP 122, and constructing a parking area on the west side of the Parks Highway at Rabideux Creek to accommodate 50 vehicles would create additional parking for snowmachine users which would improve the quality of the experience because users would not have to worry about trying to find a place to park. These parking areas would also alleviate the need to drive down Petersville Road to a parking area.

Improving the highway crossing at MP 122 of the Parks Highway would provide safer access to trail systems and parking areas.

Constructing an access road in the Peters Hills would provide an additional access route to the Peters Hills and would improve the quality of the experience by facilitating riders getting into the high country as the road would alleviate having to contend with thick brush in the lowland areas.

Opportunities for snowmachine use in the eastern part of the planning area (in Denali State Park east of the highway) would likely remain unchanged.

Visitor Safety

Visitor safety would be enhanced under this alternative because increased agency presence and expanded visitor facilities in the South Denali region would increase opportunities for visitor education. Constructing an informational kiosk on the east side of the Parks Highway/Petersville Road intersection to safely route trail users across the roadway would improve the safety of the snowmachine experience. Improving the highway crossing at MP 122 of the Parks Highway would provide safer access to trail systems and parking areas. Signing the entire winter trail system would also enhance user safety. Construction of a bike path along Petersville Road would significantly enhance the safety of the biking and pedestrian experience along Petersville Road between MP 0 and 7.

Conversely, visitor safety would be compromised because constructing a new visitor destination and associated facilities would lead to increases in types and levels of use throughout the South Denali region. Increases in use would lead to user conflicts which could include collisions between motorized and non-motorized watercraft on the Chulitna River; ORV or dirt bike users and hikers in the Peters Hills; and snowmachines and non-motorized winter recreationists on Petersville Road and on trail systems throughout the planning area. Visitor safety could also be compromised by hunters and recreational users occupying the same area. Additionally, more visitors along Petersville Road and in the Peters Hills could jeopardize visitor safety as more people would be more likely to wander into mining areas.

Cumulative Impacts

Cumulative impacts for this alternative would be the same as those discussed under Alternative A. These actions would create moderate adverse impacts on the quality of visitor opportunities along Petersville Road and in the Peters Hills and on visitor safety. Implementing this alternative alone would have major adverse impacts to opportunities for primitive, self-reliant activities and major positive impacts on visitor opportunities for individuals who require assistance with

access, facilities, and services. The incremental contribution of this alternative to impacts from past, present, and reasonably foreseeable actions would be considerable.

Conclusion

The actions proposed in this alternative would have a major positive impact on visitor opportunities for individuals who require assistance with access, facilities, and services, especially in the Peters Hills, along Petersville Road, and on the Chulitna River by increasing access, interpretation, visitor services, and trails. Actions in this alternative would improve access for some recreational activities, would enhance the experience for snowmachine users, and would retain current opportunities for primitive recreation near Curry Ridge.

It would simultaneously create a major negative impact by degrading the quality of the experience for non-motorized winter recreation throughout the planning area and introducing adverse impacts to primitive, self-reliant recreational opportunities in the Peters Hills, along Petersville Road, and on the Chulitna River by providing opportunities for increases in types and levels of use which could create user conflicts.

Visitor safety would be improved by education associated with interpretive panels, information kiosks, and agency staffing. Visitor safety would be adversely affected by conflicts between motorized and non-motorized users.

Alternative C - Parks Highway

The actions proposed in this alternative would provide additional opportunities for individuals who require assistance with access, facilities, and services, and it would preserve opportunities for primitive, self-reliant activities in the Peters Hills. It would simultaneously create a moderate negative impact to opportunities for a self-reliant wilderness experience at Curry Ridge.

Birding

Access to birding opportunities in the eastern portion of Denali State Park would increase with the construction of a new access road, visitor center, and 13 miles of new trails. Birds are not as likely to be displaced from this development site as they would at the Peters Hills site because ORVs are not allowed in the state park, and diversity of topography and vegetation shield birds from visitors and noise.

Additional birding opportunities would also be provided by improving access to the Chulitna River.

Boating – Motorized

Determining the feasibility of a docking facility on the Chulitna River could eventually lead to additional opportunities for motorized boating.

Boating – Non-motorized

Constructing access for non-motorized watercraft on the Chulitna would increase opportunities for non-motorized boaters; however, increases in motorized boating on the Chulitna River would adversely affect the primitive recreational opportunities on the Chulitna.

Cycling

The opportunity to bike on Petersville Road and on mining routes in the Peters and Dutch Hills would be improved by constructing a bike path along Petersville Road and by creating a map of recreational routes in the Peters and Dutch Hills.

General Sightseeing

Constructing a new nature center and access road to the Curry Ridge area in Denali State Park would afford visitors additional opportunities for general sightseeing. Developments would provide access to backcountry areas, and programs and facilities at and around the visitor center would provide opportunities for visitors to get a feel for the place. Opportunities for interpreting the Alaska Range, glaciers, alpine ecosystem, alpine lakes, forest, forest lakes, and rivers would be enhanced. Interpretive information at waysides along Petersville Road, at the parking area at the base of the new access road, on the shuttle bus, and at the new visitor center would help visitors interpret their surroundings. These actions would have positive impacts on opportunities to view the Alaska Range and learn about the South Denali region.

Hiking and Camping

This alternative would provide additional opportunities for hiking, backpacking, and camping because approximately 13 miles of trails would be constructed in the Curry Ridge area. These trails would provide opportunities for short walks and longer hikes on established and marked trails and would connect with the existing Curry and Kesugi Ridge trail systems. The quality of the hiking experience in the Peters Hills would be preserved for the visitor who prefers a more primitive hiking experience. The quality of the hiking experience in the Curry Ridge area would be improved for the visitor who prefers hiking on trails rather than cross-country because 13 miles of new trails would be constructed in the planning area. Trails would be marked and maintained, which would require less self-reliance and backcountry skills than cross-country travel. Very few people hike in the vegetated area around Curry Ridge because the vegetation is so dense. Public comment suggests that improving access to Curry Ridge would improve the experience, while others suggest that the primitive hiking experience on Curry Ridge would be adversely impacted with construction of new trails and a visitor center.

Because four other trailheads exist north of the Parks Highway development site, new trails originating from the visitor center would provide opportunities to connect to the Kesugi Ridge trail system, offering hikers more than 33 miles of trail along the ridge. New trails would also provide opportunities to go to the historic Curry Lookout, alpine lakes, alpine and forest ecosystems.

Constructing a campground along Petersville Road near the Forks would provide an opportunity for drive-up camping. Currently drive-up camping exists only along pullouts on Petersville Road. The quality of the experience would be improved as visitors could expect to camp at a clean, safe, and well-maintained facility instead of in a pullout along Petersville Road.

In general, constructing facilities in the Curry Ridge area would provide many additional visitor opportunities. However, new facilities would attract more users. More people and more vehicular traffic would create more noise and more visual intrusions. Increased noise and visual intrusions would detract from the remote feel and quality of the hiking experience on Curry Ridge. Increases in levels of use near Curry Ridge could create user conflicts, but because the access road, visitor center, and most trails would be located in vegetated areas (as opposed to open tundra that comprises much of the Peters Hills location), this site could accommodate more use with fewer conflicts as vegetation would absorb noise and would shield visitors from one another.

Increases in types and levels of use throughout the planning area would create user conflicts especially on general state land where there are few restrictions on use and conflicts already exist. Focusing development near Curry Ridge, however, would preserve primitive recreation opportunities (primarily for hikers) in the Peters Hills.

Hunting and Fishing

Access to hunting and fishing in the planning area would generally remain the same. Fishing in the South Denali region would continue to be popular. Increased recreational use of the area would result in increased competition among anglers.

Off-road Vehicle (ORV) Use

Opportunities for ORV use would continue throughout the planning area where use is allowed. Users would expect to encounter some additional users on general state land as improved parking and camping opportunities along Petersville Road may make it a more attractive place to recreate.

Skiing and Snowshoeing

Constructing an access road through vegetation below Curry Ridge would provide an access route to Curry Ridge. It would facilitate skiers and snowshoers getting into the high country as the road would facilitate passage through thick brush in the lowland areas. If the 3.5-mile access road to the visitor facility is not plowed in winter, parking could be cleared at the transportation center and the unplowed road could become a multi-use winter trail to Curry Ridge.

Thirteen miles of new trails in the Curry Ridge area would provide additional opportunities for skiers and snowshoers. The quality of the experience, however, may be poor as snowmachine use would likely be popular on Curry Ridge.

The quality of the experience would be degraded throughout the planning area, particularly on general state land, by an increase in motorized use resulting from the addition or improvement of winter parking areas and trailhead on the Petersville Road and Parks Highway. Existing motorized versus non-motorized use conflicts would be exacerbated by increasing opportunities for access to public lands.

Skijoring and Dog Mushing

Additional opportunities for dog mushing and skijoring would be provided by marking and grooming winter trails in the South Denali region and grooming Petersville Road from Kroto Creek to the Forks Roadhouse.

Marking and grooming winter trails in the South Denali region and grooming Petersville Road from Kroto Creek to the Forks Roadhouse would improve the quality of the experience by providing groomed surfaces that are more desirable than the washboard conditions that typically develop on Petersville Road.

Constructing an access road through vegetation below Curry Ridge would provide an access route to Curry Ridge. It would facilitate access to the high country as the road would facilitate passage through thick brush in the lowland areas. If the 3.5-mile access road to the visitor facility is not plowed in winter, parking could be cleared at the transportation center and the unplowed road could become a multi-use winter trail to Curry Ridge.

The quality of the experience would be degraded throughout the planning area, particularly on general state land, by an increase in motorized use resulting from the addition or improvement of winter parking areas and trailhead on the Petersville Road and Parks Highway. Existing motorized versus non-motorized use conflicts would be exacerbated by increasing opportunities for access to public lands.

Snowmachine Use

Opportunities for snowmachine use would continue throughout the planning area. Additional opportunities would be provided through marking and grooming winter trails in the South Denali region and grooming Petersville Road from Kroto Creek to the Forks Roadhouse. Marking and grooming winter trails in the South Denali region and grooming Petersville Road from Kroto Creek to the Forks Roadhouse would improve the quality of the snowmachine experience because riders would be able to follow marked routes and ride on groomed surfaces that are more desirable than the washboard conditions that typically develop on Petersville Road.

Seeking a dedicated trail easement and constructing a primitive trail for the regionally significant Chulitna Bluff/Rabideux/106 Seismic Trail System would allow for the continuation of a north/south corridor on the east side of the Parks Highway, and a route to access recreational areas to the west. This would increase opportunities for snowmachine use in the planning area.

Enhancements to Petersville Road proposed under this alternative would enhance the experience for snowmachine users. Turnouts at MP 12.8 and 16.3 would provide additional parking for

snowmachine users. Redesigning the Kroto Creek parking lot and providing a ramp for snowmachine users to load and unload their machines would enhance the snowmachine experience by facilitating parking and loading of machines. In addition, improving the parking area at MP 121.5 on the east side of the Parks Highway to accommodate 50 vehicles with trailers, constructing a park area on the west side near MP 122, and constructing a parking area on the west side of the Parks Highway at Rabideux Creek to accommodate 50 vehicles would create additional parking for snowmachine users which would improve the quality of the experience because users would not have to worry about trying to find a place to park. These parking areas would also alleviate the need to drive down Petersville Road to a parking area.

Improving the highway crossing at MP 122 of the Parks Highway would provide safer access to trail systems and parking areas.

Constructing an access road in the Curry Ridge area would provide an access route to Curry Ridge and would improve the quality of the experience by facilitating passage through thick lowland vegetation.

If the 3.5-mile access road to the visitor facility is not plowed in winter, parking could be cleared at the transportation center and the unplowed road could become a multi-use winter trail to Curry Ridge.

Visitor Safety

Visitor safety would be enhanced under this alternative because increased agency presence and expanded visitor facilities in the South Denali region would increase opportunities for visitor education. For example, constructing an informational kiosk on the east side of the Parks Highway/Petersville Road intersection to safely route trail users across the roadway would improve the safety of the snowmachine experience. Signing the entire winter trail system would also enhance user safety. Improving the highway crossing at MP 122 of the Parks Highway would provide safer access to trail systems and parking areas.

Conversely, visitor safety would be compromised because constructing a new visitor destination and associated facilities would lead to increases in types and levels of use throughout the South Denali region. Increases in use would lead to user conflicts which could include collisions between motorized and non-motorized watercraft on the Chulitna River; ORV or dirt bike users and hikers in the Peters Hills; and snowmachines and non-motorized winter recreationists on Petersville Road and on trail systems throughout the planning area. Visitor safety could also be compromised by hunters and recreational users occupying the same area.

Cumulative Impacts

Cumulative impacts for this alternative would be the same as those discussed under Alternative A. Overall, these actions would have moderate adverse impacts to the quality of visitor opportunities in the South Denali region and on visitor safety. Implementing this alternative alone would not impact opportunities for primitive, self-reliant activities in the Peters Hills and

would have major positive impacts on visitor opportunities in the South Denali region for individuals who require assistance with access, facilities, and services. This alternative would negatively impact primitive recreational opportunities on Curry Ridge. The incremental contribution of this alternative to impacts from past, present, and reasonably foreseeable actions would be considerable.

Conclusion

The actions proposed in this alternative would have a major positive impact on visitor opportunities for individuals who require assistance with access, facilities, and services throughout the South Denali region and especially at Curry Ridge, along Petersville Road, and on the Chulitna River by increasing access, interpretation, visitor services, and trails. Actions in this alternative would improve access for some recreational activities, would enhance the experience for snowmachine users, and would retain current opportunities for primitive recreation in the Peters Hills.

It would simultaneously create a major negative impact by degrading the quality of the experience for non-motorized winter recreation throughout the planning area and introducing adverse impacts to primitive, self-reliant recreational opportunities on Curry Ridge and on the Chulitna River by providing opportunities for increases in types and levels of use which could create user conflicts.

Visitor safety would be improved by education associated with interpretive panels, information kiosks, and agency staffing. Visitor safety would be adversely affected by conflicts between motorized and non-motorized users.

SUSTAINABILITY

Alternative A - No Action

Relationship between Short-Term Uses and Long-Term Productivity

The short-term uses allowed under this alternative would not significantly compromise any part of the long-term productivity of resources in the planning area.

Irretrievable or Irreversible Commitments of Resources

There would be no irreversible or irretrievable commitments of resources made under this alternative.

Unavoidable Adverse Environmental Impacts

There would be no unavoidable adverse impacts to resources in the planning area.

Alternative B - Peters Hills

Relationship between Short-Term Uses and Long-Term Productivity
No aspects of this action would jeopardize the long-term productivity of the environment. Impacts associated with construction, particularly noise, viewshed impairment, and air and water pollution may displace some wildlife from the immediate area. These impacts would be short-term for most wildlife and fish species.

Irretrievable or Irreversible Commitments of Resources
Financial resources committed to the proposed action would be, in a practical sense, irreversible. Irretrievable commitments are those involving specific commitments of particular renewable resources. Actions under this alternative would result in disturbance or loss of 117 acres of terrestrial vegetation and 14 acres of wetlands. This irretrievable commitment would preclude its use as habitat for some wildlife species.

Unavoidable Adverse Environmental Impacts
There would be unavoidable adverse impacts to soils, wetlands, vegetation, cultural resources, quality of life in local communities, and opportunities for primitive recreation in the Peters Hills.

Alternative C - Parks Highway (Preferred Alternative)

Relationship between Short-Term Uses and Long-Term Productivity
No aspects of the proposed action would jeopardize the long-term productivity of the environment. Impacts associated with construction, particularly noise, viewshed impairment, and air and water pollution may displace some wildlife from the immediate area. These impacts would be short-term for most wildlife and fish species.

Irretrievable or Irreversible Commitments of Resources
Financial resources committed to the proposed action would be, in a practical sense, irreversible. Irretrievable commitments are those involving specific commitments of particular renewable resources. The proposed action would result in disturbance or loss of 143 acres of terrestrial vegetation and six acres of wetlands. This irretrievable commitment would preclude its use as habitat for some wildlife species.

Concurrent with most of the comments received by local Alaskans, locating facilities along the already developed highway system would retain the rural character of local communities and the wild character of the Peters Hills.

Unavoidable Adverse Environmental Impacts
There would be unavoidable adverse impacts to soils, wetlands, vegetation, cultural resources, quality of life in local communities, and opportunities for primitive recreation on Curry Ridge.