

Chapter 4:

Environmental Consequences

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4.0 CHAPTER 4: ENVIRONMENTAL CONSEQUENCES

4.1 Introduction

This chapter evaluates the environmental consequences associated with the five alternatives presented in Chapter 2. The potential effects associated with each alternative are analyzed and compared to the existing conditions of each impact topic identified in Chapter 1. A detailed description of the affected environment is presented in Chapter 3.

4.1.1 Overview of Methodology and Threshold Criteria

The effects analysis is organized by impact topic and includes subsections on methodology, impact analysis by alternative, and conclusions. The methodology section describes the methods used to predict the impacts resulting from each alternative, defines threshold criteria, and lists the analysis assumptions. Three categories of effects, or impacts, are considered and analyzed:

- Direct Impacts: Impacts that occur at the same time and in the same place as the action.
- Indirect Impacts: Impacts that occur later in time or at a location away from the action.

Cumulative Impacts: Impacts that result from the incremental impact of an action when added to other past, present, or future foreseeable actions, regardless of what agency (federal or non-federal) or person undertakes the other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.

Threshold criteria help to establish the framework for understanding the severity and magnitude of an impact. Thresholds consider the geographic area of effect, the severity of the effect, and the duration of the effect. Each impact topic discussion includes a set of threshold criteria defined using four categories of impact: negligible, minor, moderate, and major impact levels. In general:

- Negligible effects may or may not cause observable changes to natural conditions; regardless, they do not reduce the integrity of a resource.
- Minor effects cause observable and short-term changes to natural conditions, but they do not reduce the integrity of a resource.
- Moderate effects cause observable and short-term changes to natural conditions, and/or they reduce the integrity of a resource.
- Major effects cause observable and long-term changes to natural conditions, and they reduce the integrity of a resource.

To evaluate the effects of the alternatives on each impact topic, the following methodology is applied:

- Identify the proposed activity that could affect the resource.
- Determine how those activities would affect the resource.
- Determine the level of effect of those activities and whether the effects are adverse or beneficial.

- Determine the significance of those effects in terms of the resource.

The range of alternatives presents a complicated and complex array of trail improvement and administration. As a tool to help analyze all of the details considered within the range of alternatives, a summary impact table was developed for each park resource (e.g., all of the impact topics except trail conditions and socioeconomics, which are not park “resources”.) These tables, provided in Appendix E, were used to ensure that all facets of each alternative were considered.

Estimated trail use under current conditions and for each alternative is presented in Table 4-1. This table lists the average ORV use (round trips) that would be likely each year, for the next 20 years, to gain access to the trails considered within the analysis area. This 20-year planning period serves as the timeframe over which impacts are evaluated for each alternative. As described in Section 2.2, implementation of the ORV Management Plan will likely begin in 1 to 5 years, but will depend on many factors. The trail use numbers in Table 4-1 form the basis of the analysis to characterize the potential environmental effects of the alternatives under each impact topic.

Average ORV use levels (round trips) on each trail per year, under current conditions and for the alternatives, were estimated based on several assumptions, including:

The level of ORV use estimates are based on the projected 20-year average number of ORV users only, and do not include hikers, bikers, or horseback riders. Table 4-1 displays the estimated annual ORV use per trail. Numbers in the table represent one ORV making one round trip on a trail. For example, 55 equals 55 ORVs, each making one round trip. These numbers do not represent total permitted use because each permittee may use multiple trails. Numbers were estimated based on trail counter data, permit data, telephone interviews with permittees, and harvest data.

Individuals using ORVs to access inholdings are included with subsistence ORV users in Table 4-1. Currently, the use of ORVs to access private inholdings constitutes a very small proportion of the total ORV use (less than five percent) and is not expected to change throughout the planning period.

Sport hunting makes up approximately 85 percent of the current recreational ORV use in the analysis area. If trails were improved, the recreational component of ORV use (access to non-motorized activities, dispersed camping, or sport fishing) would increase.

The number of sport hunters that use ORV trails depends heavily on ADF&G regulations for GMUs 11 and 12. Based on conversations with Glennallen field office biologists, improved trail access in Unit 11 most likely would not trigger the need for a regulatory change (for example, from the current general harvest ticket for sheep to a more limited drawing). Based on a conversation with the Tok field office biologist, regulatory changes might need to be considered for Unit 12 sheep if trail access were improved.

For the alternatives with no trail improvements, predicted recreational ORV use levels are based on past ORV permitting trends. With no trail improvements, recreational ORV use has increased at a rate of 6.4 users per year over the 15-year period from 1990 to 2005 (NPS 2008a).

For subsistence ORV use, predicted use levels are based on Wrangell-St. Elias records for total subsistence permits issued from 2003 to 2008. These records show a slight annual increase (2 percent) of individuals hunting subsistence moose in Unit 11 (NPS 2009d). This rate of increase is consistent with trends shown for voluntary subsistence ORV permits issued. Census data for the Copper Valley shows a doubling of population in the 20 years from 1980 to 2000 (1,339 to 3,410) but total population trends do not correlate well with subsistence use trends.

Table 4-1. Recreational and Subsistence ORV Use on Affected Trails under Current Conditions and by Alternative (annual average over planning period)

Trail	Current or Projected Recreational ORV Use (round trips)	Current or Projected Subsistence ORV Use (round trips)	Total Current or Projected ORV Use (round trips)
Current Conditions¹			
Black Mountain ²	0	55	55
Boomerang	5	5	10
Caribou Creek	90	30	120
Copper Lake	20	105	125
Lost Creek	114	40	154
Reeve Field	25	20	45
Soda Lake	63	25	88
Suslota	0	60	60
Tanada Lake	0	65	65
Trail Creek	120	35	155
Wilderness trails south of Tanada Lake	0	40	40
Total	437	480	917
Alternative 1			
Black Mountain ²	0	65	65
Boomerang	7	6	13
Caribou Creek	121	40	161
Copper Lake	30	125	155
Lost Creek	153	50	203
Reeve Field	35	24	59
Soda Lake	82	35	117
Suslota	0	70	70
Tanada Lake	0	75	75
Trail Creek	162	45	207
Wilderness trails south of Tanada Lake	0	47	47
Total	590	582	1,172
Alternative 2			
Black Mountain ²	0	55	55
Boomerang	4	4	8
Caribou Creek	92	40	132
Copper Lake	35	110	145
Lost Creek	121	47	168
Reeve Field	21	24	45
Soda Lake	49	20	69
Suslota	85	62	147
Tanada Lake	105	73	178
Trail Creek	138	41	179
Wilderness trails south of Tanada Lake	0	45	45
Total	650	521	1,171
Alternative 3			
Black Mountain ²	0	65	65
Boomerang	0	6	6
Caribou Creek	0	40	40
Copper Lake	0	125	125
Lost Creek	0	50	50
Reeve Field	0	24	24

Table 4-1. Recreational and Subsistence ORV Use on Affected Trails under Current Conditions and by Alternative (annual average over planning period)

Trail	Current or Projected Recreational ORV Use (round trips)	Current or Projected Subsistence ORV Use (round trips)	Total Current or Projected ORV Use (round trips)
Soda Lake	0	35	35
Suslota	0	70	70
Tanada Lake	0	75	75
Trail Creek	0	45	45
Wilderness trails south of Tanada Lake	0	47	47
Total	0	582	582
Alternative 4			
Black Mountain ²	0	144	144
Boomerang	0	6	13
Caribou Creek	180	25	205
Copper Lake	0	274	274
Lost Creek	153	50	203
Reeve Field	50	24	74
Soda Lake	126	25	151
Suslota	0	70	70
Tanada Lake	0	265	265
Trail Creek	162	45	207
Wilderness trails south of Tanada Lake	0	172	172
Total	671	1,100	1,771
Alternative 5			
Black Mountain ²	0	90	90
Boomerang	7	6	13
Caribou Creek	180	25	205
Copper Lake	125	171	296
Lost Creek	153	50	203
Reeve Field	50	24	74
Soda Lake	126	25	151
Suslota	0	80	80
Tanada Lake	234	78	312
Trail Creek	162	45	207
Wilderness trails south of Tanada Lake	0	48	48
Total	1,037	642	1,679

¹ Current condition data also presented in Table 3-5. These are presented again here for ease of comparison with proposed alternatives.

² Black Mountain includes all trails in wilderness south of Copper Lake. Black Mountain trails are not part of the nine trails considered in the Plan/EIS; they are included because ORV use would be affected under the proposed alternatives.

BLM has considered offering public lands in the Slana area for sale at a fair market value. This could increase the number of local rural residents who would qualify for subsistence activities. Recent conversations with Glennallen field office staff indicate that this proposal is on hold, pending survey of the area and future public involvement. The assumption is that an offering of public lands by BLM in the Slana area will not occur within the next 20 years.

Estimated miles and acres of impacts related to trail construction, trail improvements, and associated activities under each alternative are presented in Table 4-2. This information is based on detailed prescriptions done for proposed trail improvements that include, by trail segment, estimated construction type and estimated disturbance width. The discussions for several impact topics consider these construction impacts in determining the intensity of possible short-term effects.

Table 4-2. Short-Term Impacts during Trail Construction, Improvements, and Associated Activities by Alternative¹

Trail	Proposed Trail Construction or Improvement Activity ²	Length of Proposed Trail Change (miles)	Area Impacted During Proposed Trail Change (acres)
Alternative 1			
N/A	No Trail Construction or Improvements	0.0	0.0
Total Acres Impacted			0.0
Alternative 2			
N/A	No Trail Construction or Improvements	0.0	0.0
Total Acres Impacted			0.0
Alternative 3			
Soda Lake	Re-route Trail	4.3	10.0
Rock Creek	Construct Non-motorized Trail	1.9	2.8
Platinum-Soda	Mark Non-motorized Route	7.4	0.0
Platinum-Reeve	Mark Non-motorized Route	7.1	0.0
Sugarloaf	Mark Non-motorized Route	11.7	0.0
Total Acres Impacted			12.8
Alternative 4			
Caribou Creek	Improve Existing Trail	3.2	3.1
Trail Creek	Improve Existing Trail	6.1	4.4
Lost Creek	Improve Existing Trail	4.0	2.9
Soda Lake	Re-route Trail	4.3	10.0
Reeve Field	Re-route Trail	3.1	3.0
Tanada Lake	Create Gravel Pit	N/A	1.1
	Construct Gravel Road	0.1	0.1
	Re-route Trail	21.1	57.3
Boomerang	Improve Existing Trail	0.1	0.1
Copper Lake	Improve Existing Trail	3.1	4.7
	Re-route Trail	11.2	23.7
	Trailhead	<0.1	0.5
Black Mountain	Improve Trails in Wilderness	0.0	0.0
South of Tanada Lake	Improve Trails in Wilderness	0.0	0.0
Rock Creek	Construct Non-motorized Trail	1.9	2.8
4-Mile	Construct Non-motorized Trail	1.1	1.6
Tanada Spur	Construct Non-motorized Trail	2.9	4.2

Table 4-2. Short-Term Impacts during Trail Construction, Improvements, and Associated Activities by Alternative¹

Trail	Proposed Trail Construction or Improvement Activity ²	Length of Proposed Trail Change (miles)	Area Impacted During Proposed Trail Change (acres)
Platinum-Soda	Mark Non-motorized Route	7.4	0.0
Platinum-Reeve	Mark Non-motorized Route	7.1	0.0
Sugarloaf	Mark Non-motorized Route	11.7	0.0
Wait-Nabesna	Mark Non-motorized Route	16.0	0.0
Total Acres Impacted			119.5
Alternative 5			
Suslota	Improve Existing Trail	0.5	0.6
Caribou Creek	Improve Existing Trail	3.2	3.1
Trail Creek	Improve Existing Trail	6.1	4.4
Lost Creek	Improve Existing Trail	4.0	2.9
Soda Lake	Re-route Trail	4.3	10.0
Reeve Field	Re-route Trail	3.1	3.0
Tanada Lake	Create Gravel Pits	N/A	2.9
	Improve Existing Trail	10.0	26.5
	Create Temporary Gravel Haul Routes	4.1	2.9
	Re-route Trail	4.6	3.3
Boomerang	Improve Existing Trail	0.1	0.1
Copper Lake	Improve Existing Trail	3.1	4.7
	Re-route Trail	11.2	23.7
	Trailhead	<0.1	0.5
Black Mountain	Improve Trails in Wilderness	0.0	0.0
South of Tanada Lake	Improve Trails in Wilderness	0.0	0.0
Rock Creek	Construct Non-motorized Trail	1.9	2.8
Mentasta Traverse	Construct Non-motorized Trail	28.8	41.9
4-Mile	Construct Non-motorized Trail	1.1	1.6
Tanada Spur	Construct Non-motorized Trail	2.9	4.2
Platinum-Soda	Mark Non-motorized Route	7.4	0.0
Platinum-Reeve	Mark Non-motorized Route	7.1	0.0
Sugarloaf	Mark Non-motorized Route	11.7	0.0
Wait-Nabesna	Mark Non-motorized Route	16.0	0.0
Total Acres Impacted			139.2

Note: N/A = not applicable.

¹ Distance and area estimates include only activities that would result in construction impacts, such as trail segments that would undergo ditch and elevate prescriptions, porous pavement panel installation, or new trail construction. As a result, trail lengths presented here do not necessarily match lengths presented in other portions of the Plan/EIS.

² Improvements to wilderness trails would result in 0.0 acres of net disturbance. All work would be done by hand and would be limited to trail marking, brushing, spot hardening using native materials, and water control features such as water bars that could be done with hand tools. Any re-routes would be brushed out if necessary and marked. No tread construction on re-routes would occur. Also, any minimal impacts associated with the above activities would be mitigated by closing old degraded routes if re-routes were brushed, marked, and opened. Also, proposed non-motorized routes would involve marking and no construction activities; they are shown with 0.0 acres impacted. Trail closures and changes in allowed uses are not included.

Sources: NPS 2009j, 2009k.

4.1.2 Assumptions for the Cumulative Effect Analysis

The cumulative effects analysis considers any actions or natural phenomena that may occur within the Wrangell-St. Elias National Park and Preserve and surrounding areas. Projects and actions assumed to contribute to cumulative effects are listed below. These projects and actions are likely to affect several or all resources evaluated in this EIS.

As described in Section 3.5.5.3, the number of visitors to the Wrangell-St. Elias and to the analysis area specifically has increased over the past several years. Park visitation would continue to slowly increase. Visitation at Slana has and would continue to increase at a slower rate (4,180 in 2005, 4,242 in 2008). Based on conversations with Slana Ranger Station staff, locals account for approximately one-quarter of visitation, and non-locals for three-quarters. Of the non-local visitors, approximately half stop off the highway and do not proceed into the National Park or Preserve. Visitors using ORVs account for less than 20 percent of visitors. Other visitors drive the Nabesna Road, camp at dispersed sites, or undertake day hikes. Development of recreational infrastructure along the Nabesna Road and/or improvement or construction of multi-purpose trails could increase visitation at a faster rate.

As portrayed on Figure 3-2, there are other motorized trails present within the analysis area. With the exception of the Batzulnetas trail, these trails receive very little use (less than 20 passes per year). Because they are not marked or maintained and are only used for local subsistence needs, it is assumed that the current use levels on these trails would remain stable across all alternatives.

U.S. Census data for the Copper Valley (which includes the communities of Mentasta Village, Slana, Chistochina, Nabesna, Gakona, Gulkana, Glennallen, Tazlina, Willow Lake, Kenny Lake, Copper Center, and Chitina) show a doubling of population in the 20 years from 1980 to 2000 (from 1,339 to 3,410). Population is assumed to increase at a slower rate during the 20-year planning period. However, based on past trends, most increases would occur in Glennallen, Tazlina, Kenny Lake, and Copper Center. Only a slight population increase is assumed for the community of Slana, and a stable number of residents is assumed along the Nabesna Road.

Wrangell-St. Elias National Park and Preserve is in the process of initiating a frontcountry planning effort. Within the 20-year planning period, construction of additional infrastructure would likely occur along the Nabesna Road. These could include a campground improvement (involving 6 additional campsites) at Twin Lakes, a 12-unit campground at a site yet to be determined, parking and a boat launch at Long Lake (mile 22.9 on the Nabesna Road), expansion and/or improvement of existing trailheads, and one additional wayside/outhouse.

The numbers of outfitters or guides operating within the National Park and Preserve would remain stable.

Little to no development of Ahtna Corporation lands within the analysis area is assumed during the 20-year planning period.

Little to no development would occur on non-park lands (BLM, state, and Tetlin Wildlife Refuge) adjacent to the analysis area during the 20-year planning period.

Wrangell-St. Elias National Park and Preserve is considering options for clean-up of mine tailings at the Nabesna Mine. Options include capping material on site or hauling tailings out via the Nabesna Road to an appropriate in-state handling facility. No other minerals development or clean-up is anticipated within or adjacent to the analysis area.

Wrangell-St. Elias National Park and Preserve would continue to accommodate reasonable access to inholdings within the analysis area. The park is currently considering a proposal for winter access to Chisana via either the Reeve Field trail and Jacksina trail, or up the Nabesna River via the Tetlin Wildlife Refuge. Neither alternative would impact spring, summer, or fall ORV use or trail conditions.

4.2 Physical Environment

4.2.1 Soils

4.2.1.1 Methodology

The evaluation of likely effects to soil resources under each of the proposed alternatives is based on the research summarized in Section 3.3.1.3. These studies describe the factors that contribute to soil degradation and recovery from ORV use in this portion of Alaska. The quantification of acres of short-term construction disturbance, acres of long-term trail tread across permafrost soils, and acres of long-term recovery of permafrost soils from trail closures are based on overlays of GIS data (trail widths, vegetation, and others).

4.2.1.2 Impact Threshold Criteria

To determine the significance of effects on soils the impacts are compared against the following threshold criteria:

Negligible: Some small observable soil impacts may occur such as compaction, but no significant shearing, displacement, or horizon mixing. There would be no observable soil erosion and little alteration of hydrologic or biologic soil function. Negative effects would be very localized in extent.

Minor: Some soil impacts would occur with compaction, soil shearing and abrasion along short segments of trail. Changes to the physical properties of soil would be detectable and there would be measureable impacts to soil function. Effects would be small and localized in extent, but may occur at multiple locations.

Moderate: Changes in the physical properties of soils would be readily apparent. Impacts would include soil shearing, compaction, and abrasion. There would be observable or clear changes in the rate of soil sediment and thermal erosion and soil function. These changes would occur over moderately sized areas and at multiple locations but impacts would largely be contained within the original site of disturbance.

Major: The physical properties of soils would be substantially changed or frequently altered. Associated impacts would include soil compaction, shearing, abrasion, displacement, and horizon mixing. There would be highly noticeable changes in the rate of soil or thermal erosion and soil function. These changes would occur over larger areas and at multiple locations, with impacts extending well beyond the original site of disturbance.

4.2.1.3 Assumptions

The presence of shallow permafrost versus the absence of permafrost or presence of deep permafrost is assumed based on correlations between permafrost and vegetation types described by Happe et al. (1998). See Section 3.3.1 for more information.

For trail construction or re-construction, the amount of soil disturbance is calculated based on Table 4-2. The impacted areas are based on specific disturbance widths for different trail segments. The data sources are footnoted on Table 4-2.

4.2.1.4 Alternative 1 Effects on Soils

Direct and Indirect

Seasonal closures of Suslota, Tanada Lake, and portions of Copper Lake trails to recreational ORV use would continue under Alternative 1 (No Action) (Figure 2-3). This closure of 41 percent of trails previously open to recreational ORV use would reduce the number of ORV passes on the sensitive soils (e.g., finely textured, saturated soils with shallow permafrost) underlying these degraded trails, which could slow the progression of further soil damage. However, no trail re-routing or trail improvements would occur, and subsistence ORV use and access to inholdings using ORVs would continue. Over the 20-year planning period, ORV use levels on the three trails seasonally closed to recreational ORV use would increase by 20 percent above current ORV use levels on those trails (Table 4-1). Total ORV use would increase by 28 percent compared to current conditions in the analysis area under this alternative, with 50 percent of the use attributed to recreational ORVs and 50 percent attributed to subsistence ORV use. Given the lack of improvements and the increase in ORV use, the long-term recovery of soil resources on degraded trail segments would be unlikely. Trail maintenance would be limited to addressing safety concerns and acute resource issues. Wetland soils would continue to subside (Ahlstrand and Racine 1990). Existing damage on permafrost soils would result in moderate, long-term deterioration of soils (Ahlstrand and Racine 1990), even on the trails closed to recreational ORV use. As described in Section 3.3.1.3, Soil Susceptibility to ORV-related Damage, soils underlain by permafrost are particularly susceptible to impacts from ORV use. On ground underlain by permafrost, soil damage from ORVs initiates a series of changes lasting long after the initial vehicle traffic. Exposing soils leads to thermokarsting, or melting of the permafrost, which results in ponding and large mud bogs. ORV users develop alternate trails to avoid the mud bogs, resulting in trail braiding. Because standing water has a greater heat absorption capacity than bare soil or vegetation, the melting of underlying permafrost is accelerated in trails with ponding (Allen et al. 2000). Very little soil disturbance occurs on the Lost Creek or Trail Creek trails because these trails occur on durable gravel streambeds.

Table 4-3 summarizes impacts to soils that would occur on each trail under this alternative and was used to reach the following conclusions for direct and indirect impacts. “Greater than” symbols are added where impacts to permafrost soils are expected to expand.

For the Tanada Lake, Copper Lake, and Suslota trails, physical properties of soils would be substantially changed or frequently altered and these impacts would occur over larger areas and at multiple locations, resulting in major direct and indirect adverse impacts. For Caribou Creek, Soda Lake, Reeve Field, Boomerang, and Black Mountain, changes in the physical properties of soils would be readily apparent, and impacts would occur over moderately sized areas, resulting in moderate direct and indirect adverse impacts. For Trail Creek and Lost Creek trails, some small observable soil impacts may occur, such as compaction, but no significant shearing, displacement, or horizon mixing would occur, resulting in negligible direct and indirect adverse impacts.

Table 4-3. Summary of Impacts to Soils on Nine ORV Trails and Black Mountain Trails under Alternative 1

Trail	Projected ORV Use (round trips per year)		Action	Permafrost Soil Acres Impacted ¹
	Recreational	Subsistence		
Black Mountain	Closed	65	No improvements	>2
Boomerang	7	6	No improvements	8
Caribou Creek	121	40	No improvements	>2
Copper Lake	30	125	No improvements	>197
Lost Creek	153	50	No improvements	Less than 1
Reeve Field	35	24	No improvements	>8
Soda Lake	82	35	No improvements	>7
Suslota	Closed	70	No improvements	>132
Tanada Lake	Closed	75	No improvements	>206
Trail Creek	162	45	No improvements	Less than 1

¹ Impacted acres based on acres of Low Shrub, Dwarf Shrub, and Herbaceous vegetation types (see Section 3.4.2) overlaid with trail areas mapped by SMU (2008). These areas are expected to expand with increasing ORV use under Alternative 1 (590 recreational and 582 subsistence ORV round trips compared to 437 and 480, respectively, under current conditions), except on Trail Creek and Lost Creek trails, which are mostly gravel substrates.

Cumulative

Several of the cumulative effects assumptions (listed in Section 4.1.2) were factored into the ORV use projections presented in Table 4-1, which are evaluated under the direct and indirect impacts discussion. As discussed in Section 3.3.2.1, there are approximately 94 miles of other motorized trails in the analysis area. Condition and impacts to soils on these trails vary widely. Most are in fair condition, with some degraded segments and associated impacts to soils such as subsidence and soil compaction (Connery 1987). Because of very light use on most of the trails, soil impacts are contained and not expanding. Because impacts are localized and contained within the footprints of the existing trails, the cumulative impacts on soils associated with these additional trails would be minor.

Because soil compaction and displacement would occur in small, localized locations, construction of facilities along the Nabesna Road would have short-term, minor, adverse impacts on soils. The result would be some long-term commitment of soil resources. The planned clean-up of mine tailings at the Nabesna Mine would result in localized improvements in soil quality over the long term. Providing reasonable access to inholdings would involve minimal ORV use on several analysis area trails. Winter access to inholdings would have no impact because soils would be frozen. During other times of year, the level of expected use (less than 40 round trips per year over five different trails) would be low enough to produce only negligible adverse impacts to soils from ORV passes across analysis area trails. In addition to the assumptions listed in Section 4.1.2, global climate change could also affect soils over the long term. According to research presented in the Alaska Climate Change Strategy (State of Alaska 2009), permafrost is warming and thawing throughout this region, which could exacerbate any thermokarsting caused by ORV use or other causes in the analysis area.

The impacts of other nearby past, present, and foreseeable future actions would result in soil compaction, soil shearing and abrasion, and soil displacement. There would be measureable impacts to soil function that would occur at multiple locations. However, effects would be small (likely less than 5 acres at any individual location) and localized in extent, resulting in minor, long term impacts to soils.

In combination with the moderate, long-term, adverse direct and indirect impacts to soils, Alternative 1 would result in net long-term, moderate, adverse cumulative impacts to soils in the analysis area.

Conclusion

Continued subsistence ORV use without trail improvement would result in major impacts to soils on the Tanada Lake, Copper Lake, and Suslota trails. Continued recreational and subsistence ORV use on the other unimproved trails would result in moderate to negligible impacts to soils because, in general, these trails occur on better soils. This alternative would have moderate direct, indirect, and cumulative effects on soils.

The moderate impacts to soils anticipated from this alternative would not result in impairment of park resources that fulfill specific purposes identified in the establishing legislation or that are essential to the integrity of the park.

4.2.1.5 Alternative 2 Effects on Soils

Direct and Indirect

Over the 20-year planning period, ORV use levels on the Copper Lake, Suslota, and Tanada Lake trails would increase by 54 percent above current ORV use levels on those trails (Table 4-1). Under this alternative, total ORV use throughout the analysis area would increase by 28 percent compared to current conditions, with 56 percent attributed to recreational ORV use and 44 percent subsistence ORV use. The continuing progression of soil compaction, shearing, abrasion, displacement, and horizon mixing would be evident, particularly along very degraded and extremely degraded trail portions (Figure 3-2; Table 3-2), including Suslota, Tanada Lake, and Copper Lake trails. Soil erosion and the inability of soil to support native vegetation are well-documented along many trails in the analysis area. These processes are self-compounding (Allen et al. 2000, Ahlstrand and Racine 1990, Loomis and Liebermann 2006) and would therefore continue at increasing rates without trail improvements or closures. As under Alternative 1, trail maintenance would be limited.

Mucky silt loams and organic silt loams, particularly while saturated and underlain by permafrost, tend to be susceptible to churning and displacement of vegetation and organic matter from ORV use. Based on assessments of ORV trails in the analysis area (Allen et al. 2000, Happe et al. 1998), these soil types have greater number of trail braids, trail width, ponding, thaw depth, and subsidence depth than well-drained soils. These are the predominant soil types along the Suslota, Copper Lake, Tanada Lake, and Boomerang trails. They are also found along segments of the Reeve Field and Soda Lake trails. Where these soil types occur, the projected level of ORV use under this alternative would result in increased soil disturbance (outside of existing braided and disturbed areas) as well as more severe soil shearing, abrasion, displacement, and horizon mixing. Caribou Creek trail has small segments of organic silt loams, but mostly crosses fine mineral soils, which are more resistant to impacts. Gravel substrates, which can support ORV use, dominate both the Lost and Trail Creek trails.

Table 4-4 summarizes impacts to soils that would occur on each trail under this alternative and was used to reach the following conclusions for direct and indirect impacts. “Greater than” symbols are added where impacts to permafrost soils are expected to expand.

Table 4-4. Summary of Impacts to Soils on Nine ORV Trails and Black Mountain Trails under Alternative 2

Trail	Projected ORV Use (round trips per year)		Action	Permafrost Soil Acres Impacted ¹
	Recreational	Subsistence		
Black Mountain	Closed	55	No improvements	>2
Boomerang	4	4	No improvements	8
Caribou Creek	92	40	No improvements	>2
Copper Lake	35	110	No improvements	>197
Lost Creek	121	47	No improvements	Less than 1
Reeve Field	21	24	No improvements	>8
Soda Lake	49	20	No improvements	>7
Suslota	85	62	No improvements	>132
Tanada Lake	105	73	No improvements	>206
Trail Creek	138	41	No improvements	Less than 1

¹ Impacted acres based on acres of Low Shrub, Dwarf Shrub, and Herbaceous vegetation types (see Section 3.4.2) overlaid with trail areas mapped by SMU (2008). These areas are expected to expand with increasing ORV use under Alternative 2 (650 recreational and 521 subsistence ORV round trips compared to 437 and 480, respectively, under current conditions), except on Trail Creek and Lost Creek trails, which are mostly gravel substrates.

The direct and indirect impacts to soils along the Tanada Lake, Copper Lake, and Suslota trails would be major; along Caribou Creek, Soda Lake, and Reeve Field, Boomerang, and Black Mountain they would be moderate; and along Lost Creek and Trail Creek, they would be negligible. On Tanada Lake, Copper Lake, and Suslota trails, the physical properties of soils would be substantially changed, with impacts including soil compaction, shearing, abrasion, displacement, horizon mixing, and soil or thermal erosion. These impacts would occur over larger areas and at multiple locations, with impacts extending well beyond the original site of disturbance. Because of the severity of these impacts, combined with moderate impacts on the Caribou Creek, Soda Lake, Reeve Field, and Boomerang trails, the net direct and indirect impacts to soils in the analysis area under Alternative 2 would be major, long-term, and adverse.

Cumulative

The impacts of other nearby past, present, and foreseeable future actions on soils are described under Alternative 1, and would result in minor, long-term impacts to soils. The net effect of these impacts in combination with the direct and indirect impacts likely under Alternative 2 would be long-term, major, adverse impacts to soils.

Conclusion

Continued recreational and subsistence ORV use without trail improvement would result in major impacts to soils on the Tanada Lake, Copper Lake, and Suslota trails and moderate impacts on the Caribou Creek, Soda Lake, Reeve Field, and Boomerang trails. Existing degraded segments of trails would experience more severe impacts to soils and an expansion of impacts from increased trail braiding. This alternative would have major direct, indirect, and cumulative effects on soils.

This alternative would result in major impacts to soils. These impacts are not considered an impairment of park resources and values for the following reasons:

- Major impacts to soils are projected to occur on at least 544 acres. This represents 0.06 percent of the unglaciated portion of the analysis area.

- While the impacts described above have an obvious effect on the natural state of the landscape, they do not occur at a scale that threatens intact native ecological communities.
- Impacts to soils at the scale described for this alternative are not key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park.

4.2.1.6 Alternative 3 Effects on Soils

Direct and Indirect

Under Alternative 3, all nine trails in the analysis area that were previously open to recreational ORV use would be closed to recreational ORV use (Figure 2-6). As indicated in Table 4-1, levels of ORV use would decrease. Under this alternative, total ORV use throughout the analysis area would decrease by 37 percent compared to current conditions, with 100 percent of the use attributed to subsistence ORV use. Because damage to sensitive soils increases with increasing ORV use (Ahlstrand and Racine 1990), this alternative would slow the progression of soil shearing, compaction, and abrasion on many degraded trail segments, including Boomerang, Caribou Creek, Reeve Field, and Soda Lake trails, all of which would experience lower ORV use under this alternative than under current conditions. ORV use levels would also decrease on the gravel-bedded Lost Creek and Trail Creek trails, which are not currently degraded. However, over the 20-year planning period, ORV use levels on the Copper Lake, Suslota, and Tanada Lake trails would increase by 8 percent above current ORV use levels on those trails (Table 4-1). Subsistence ORV use on the Black Mountain trails also would increase over current conditions. Many segments along these trails are underlain by mucky silt loams and organic silt loams, and are saturated and underlain by permafrost. As a result, they are susceptible to churning and displacement of vegetation and organic matter from ORV use. Although subsistence ORV use would increase on these already degraded trails, impacts to soils would be limited because of the monitoring approach that would be implemented under this alternative. This monitoring approach would include management tools to limit impacts to soil resources related to ORV use that exceeded monitoring standards for at least two measured indicators, including trail braiding, soil erosion, soil compaction, and others.

Construction of the Soda Lake Re-route (Figure 2-5) would result in 10 acres of disturbed soils during construction activities (Table 4-2). Over the long-term, permanent loss of soil function would occur within the newly constructed 6-foot trail tread, an adverse impact localized to the trail's footprint. Also, 3.1 acres of permafrost soils would be disturbed (Table 4-5). Because these adverse effects would be small and localized in extent, the impacts to soils would be minor. Closure to recreational and subsistence ORV use of the old segment of the Soda Lake trail with a very low level of use continuing to provide access to an inholding would allow 5.8 acres of permafrost soils to recover naturally (Table 4-5). The net benefit to the soils on the Soda Lake trail would be long-term stabilization and revegetation of several very degraded and extremely degraded segments, which would provide for soil insulation and stabilization (Allen et al. 2000), a beneficial effect.

In addition, 1.9 miles of non-motorized trail (Rock Creek trail) would be constructed and 26.2 miles of non-motorized routes (Platinum-Soda, Platinum-Reeve, and Sugarloaf routes) would be marked (Table 4-2). Construction of the Rock Creek trail with mechanical earth-moving equipment would impact 2.8 acres of soils. Due to the sustainable design character of that construction over the long term, negligible impact to soil resources would occur. The construction would result in a 4-foot tread over the 1.9 miles, with 0.9 acre of active tread surface being non-vegetated. Some observable soil compaction would occur, but with non-motorized use, no shearing, displacement, or horizon mixing would be expected. Soil erosion would be unlikely, but revegetation would not likely occur on the

0.9 acre of trail tread. Without a constructed tread, no compaction or other long-term impacts to soils would be expected on the proposed non-motorized routes.

Table 4-5. Acres of Permafrost Soils Disturbed by Proposed Re-Routes and Allowed to Recover by Proposed Trail Closures for Alternatives 3, 4, and 5¹

Trail Name	Area of Trail Re-routes on Permafrost Soils (acres)	Area of Recovery of Permafrost Soils (acres)
<i>Alternative 3</i>		
Soda Lake	3.1	5.8
Total Alternative 3	3.1	5.8
<i>Alternative 4</i>		
Copper Lake	7.2	156.7
Reeve Field	0.4	7.3
Soda Lake	3.1	5.8
Tanada Lake	11.0	204.0
Total Alternative 4	24.2	373.8
<i>Alternative 5</i>		
Copper Lake	7.2	156.7
Reeve Field	0.4	7.3
Soda Lake	3.1	5.8
Tanada Lake	4.3	41.9
Total Alternative 5	15.0	211.7

No trail re-routes or trail closures to both recreational and subsistence ORV use are proposed under Alternatives 1 or 2.

Table 4-6 summarizes impacts to soils that would occur on each trail under this alternative and was used to reach the following conclusions for direct and indirect impacts. The Permafrost Soil Acres Impacted column sums ongoing impacts to permafrost soils from trail braiding, soil erosion, and soil compaction, together with construction impacts to permafrost soils where the trail re-route is proposed. The Permafrost Soil Acres Recovered column shows acres of currently impacted soils that would be allowed to recover. A positive number in this column indicates a beneficial impact.

Despite increased subsistence ORV use along the unimproved and degraded Tanada Lake, Copper Lake, and Suslota trails, direct and indirect impacts to soils would be moderate because of monitoring and management tools that would limit the expansion of impacts to soil resources related to ORV use under this alternative. Because only small areas of permafrost soils would be impacted, and expansion of impacts would not occur under the monitoring approach, impacts to soils along Black Mountain, Boomerang, Caribou Creek, and Reeve Field would be minor; along the gravel-bedded Lost Creek and Trail Creek they would be negligible. For the Soda Lake trail, the combination of small and localized construction impacts and soil recovery along the closed trail segment would result in minor adverse impacts to soils. Overall, based on the moderate impacts on Tanada Lake, Copper Lake, and Suslota trails, combined with minor to negligible impacts on the remaining trails, the net direct and indirect impacts to soils in the analysis area under Alternative 3 would be moderate, long-term, and adverse.

Table 4-6. Summary of Impacts to Soils on Nine ORV Trails and Black Mountain Trails under Alternative 3

Trail	Projected ORV Use (round trips per year)		Action	Permafrost Soil Acres Impacted ¹	Permafrost Soil Acres Recovered ²
	Recreational	Subsistence			
Black Mountain	Closed	65	No improvements	2	0
Boomerang	Closed	6	No improvements	8	0
Caribou Creek	Closed	40	No improvements	2	0
Copper Lake	Closed	125	No improvements	197	0
Lost Creek	Closed	50	No improvements	Less than 1	0
Reeve Field	Closed	24	No improvements	8	0
Soda Lake	Closed	35	Constructed re-route with closure of old degraded trail	3	11
Suslota	Closed	70	No improvements	132	0
Tanada Lake	Closed	75	No improvements	206	0
Trail Creek	Closed	45	No improvements	Less than 1	0

¹ Impacted acres based on acres of Low Shrub, Dwarf Shrub, and Herbaceous vegetation types (see Section 3.4.2) overlaid with trail areas mapped by SMU (2008). These areas are not expected to increase substantially with similar or decreasing ORV use under Alternative 3 (0 recreational and 582 subsistence ORV round trips compared to 437 and 480, respectively, under current conditions).

² Under Alternative 3, only Soda Lake trail would be re-routed. This column shows the acres of permafrost soils along the original trail that would recover after that original trail was closed.

Cumulative

The impacts of other nearby past, present, and foreseeable future actions on soils are described under Alternative 1, and would result in minor, long-term impacts to soils. The net effect of these impacts in combination with the direct and indirect impacts likely under Alternative 3 would be long-term, moderate, adverse impacts to soils, primarily related to ongoing soil degradation along unimproved very degraded and extremely degraded trail segments.

Conclusion

Re-routing around very degraded and extremely degraded portions of the Soda Lake trail, implementing a monitoring/management response program, and closing trails to recreational ORV use would slow the progression of ongoing adverse impacts to soils. Continued subsistence ORV use without trail improvement would result in moderate impacts to soils on Tanada Lake, Copper Lake, and Suslota trails; minor impacts to soils on Black Mountain, Boomerang, Caribou Creek, and Reeve Field; and negligible impacts to soils on the gravel-bedded Lost Creek and Trail Creek. For the Soda Lake trail, the combination of small and localized construction impacts and soil recovery along the closed trail segment would result in minor adverse impacts to soils. Overall, the adverse impacts to soils under Alternative 3 would be moderate, based on the moderate impacts on Tanada Lake, Copper Lake, and Suslota trails, combined with minor to negligible impacts on the remaining trails.

The moderate impacts to soils anticipated from this alternative would not result in an impairment of park resources that fulfill specific purposes identified in the establishing legislation or that are essential to the integrity of the park.

4.2.1.7 Alternative 4 Effects on Soils

Direct and Indirect

Alternative 4 would improve eight of the nine trails previously open to recreational ORV use in the analysis area to design-sustainable or maintainable condition (Figure 2-7), which would benefit soils on those trails. Recreational ORV use would not be permitted on trails with segments in worse than fair condition until after trail improvements were completed. Following trail improvements, recreational ORV use would be allowed in the National Preserve, but excluded from the National Park portion of the analysis area, including on Tanada Lake, Copper Lake, and Boomerang trails (Figure 2-8). Suslota trail also would be closed to recreational ORV use to minimize further damages to soils and other resources. These closures would represent 65 percent of the trails previously open to recreational ORV use.

Under this alternative, total ORV use throughout the analysis area would increase by 93 percent compared to current conditions, with 38 percent attributed to recreational ORV use and 62 percent subsistence ORV use. This alternative would implement the same monitoring approach described under Alternative 3, which would benefit soils. Furthermore, on the eight improved trails, exceeding a monitoring standard for any measured indicator would be addressed with management tools, which would substantially minimize potential adverse impacts to soils. Over the 20-year planning period, subsistence ORV use levels on the Copper Lake and Tanada Lake trails would increase by 184 percent above current ORV use levels on those trails (Table 4-1). Although damage to sensitive soils increases with increasing ORV use (Ahlstrand and Racine 1990), the trail improvements along Copper Lake and Tanada Lake trails would limit future damage to soil resources from ORV use. Impacts to soil from ORV use on these improved trails would be small and localized in extent, or minor. Subsistence ORV use in the designated wilderness (Black Mountain and the trails south of Tanada Lake) would increase by 233 percent. Because of that increase in ORV use and the lack of trail designations or off-trail monitoring, impacts to soils could increase on and off existing trails, including soil compaction, shearing, and subsidence. However, trail improvements along the Black Mountain trails would contain soil impacts to small, localized areas, a minor impact to soils. Subsistence use would increase by 17 percent on Suslota trail over current conditions. Because monitoring efforts would keep soil impacts from expanding, slightly increased ORV use would result in minor impacts to soils along Suslota trail. ORV use would increase 30 to 72 percent on degraded segments of Boomerang, Caribou Creek, Reeve Field, and Soda Lake trails. Because trail improvements and monitoring/management would keep soil impacts small and localized in extent, ORV use would result in minor impacts to soils on these trails as well. Because of trail improvements and gravel substrates on Lost Creek and Trail Creek trails, increased ORV use would result in negligible impacts to soils.

The impacts to soils related to the Soda Lake Re-route would be minor and related to closure of the re-routed segment of the Soda Lake trail would be beneficial, the same as described under Alternative 3. Proposed trail improvements on Lost Creek and Trail Creek trails would have negligible, short- or long-term, impacts on soil resources, because they are coarsely textured and have good load-bearing capacity. Because of the limited extent of improvements and the relatively good existing trail condition (with few very or extremely degraded segments), the proposed improvements along Caribou Creek trail would have negligible, short- or long-term, impacts on soil resources. The proposed improvement to the Copper River crossing at the beginning of the Boomerang trail would mitigate impacts to sensitive soils at that location, a beneficial impact. The first 3.1 miles of the Copper Lake trail would be improved under Alternative 4, resulting in 4.7 acres of short-term disturbance during improvement activities (Table 4-2). Over the long term, ongoing maintenance along the improved segments would prevent soil degradation. Construction of the Reeve Field,

Tanada Lake, and Copper Lake Re-routes would result in 3, 58.5, and 24.2 acres, respectively, of disturbed soils during construction activities (Table 4-2). Over the long term, permanent loss of soil function would occur within the newly constructed trail treads, an adverse impact localized to the footprints of the re-routed trails. The newly constructed trail treads would result in 0.4, 11, and 7.2 acres, respectively, of disturbance to permafrost soils (Table 4-5). Because these adverse effects would be small and localized in extent, the impacts to soils from construction of these re-routes would be minor. Closure to recreational and subsistence ORV use of the re-routed segments of these trails would allow a substantial area (7.3, 204, and 156.7 acres, respectively) of permafrost soils to stabilize and revegetate naturally (Table 4-5). The net benefit to the soils on the Reeve Field, Tanada Lake, and Copper Lake trails would be long-term re-vegetation of several very degraded and extremely degraded segments, which would provide soil insulation and stabilization (Allen et al. 2000).

As described under Alternative 3, the short- and long-term adverse impacts to soils related to the Rock Creek non-motorized trail and to the Platinum-Soda, Platinum-Reeve, or Sugarloaf non-motorized routes would be negligible. Under Alternative 4 another 4.0 miles of constructed non-motorized trail (4-Mile and Tanada Spur trails) would be constructed. Over the short term, up to 5.8 acres of soils would be disturbed during construction of these trails (Table 4-2). Due to the sustainable design character of that construction over the long term, negligible impact to soil resources would occur. The construction would result in a 4-foot tread over the 4.0 miles, with 1.9 acre of active tread surface being non-vegetated. Some observable soil compaction would occur, but with non-motorized use, no shearing, displacement, or horizon mixing would be expected. Soil erosion would be unlikely, but revegetation would not likely occur on the 1.9 acre of trail tread. The 16-mile Wait-Nabesna non-motorized route would also be marked under Alternative 4. Without a constructed tread, no compaction or other long-term impacts to soils would be expected on this non-motorized route.

Table 4-7 summarizes impacts to soils that would occur on each trail under this alternative and was used to reach the following conclusions for direct and indirect impacts. The Permafrost Soil Acres Impacted column sums ongoing impacts to permafrost soils from trail braiding, soil erosion, and soil compaction, together with construction impacts to permafrost soils where trail re-routes are proposed. “Greater than” and “less than” symbols are added where impacts to permafrost soils are expected to expand or decrease. The Permafrost Soil Acres Recovered column shows acres currently impacted soils that would be allowed to recover. A positive number in this column indicates a beneficial impact.

Because of trail improvements, monitoring, and management tools, the impacts to soils from increased ORV use would be minor on Black Mountain, Boomerang, Caribou Creek, Copper Lake, Reeve Field, Soda Lake, Suslota, and Tanada Lake trails. The good load-bearing capacity on Lost Creek and Trail Creek trails would support increased ORV use with negligible effects to soils. Recovery along the closed trail segments would result in beneficial impacts to soils. Overall, based on the negligible to minor impacts from increasing ORV use on the analysis area trails, the minor to negligible short-term construction impacts on improved trails, and the long-term benefits to soils from monitoring, trail closures, and trail improvements, the net direct and indirect impacts to soils in the analysis area under Alternative 4 would be minor to beneficial in the long term and minor and adverse in the short term.

Table 4-7. Summary of Impacts to Soils on Nine ORV Trails, Black Mountain Trails, and Non-motorized Trails under Alternative 4

Trail	Projected ORV Use (round trips per year)		Action	Permafrost Soil Acres Impacted ¹	Permafrost Soil Acres Recovered ²
	Recreational	Subsistence			
Black Mountain	Closed	65	Minor re-routes, drainage structures, and spot hardening	<2	
Boomerang	Closed	6	Improvement of river ramp	<8	0
Caribou Creek	180	25	Major trail hardening and some re-alignment	<2	0
Copper Lake	Closed	274	Constructed re-route and hardening with old trail closure.	14	157
Lost Creek	153	50	Bladed trail to minimize crossings	<1	0
Reeve Field	50	24	Re-route with closure of old degraded trail.	1	7
Soda Lake	126	25	Constructed re-route with closure of old degraded trail	3	6
Suslota	Closed	70	No improvements	132	0
Tanada Lake	Closed	265	Constructed re-route with closure of old trail.	10	204
Trail Creek	162	45	Bladed trail to minimize crossings	<1	0
Non-motorized trails	Closed	Closed	Constructed to sustainable standard	Unknown	0

¹ Impacted acres based on acres of Low Shrub, Dwarf Shrub, and Herbaceous vegetation types (see Section 3.4.2) overlaid with trail areas mapped by SMU (2008). Because of trail improvements, these areas are not expected to expand substantially with increasing ORV use under Alternative 4 (671 recreational and 1,100 subsistence ORV round trips compared to 437 and 480, respectively, under current conditions).

² Under Alternative 4, portions of Copper Lake, Reeve Field, Soda Lake, and Tanada Lake trails would be re-routed. This column shows the acres of permafrost soils along the original trails that would recover after those trail segments were closed. Additional acres would recover along trail improvements.

Cumulative

The impacts of other nearby past, present, and foreseeable future actions on soils are described under Alternative 1, and would result in minor, long-term impacts to soils. The net effect of these impacts in combination with the direct and indirect impacts likely under Alternative 4 would be long-term, minor, adverse impacts to soils. Soil compaction, shearing, and abrasion could occur on short segments of trail before being addressed with the proactive monitoring program.

Conclusion

Improving eight trails, re-routing and reconstructing very degraded and extremely degraded trail segments, and implementing monitoring and management actions would largely reverse the progression of ongoing adverse impacts to soils. Continued ORV use with trail improvements would result in minor impacts to soils on Black Mountain, Boomerang, Caribou Creek, Copper Lake, Reeve Field, Tanada Lake, and Soda Lake trails; and negligible impacts to soils on the gravel-bedded Lost Creek and Trail Creek. Because of monitoring efforts that would contain existing impacts, slightly increased ORV use on the unimproved Suslota trail would result in minor impacts to soils. Overall, the adverse impacts to soils under Alternative 4 would be minor, based on the minor to negligible impacts on the nine analyzed trails and wilderness trails.

The minor impacts to soils anticipated from this alternative would not result in an impairment of park resources that fulfill specific purposes identified in the establishing legislation or that are essential to the integrity of the park.

4.2.1.8 Alternative 5 Effects on Soils

Direct and Indirect

Alternative 5 would improve all nine trails previously open to recreational ORV use in the analysis area, and eight of the nine would be improved to at least a maintainable condition (Figure 2-9), which would benefit soils. Recreational ORV use would not be permitted on trails with segments in worse than fair condition until after trail improvements were completed. Following trail improvements, recreational ORV use would be allowed in both the National Park and Preserve (Figure 2-10). Suslota trail would be closed to recreational ORV use to minimize further damages to soils and other resources.

As indicated in Table 4-1, levels of ORV use would increase by 83 percent compared to current conditions, with 62 percent attributed to recreational ORV use and 38 percent subsistence ORV use. This alternative would implement the same monitoring approach described under Alternative 4, which would benefit soils by identifying early indicators of degradation and implementing management tools to mitigate potential negative effects. Monitoring for off-trail impacts related to subsistence ORV use would be implemented under Alternative 5, which would allow for early detection and appropriate mitigation of any adverse impacts to soils. Over the 20-year planning period, ORV use levels on the Copper Lake, Suslota, and Tanada Lake trails would increase by 185 percent above current ORV use levels on those trails (Table 4-1). Although damage to sensitive soils increases with increasing ORV use (Ahlstrand and Racine 1990), the trail improvements along these trails would limit future damage to soil resources from ORV use. Impacts to soil from ORV use on these trails would be small and localized in extent, or minor. Subsistence ORV use in the designated wilderness (Black Mountain and the trails south of Tanada Lake) would increase by 45 percent. Trail improvements along the Black Mountain trails would limit future damage to soil resources from ORV use. Monitoring for off-trail impacts related to subsistence ORV use would allow for mitigation of any adverse impacts to soils. Designation of trails for subsistence ORV use in the designated wilderness would eliminate any off-trail impacts to soils and would allow stabilization of any existing off-trail impacts to soils. Because of trail improvements and monitoring/management, increased subsistence ORV use in the wilderness would result in small and localized compaction, soil shearing, and abrasion, or minor impacts to soils. ORV use would increase 30 to 72 percent on degraded segments of Boomerang, Caribou Creek, Reeve Field, and Soda Lake trails. Because trail improvements and monitoring/management would keep soil impacts small and localized in extent, ORV use would result in minor impacts to soils on these trails as well. Because of trail improvements and gravel substrates on Lost Creek and Trail Creek trails, increased ORV use would result in negligible impacts to soils.

Under Alternative 5, the same re-routes and trail closures would be implemented as under Alternative 4 on the Soda Lake, Reeve Field, and Copper Lake trails. The impacts to soils related to these re-routes and closures would be minor and beneficial, respectively, as described under Alternative 3 (for Soda Lake) and under Alternative 4 (for Reeve Field and Copper Lake). Because construction impacts would be small and localized in extent, the short-term construction impacts to soils related to improvement of the first 3.1 miles of the Copper Lake trail, and proposed trail improvements on Lost Creek, Trail Creek, Caribou Creek, and Boomerang trails would be minor, the same as described under Alternative 4. Under Alternative 5, minor improvements would be made along the Suslota trail, which would involve 0.6 acre of disturbance to soils during improvement activities. Over the

long term, the improvements would allow the stabilization and natural revegetation of soil along 10 acres of very degraded and extremely degraded portions of the trail, a beneficial impact to soils.

In addition, Alternative 5 would involve 10 miles of trail improvements and 4.6 miles of trail re-routes along the Tanada Lake trail (Table 4-2). The trail improvements would result in 26.5 acres of short-term disturbance during improvement activities and would result in a permanent loss of soil function within the newly constructed trail tread, an adverse impact localized to the trail's footprint. Over the long term, maintenance activities along improved segments would prevent soil degradation. Three small gravel pits would be developed along the Tanada Lake trail based on locations of surficial gravel deposits and the results of future test drilling. Pit sizes are estimated at 0.75, 1.3, and 0.87 acres, excavated at a depth of 3 feet. Gravel pits would be developed with mechanized equipment. Top soil and organics would be removed and stockpiled, which would minimize the long-term, adverse impacts to soils. When trail construction is completed, gravel pits and access roads would be re-shaped, re-vegetated, and closed. Factoring in gravel pits and temporary haul roads, construction of the Tanada Lake Re-route under Alternative 5 would result in approximately 9.1 acres of disturbed soils during construction activities. Over the long term, the newly constructed trail tread would result in 4.3 acres of disturbance to permafrost soils (Table 4-5). Because of the small size and localized extent, the impact to soils from constructing the Tanada Lake Re-route would be minor. Closure to recreational and subsistence ORV use of the abandoned segments of this trail would allow 42 acres of permafrost soils to stabilize and naturally revegetate. The net benefit to the soils on the Tanada Lake trail would be long-term revegetation of several very degraded and extremely degraded segments, which would provide soil insulation and stabilization (Allen et al. 2000).

As described under Alternative 4, the short- and long-term adverse impacts to soils related to the Rock Creek, 4-Mile, and Tanada Spur non-motorized trails and to the Platinum-Soda, Platinum-Reeve, Sugarloaf, and Wait-Nabesna non-motorized routes would be negligible. Under Alternative 5 another 28.8 miles of non-motorized trail (Mentasta Traverse) would be constructed. Over the short term, 42 acres of soils would be disturbed during construction of this trail (Table 4-2). Due to the sustainable design character of that construction over the long term, negligible impact to soil resources would occur. The construction would result in a 4-foot tread over the 28.8 miles, with 14 acres of active tread surface being non-vegetated. Some observable soil compaction would occur, but with non-motorized use, no shearing, displacement, or horizon mixing would be expected. Soil erosion would be unlikely, but revegetation would not likely occur on the 14 acres of trail tread.

Table 4-8 summarizes impacts to soils that would occur on each trail under this alternative and was used to reach the following conclusions for direct and indirect impacts. The Permafrost Soil Acres Impacted column sums ongoing impacts to permafrost soils from trail braiding, soil erosion, and soil compaction, together with construction impacts to permafrost soils where trail re-routes are proposed. "Less than" symbols are added where impacts to permafrost soils are expected to decrease. The Permafrost Soil Acres Recovered column shows acres of currently impacted soils that would be allowed to recover. A positive number in this column indicates a beneficial impact.

Because of trail improvements, monitoring, and management tools, the impacts to soils from increased ORV use would be minor on Black Mountain, Boomerang, Caribou Creek, Copper Lake, Reeve Field, Soda Lake, Suslota, and Tanada Lake trails. The good load-bearing capacity on Lost Creek and Trail Creek trails would support increased ORV use with negligible effects to soils. Recovery along the closed trail segments would result in beneficial impacts to soils. Overall, based on the negligible to minor impacts from increasing ORV use on the analysis area trails, the minor to negligible short-term construction impacts on improved trails, and the long-term benefits to soils from monitoring, trail closures, and trail improvements, the net direct and indirect impacts to soils in the

analysis area under Alternative 5 would be minor to beneficial in the long term and minor and adverse in the short term.

Table 4-8. Summary of Impacts to Soils on Nine ORV Trails, Black Mountain Trails, and Non-motorized Trails under Alternative 5

Trail	Projected ORV Use (round trips per year)		Action	Net Soil Acres Impacted ¹	Permafrost Soil Acres Recovered ²
	Recreational	Subsistence			
Black Mountain	Closed	90	Minor re-routes, drainage structures, and spot hardening	<2	0
Boomerang	7	6	Improvement of river ramp	<8	0
Copper Lake	125	171	Constructed re-route and hardening with old trail closure.	14	157
Caribou Creek	180	25	Major trail hardening and some re-alignment	<2	0
Lost Creek	153	50	Bladed trail to minimize crossings	<1	0
Reeve Field	50	24	Re-route with closure of old degraded trail.	1	7
Soda Lake	126	25	Constructed re-route with closure of old degraded trail	3	6
Suslota	Closed	80	Spot hardening of degraded meadows and stream crossings	<132	0
Tanada Lake	234	78	Re-construction with closure of old trail.	8	42
Trail Creek	162	45	Bladed trail to minimize crossings	<1	0
Non-motorized trails	Closed	Closed	Constructed to sustainable standard	Unknown	0

¹ Impacted acres based on acres of Low Shrub, Dwarf Shrub, and Herbaceous vegetation types (see Section 3.4.2) overlaid with trail areas mapped by SMU (2008). Because of trail improvements, these areas are not expected to expand substantially with increasing ORV use under Alternative 5 (1,037 recreational and 642 subsistence ORV round trips compared to 437 and 480, respectively, under current conditions).

² Under Alternative 5, portions of Copper Lake, Reeve Field, Soda Lake, and Tanada Lake trails would be re-routed. This column shows the acres of permafrost soils along the original trails that would recover after those trail segments were closed. Additional acres would recover along trail improvements.

Cumulative

The impacts of other nearby past, present, and foreseeable future actions on soils are described under Alternative 1, and would result in minor, long-term impacts to soils. The net effect of these impacts in combination with the direct and indirect impacts likely under Alternative 5 would be long-term, minor, adverse impacts to soils. Soil compaction, shearing, and abrasion could occur on short segments of trail before being addressed with the proactive monitoring program.

Conclusion

Improving all nine trails, re-routing and reconstructing very degraded and extremely degraded trail segments, and implementing monitoring and management actions would largely reverse the

progression of ongoing adverse impacts to soils. Continued ORV use with trail improvements would result in minor impacts to soils on Black Mountain, Boomerang, Caribou Creek, Copper Lake, Reeve Field, Tanada Lake, Soda Lake, and Suslota trails; and negligible impacts to soils on the gravel-bedded Lost Creek and Trail Creek. The combination of small and localized construction impacts and soil recovery along closed trail segments on Copper Lake, Reeve Field, Tanada Lake, and Soda Lake would result in minor adverse impacts to soils. Overall, the adverse impacts to soils under Alternative 5 would be minor, based on the minor to negligible impacts on the nine analyzed trails and wilderness trails.

The minor impacts to soils anticipated from this alternative would not result in an impairment of park resources that fulfill specific purposes identified in the establishing legislation or that are essential to the integrity of the park.

4.2.2 Trail Condition

4.2.2.1 Methodology

Analysis of expected impacts to trail conditions within the analysis area was based primarily on careful consideration of the specific management actions included within the respective alternatives. In general, the orientation and physical extent of management actions such as closures, re-routes, reconstruction or new construction, trail hardening and increased maintenance will translate into changes from the current conditions for the specific trail segments affected by these actions. Consequently, the fundamental step in the assessment of trail conditions was to identify where trail conditions would be expected to improve or deteriorate based on the corresponding trail management regime. In addition, projected changes in future ORV use levels were evaluated to assess, at a qualitative level, the degree to which increased or decreased use (in the case of trail closures or restrictions) would translate into changes in trail conditions. The assessment does not include an updated quantitative assessment of trail mileage in the respective condition classifications (as is provided in Table 3-2 for the current conditions) by alternative, as this would require a level of precision about future trail conditions that is beyond the reach of current planning tools.

4.2.2.2 Impact Threshold Criteria

To determine the significance of effects on trail condition, the impacts identified for each alternative are compared against the following threshold criteria:

Negligible: The trail condition is such that trail use does not result in any significant direct or indirect physical resource impacts and any tread wear or aging of trail structures can be corrected with routine maintenance. The trail would be considered to be in good condition and would generally fall into one of the following three sustainability classes: design sustainable, performance sustainable, or maintainable

Minor: The trail condition is such that trail use may result in small localized impacts to associated physical resource within and outside of the established trail tread. Most problems can be corrected with routine maintenance, a few with small mitigation actions such as supplemental capping, water control or surface hardening. The trail would be considered to be in fair or better condition and would generally fall into one of the following two sustainability classes: design sustainable or maintainable

Moderate: The trail condition is such that some trail segments would be expected to be in a degraded or poorer condition. Tread can be muddy and some sections are ponded under wet conditions which may lead to the formation of deep ruts. Within these segments, trail tread has

deteriorated to the point that trail utility has decreased and users have responded by widening the tread width or creating new by-pass alignments. This results in off-trail resource impacts. Some trail tread problems can be corrected through routine maintenance, but some require moderate sized re-construction, trail hardening, or re-routing actions. The trail would be considered in fair condition with some degraded sections and would generally fall into the maintainable sustainability class.

Major: The trail condition for most of the trail would be in a degraded, very degraded, or severely degraded condition. Trail tread has deteriorated to the point that there is active and expanding trail braiding. This deterioration has created resource impacts both within the area of braiding, but in some places more distant. Trail tread problems cannot be corrected through routine maintenance, and major re-construction, trail hardening, or re-routing would be required. The trail would be considered in degraded or worse condition and would generally fall into one of the two following sustainability classes depending on trail design, location, condition, and administrative constraints: maintainable or unmaintainable.

4.2.2.3 Assumptions

Over time, trail conditions will change in direct response to changes in trail management. Trails or trail segments that are closed to ORV use will stabilize and slowly revegetate through natural processes (absent any targeted restoration activity), and trail conditions at the end of the planning period will be improved relative to the baseline condition.

Changes in trail conditions in response to trail management actions will occur in general relation to changes in the overall level of ORV use. For example, conditions on a trail that is closed to recreational ORV use will improve or deteriorate based on whether the future subsistence ORV use level is higher or lower than the current use. A similar pattern is expected for trails on which seasonal use restrictions are applied. It is recognized that this may not hold true for some areas where slope erosion or thermal degradation has been initiated. In that case, deterioration may continue even under lower use levels.

Physical actions to construct new trails or reconstruct, re-locate, or increase the maintenance of existing trail segments are assumed to result in the intended improvements in trail conditions. For example, a new trail segment constructed to sustainable design criteria is assumed to remain in good condition throughout the planning period. A trail segment that is reconstructed or improved to provide a suitable tread is assumed to be changed to good condition and to remain in that condition throughout the planning period. Under both cases, it is assumed that a basic level of routine maintenance would be provided throughout the planning period.

4.2.2.4 Alternative 1 Effects on Trail Condition

Direct and Indirect

Under Alternative 1 (No Action), there would be no expected change in present management of the trail system in the analysis area. ORV use for subsistence purposes and for access to inholdings would continue without restrictions. Recreational ORV use would continue to be permitted year-round on six trails. Portions of three trails totaling approximately 38 miles of trail would continue to be limited to recreational ORV use during the winter months when the ground is frozen, in an effort to minimize resource impacts. Trail maintenance would continue at current levels and no actions to re-route, re-construct, or harden existing trails would be undertaken.

Table 4-1 identifies current estimated use levels for recreational and subsistence ORV users and the projected level of future use under Alternative 1. Total current ORV use for both subsistence and recreational users is estimated at 917 round trips annually, with a 48/52 percent split for the two user groups. Total ORV use by the end of the 20-year planning period under Alternative 1 is expected to reach 1,172 round trips, an increase of approximately 28 percent over the baseline use level. Recreational ORV use is projected to increase by 17 percent, compared to 11 percent for subsistence ORV use.

Because the current trail management regime would continue, changes in the physical condition of the trails under Alternative 1 would occur in direct response to changes in use levels. With an overall increase in ORV use of 28 percent over 20 years, net moderate to major deterioration in system-wide trail conditions could be expected. Trail segments that currently have degraded conditions would not be repaired or improved, and increased use would likely cause some degree of expanded trail braiding and incision. Because the assumptions about future use rates are applied system-wide for recreational and subsistence ORV use (annual increases of 3 percent for recreational use and 2 to 3 percent for subsistence use), future physical conditions on each trail would be similar to the current classification results, i.e., there would not be major changes in ORV use on any individual trail and no substantial shifts in use from some trails to others. Nevertheless, use would increase more slowly on the trails that are now closed to recreational ORV use. Future use on the Tanada Lake trail under Alternative 1 would be approximately 15 percent, compared to the 28 percent increase in total ORV use. At the end of the planning period, approximately half of the total trail mileage in the system would still have degraded, very degraded, or extremely degraded conditions. That half would meet the criteria for major impacts, while the balance of the trails would meet the negligible, minor, or moderate threshold. Considering all of the above and balancing these different impact levels, it is expected that the net overall condition of the trail system would be within the moderate threshold at the end of the planning period.

Cumulative

The projected changes in ORV use levels discussed above are reflective of relatively long-term local and regional trends in population, land development, and wildlife management as they relate to future ORV use. Assumptions for cumulative impact analysis (see Section 4.1.2) indicate that minimal changes are expected in conditions related to inholdings and development on non-NPS lands in the analysis area. Overall park visitation is expected to continue to increase slowly, and development of additional infrastructure along the Nabesna Road (such as plans for additional campsites) is assumed. These changes are likely to result in increased recreational use within the Nabesna Road corridor over time, including some increased level of non-ORV use on the trail system. These increases in non-motorized use are not expected to result in additional changes in physical conditions on the analysis area trails.

As discussed in Section 3.3.2.1, there are approximately 94 miles of other motorized trails in the analysis area. No condition assessment has been done on these trails since 1986 and conditions vary widely. Most are in fair condition, with some degraded segments (Connery 1987). Because of very light use on most of the trails, degraded sections are contained and not expanding. The Batzulnetas trail receives consistently heavy use (greater than 200 passes per year) and has segments in degraded and very degraded condition. Because degraded areas are localized and contained, the cumulative impacts on trail condition associated with these additional trails are considered minor. Consequently, considering the minor impacts from these other motorized trails in conjunction with the moderate overall direct and indirect impacts identified for Alternative 1, cumulative long-term impacts to the trail conditions within the analysis area would be moderate.

Conclusion

Alternative 1 would result in continued deterioration, or moderate, long-term adverse effects to trail conditions within the analysis area. The changes to existing trail conditions would occur in response to expected increases in ORV use. Trail segments that are currently classified in degraded condition could experience expanded trail braiding, for example, and some segments currently classified as in fair condition might become degraded. The overall condition class of the trail system and individual trails would likely change incrementally. Trails that currently are dominated by degraded conditions (such as the Suslota, Tanada Lake, and Copper Lake trails) would continue to meet the threshold criterion for long-term, major impacts; trails that are currently in good to fair condition due to favorable tread characteristics (Lost Creek and Trail Creek) would meet the threshold for the negligible criteria; and the balance (Soda Lake, Reeve Field, Boomerang, Caribou Creek, and the wilderness trail systems) would meet the threshold for the moderate criteria with some sections crossing the major threshold.

4.2.2.5 Alternative 2 Effects on Trail Condition

Direct and Indirect

Under Alternative 2, recreational ORV use would be permitted year-round on the nine trails throughout the analysis area. All trails in designated wilderness would remain closed to recreational ORV use. In addition, trails would remain open for ORV use for subsistence and to access private inholdings. Trail maintenance would continue at current levels and no trail improvements would occur under this alternative. Therefore, any incremental impacts to trail conditions associated with ORV management would occur as a result of changes in ORV use levels and/or in the distribution of that use.

It is assumed that ORV use would grow from 917 to 1,171 round trips per year over the next 20 years under Alternative 2, an overall increase of 28 percent over the current use level (Table 4-1). Subsistence ORV use would increase slightly (by 41 round trips, or 9 percent) and recreational ORV use would increase more rapidly (by 213 round trips, or 49 percent) under this alternative.

Because this alternative would not involve physical changes to the trail system itself, changes in the physical condition of the trails would occur in direct response to changes in use levels. An overall increase in ORV use by 28 percent over 20 years would result in a long-term, moderate to major deterioration in system-wide trail conditions. Trail segments considered to have degraded conditions would not be repaired or improved, and increased use would likely cause expanded trail braiding and incision. Because the assumptions about future use rates are applied system-wide for recreational and subsistence ORV use, there would not be major changes in ORV use on most trails and future physical conditions on most trails would be similar to the current classification results. Three trails, the Suslota, Copper Lake, and Tanada Lake trails, are expected to see a substantial increase in recreational ORV use. Because these three trails currently have no recreational use and already have degraded and extremely degraded sections, projected future use increases of over 100 percent for both trails would cause further damage to already degraded trail segments. This further damage would place these trails well into the major impact threshold. Because existing trail conditions are fair to good on Lost Creek and Trail Creek trails, impacts would likely remain within the threshold for the negligible criteria. Some sections of Soda Lake, Reeve Field, and Boomerang would likely cross the threshold between moderate and major criteria because of the extent of existing trail degradation and projected increasing ORV use levels.

Considering all of the above and weighing the extent of major impacts, it is expected that the net overall condition of the trail system would be within the major threshold at the end of the planning period.

Cumulative

The projected changes in ORV use levels under Alternative 2 are reflective of relatively long-term local and regional trends in population, land development, and wildlife management as they relate to future ORV use. Minimal changes are expected in conditions related to inholdings and development on non-NPS lands in the analysis area. While development of additional infrastructure along the Nabesna Road (such as plans for additional campsites) is assumed and these changes are likely to result in increased recreational use within the Nabesna Road corridor over time, these increases in use are not expected to result in additional changes in trail conditions. Other expected long-term aspects of trail conditions involve the 94 miles of other motorized trails discussed in Section 4.2.2.4, for which the condition level is considered to be at the minor threshold. Consequently, given the major direct and indirect long-term adverse impacts identified for Alternative 2, cumulative impacts to the trail system within the analysis area would be major.

Conclusion

Alternative 2 would result in the continued deterioration, or moderate to major, adverse effects, to trail conditions within the analysis area. These changes to existing trail conditions would occur in response to expected increases in ORV use. Trail segments that are currently classified in degraded condition would experience expanded degradation, and some segments currently classified as in fair condition would become degraded. The overall condition class of the trail system and individual trails would likely change incrementally. Because the Suslota, Copper Lake, and Tanada Lake trails are currently dominated by degraded conditions and total ORV use on these trails would more than double over the planning period, these trails would continue to meet the threshold criterion for long-term, major impacts; trails that are currently in good to fair condition due to favorable tread characteristics (Lost Creek and Trail Creek) would meet the threshold for the negligible criteria; and the balance (Soda Lake, Reeve Field, Boomerang, Caribou Creek, and the wilderness trail systems) would meet the threshold for the moderate criteria with some sections crossing the major threshold.

4.2.2.6 Alternative 3 Effects on Trail Condition

Direct and Indirect

Under Alternative 3, the NPS would attempt to address resource impacts primarily through trails administration, with relatively little investment in trail improvements. A monitoring and corrective management action process would be used to identify expanded degradation and implement use controls and other mitigation actions. This system would provide a more consistent method of management than that expected under the emergency closures described for Alternatives 1 and 2. Trail maintenance would continue at current levels. Approximately 2.5 miles of re-routed motorized trail would be constructed, and four new non-motorized trails or routes would be considered. Under this alternative, recreational ORV use would not be permitted on any of the trails in the analysis area, and all nine trails would be open to subsistence ORV use year-round. The trails that currently receive ORV use to access private inholdings (Suslota, Soda Lake, Reeve Field, Copper Lake, and Tanada Lake) would continue to be open for this use. Beneficial changes to the physical conditions of the existing trails would occur in response to the re-route and improvement of a portion of the Soda Lake trail and in response to changes in ORV use levels.

It is assumed that over the next 20 years, subsistence ORV use would increase at a moderate rate, by 102 round trips or 21 percent, and recreational ORV use would decrease from 437 to 0 round trips under this alternative (Table 4-1). As a result, total ORV use at the end of the planning period is projected to be 582 round trips per year, an overall reduction of 37 percent from the current use level. Therefore, ORV use patterns under Alternative 3 would result in a substantial overall reduction in the frequency of ORV use within the analysis area.

This alternative provides for the stabilization and natural revegetation of impacts on approximately 1.7 miles of the Soda Lake trail now classified as degraded, very degraded, or severely degraded, as the existing trail segment would be closed following construction of the re-routed trail segment. This action represents the removal of 3 percent of the trail mileage currently classified as degraded within the trail system. The four new non-motorized trails or routes considered under this alternative would be created, and constructed trails would be maintained to a sustainable design standard. Non-motorized use of these trails is not expected to cause physical damage to the trails.

Elimination of recreational ORV use on the trail system is projected to result in a reduction in total ORV use of 39 percent compared to current use, and use levels on some trails would decrease by up to 70 percent. With the closure of the existing trail system to recreational ORV use, it is expected that, at a minimum, the past rate of deterioration in the physical conditions of the trails would decrease, resulting in short-term and long-term beneficial effects. Ideally, the overall reduction in the level of ORV use would cause a corresponding decrease in the level of resource damage and some level of slow recovery on degraded trail segments. If this occurred the overall condition class of the trail system would remain as indicated in Table 3-2 or might improve slightly. It is possible, however, that continued deterioration in trail conditions within the analysis area would occur even with the reduced level of ORV use. Trail segments that are currently classified in degraded condition might experience expanded trail braiding, for example, and some segments currently classified as in fair condition might become degraded. With similar or decreased levels of ORV use compared to current conditions, trails currently dominated by degraded conditions (such as the Suslota, Tanada Lake, and Copper Lake trails) likely would meet the threshold criterion for long-term, minor to moderate impacts; trails that are currently in good to fair condition due to favorable tread characteristics (Lost Creek and Trail Creek) would meet the threshold for the negligible criteria; and the balance (Soda Lake, Reeve Field, Boomerang, Caribou Creek, and the wilderness trail systems) would meet the threshold for the minor criteria with some sections crossing the moderate threshold.

Considering all of the above, it is expected that the net overall condition of the trail system would be within the moderate threshold or better by the end of the planning period.

Cumulative

Potential sources of cumulative impacts are either already accounted for in the projected changes in ORV use levels (i.e., long-term local and regional trends in population, land development, and game management as they relate to future ORV use) or would not influence ORV use in the analysis area (such as conditions related to inholdings and development on non-NPS lands in the analysis area, and recreational development of along the Nabesna Road corridor). Other expected long-term aspects of trail conditions involve the 94 miles of other motorized trails discussed in Section 4.2.2.4, for which the condition level is considered to be at the minor threshold. In conjunction with the long-term, adverse, minor to moderate direct and indirect impacts identified for Alternative 3, cumulative impacts to trail conditions under this alternative would be minor to moderate.

Conclusion

Without trail improvement, ORV use levels similar to or less than current ORV use levels would result in minor to moderate impacts to trail conditions on Suslota, Tanada Lake, and Copper Lake trails, negligible impacts on Lost Creek and Trail Creek trails, and minor impacts on Reeve Field, Boomerang, Caribou Creek, and the wilderness trail systems, with some sections crossing the moderate threshold. The Soda Lake re-route would result in a good condition trail, thus providing a long-term benefit.

4.2.2.7 Alternative 4 Effects on Trail Condition

Under Alternative 4, the NPS would make substantial improvements to eight of the nine trails (all but the Suslota trail) to bring them to a design-sustainable or maintainable condition in order to provide reasonable access while protecting park resources. Prior to implementing the trail improvements, the NPS would permit recreational ORV use on trails currently in fair or good condition. Once improvements are in place, trail maintenance would increase to a level that would correct natural resource damage and keep trail conditions at the planned design standard. Following completion of the improvements, recreational ORV use would be permitted on trails in the National Preserve, but not in the National Park or on the Suslota trail. Trails would continue to be open to ORV use for subsistence purposes and for access to private inholdings. In addition to the actions to improve the motorized trails, this alternative includes consideration of six new non-motorized trails or routes.

The monitoring and management actions program outlined for Alternative 3 would also be applied for this alternative. Under this program of monitoring, the NPS would identify any additional degradation and control it through the implementation of use limitations and other mitigation actions.

Under this alternative it is assumed that over the next 20 years, subsistence ORV use would more than double, increasing from 480 to 1,100 round trips (a 129 percent increase), and recreational ORV use would increase by 54 percent, from 437 to 671 round trips per year (Table 4-1). As a result, total ORV use at the end of the planning period is projected to be 1,771 round trips per year, an overall increase of 93 percent from the current use level. Therefore, ORV use patterns under Alternative 4 would result in a substantial overall increase in the frequency of ORV use within the analysis area.

Direct and Indirect

Based on the composition of Alternative 4, changes in trail conditions could result both from physical actions to improve the trail system and from changes in use levels. The trail improvements and increased maintenance included in this alternative would decrease resource impacts on 47.2 miles of trail currently classified as degraded, very degraded, or severely degraded (Table 3-2), representing approximately 87 percent of the trail segments currently in those conditions. Approximately 57.5 miles of trail would be improved, resulting in most trails (almost 89 total miles of trail) being in at least a maintainable category. The only trail not benefiting from at least modest improvements would be the Suslota trail, leaving some segments along this trail in extremely degraded condition. As indicated above, ORV use on the Suslota trail would be allowed only for subsistence use and for access to private lands outside of the park.

The projected increase in overall ORV use of 93 percent for this alternative would normally be expected to result in some degree of continued deterioration of trail conditions through expanded trail braiding and incision. Under Alternative 4, however, all of the trails except the Suslota trail would be modified to bring them to at least a maintainable condition and would be maintained in that condition. Based on the constructed improvements, enhanced maintenance, monitoring and management action

program, and closure of most of the degraded trail segments, the modified trail system would be improved to a level that could accommodate the increased level of use without physical deterioration of the trails. Consequently, the overall physical condition of the trail system is expected to improve markedly during the planning period, resulting in short-term and long-term beneficial effects. The seven new non-motorized trails and routes considered under this alternative also would be created, and constructed trails would be maintained to a suitable design standard. Non-motorized use of these trails is not expected to cause physical degradation of the trail tread or impact to other resources.

Because trail improvements and increased maintenance would improve degraded trail conditions and all but the Suslota trail would be brought to at least a maintainable condition, the net overall condition of the trail system would be within the minor threshold by the end of the planning period.

Cumulative

Potential sources of cumulative impacts are either already accounted for in the projected changes in ORV use levels (i.e., long-term local and regional trends in population, land development and game management as they relate to future ORV use) or would not influence ORV use in the analysis area (such as conditions related to inholdings and development on non-NPS lands in the analysis area, and recreational development of along the Nabesna Road corridor). Other expected long-term aspects of trail conditions involve the 94 miles of other motorized trails discussed in Section 4.2.2.4, for which the condition level is considered to be at the minor threshold. In conjunction with the minor long-term, adverse direct and indirect impacts identified for Alternative 4, cumulative impacts to trail conditions under this alternative would be minor.

Conclusion

This alternative allows both recreational and subsistence ORV use on most trails while addressing the past resource damage from deteriorated trail conditions. The trail improvements would address the deterioration in trail conditions within the analysis area, improving conditions on most trails to a maintainable level while accommodating increased future use. Trail segments along the Suslota trail currently classified as degraded would likely remain in that condition, even though recreational ORV use would no longer be permitted on this trail. The overall condition class for the trail system and the other individual trails would likely improve substantially relative to current conditions, resulting in potential short-term and long-term beneficial impacts, meeting the threshold criterion of minor adverse impacts to trail conditions.

4.2.2.8 Alternative 5 Effects on Trail Condition

Under Alternative 5, the NPS would improve most degraded segments of the nine trails to a design-sustainable or maintainable condition in order to provide reasonable access while protecting park resources. On unimproved trails or trail segments, monitoring and management actions would be applied to ensure that resource impacts do not expand, that unimproved trail segments improve in condition over time, and that unmanaged proliferation of trails is minimized. Once the trail improvements are in place, trail maintenance would increase to a level that would correct natural resource damage and keep trail conditions at the planned design standard. Following completion of the improvements, this alternative would permit recreational ORV use on both National Park and Preserve trails. Trails would continue to be open to ORV use for subsistence purposes and for access to private inholdings. In addition to the actions to improve the motorized trails, this alternative includes consideration of eight new non-motorized trails and routes.

Under this alternative it is assumed that over the next 20 years, subsistence ORV use would increase moderately, from 480 to 642 round trips (a 34 percent increase), and recreational ORV use would more than double, increasing from 437 to 1,037 round trips per year (Table 4-1). As a result, total ORV use at the end of the planning period is projected to be 1,679 round trips per year, an overall increase of 83 percent from the current use level. Therefore, ORV use patterns under Alternative 5 would result in a substantial overall increase in the frequency of ORV use within the analysis area.

Direct and Indirect

Based on the composition of Alternative 5, changes in trail conditions could result from both physical actions to improve the trail system from changes in use levels, and from a monitoring and management action program. Approximately 58.5 miles of trail would be improved, resulting in all trails open to recreational ORV use being in at least a maintainable condition. The trail improvements and increased maintenance would result in a decrease in resource impacts of almost 48.2 miles of trail currently classified as degraded, very degraded, or severely degraded, representing 88 percent of the trail segments currently in those conditions.

The projected increase in overall ORV use of 83 percent for this alternative would normally be expected to result in some degree of continued deterioration of trail conditions through expanded trail braiding and incision. Under Alternative 5, however, most of the trails would be modified to bring them to at least a maintainable condition and would be maintained in that condition. Based on the constructed improvements, enhanced maintenance and closure of degraded trail segments, the modified trail system would be improved to a level that could accommodate the increased level of use without physical deterioration of the trails. Consequently, the overall physical condition of the existing trail system is expected to improve markedly during the planning period, resulting in short-term and long-term beneficial impacts. Eight new non-motorized trails and routes would be created, and the trails would be constructed to a sustainable design standard. Non-motorized use of these trails is not expected to cause physical degradation of the trail tread or impact to other resources.

Because trail improvements and increased maintenance would improve degraded trail conditions and all but the Suslota trail would be brought to at least a maintainable condition, the net overall condition of the trail system would be within the minor or better threshold by the end of the planning period.

Cumulative

Potential sources of cumulative impacts are either already accounted for in the projected changes in ORV use levels (i.e., long-term local and regional trends in population, land development, and game management as they relate to future ORV use) or would not influence ORV use in the analysis area (such as conditions related to inholdings and development on non-NPS lands in the analysis area, and recreational development of along the Nabesna Road corridor). Other expected long-term aspects of trail conditions involve the 94 miles of other motorized trails discussed in Section 4.2.2.4, for which the condition level is considered to be at the minor threshold. In conjunction with the minor, long-term, adverse direct and indirect impacts identified for Alternative 5, cumulative impacts to trail conditions under this alternative would be minor.

Conclusion

Trail improvements would address the deterioration in trail conditions within the analysis area, improving conditions on the trails to a maintainable level while accommodating increased future use. This would be subject to monitoring to ensure future performance. The overall condition class for the trail system and for individual trails would improve substantially relative to current conditions,

resulting in short-term and long-term beneficial effects, meeting the threshold criterion of minor adverse impacts to trail conditions.

4.3 Biological Environment

4.3.1 Wetlands

4.3.1.1 Methodology

This section describes the direct, indirect, and cumulative impacts to wetlands that would likely occur as a result of the proposed alternatives.

The effects analysis is based on published literature and existing impacts that have occurred within the Wrangell-St. Elias National Park and Preserve. These studies describe the wetland types found within the analysis area, current level of ORV disturbance to these wetlands, and the function and values that these wetlands could serve. The quantification of the estimated miles and acres of impacts to wetlands that would occur as a result of ORV use under each alternative, summarized in Table 4-9, is based on overlays of GIS and other mapping data, including the NWI database and vegetation/wetlands mapping data collected from the park by St. Mary's University (SMU 2008).

4.3.1.2 Impact Threshold Criteria

To determine the significance of effects on wetlands the impacts are compared against the following threshold criteria:

Negligible: Some limited, discontinuous impacts to wetland vegetation would be evident. Some vegetation crushing and stripping and surface compaction could occur but there would be no physiographic alterations, soil horizon mixing, or hydrologic modifications. Impacts would not affect wetland function.

Minor: Continuous linear impacts to wetland vegetation, physiography, or soils would be clearly evident. Vegetation cover would be altered, persistent tracks formed and some soil shearing, abrasion, and compaction may occur on short segments of the trails. Impacts would not affect over all wetland function.

Moderate: Continuous linear impacts to wetland vegetation, physiography, or soils would begin to affect wetland function. Vegetation impacts result in bare ground over most of the trail tread. Soil impacts include shearing, abrasion, and compaction. Soil removal, displacement, and horizon mixing would occur on some segments of the trail, resulting in increased depth of thaw, subsidence, and mud/muck-holes. Wheel rut formation leads to alteration of local, and in some instances extensive, drainage patterns. This could include drainage of adjacent wetlands areas, interception of sheet flow, and ponding and water flow along wheel tracks.

Major: Extensive impacts to wetland vegetation, physiography, or soils would affect wetland function. Vegetation and/or organic mat would be stripped from most of the trail tread. This would result in soil shearing, abrasion, compaction, removal, displacement, and horizon mixing. Increased depth of thaw could result in subsidence, ponding, and mud/muck-holes over large segments of the trail. These impacts would be long term. Wetland function would be compromised over a large area and impacts would extend beyond the limits of initial disturbance.

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Table 4-9. Estimated Impacts to Wetlands from ORV Use of the Nine Trails Analyzed (by Alternative)

Alternative	Wetland Type	Black Mountain Trails		Boomerang Trail		Caribou Creek Trail		Copper Lake Trail		Lost Creek Trail		Reeve Field Trail		Soda Lake Trail		Suslota Trail		Tanada Lake Trail		Trail Creek Trail		Total Impacts	
		Miles Crossed	Acres Impacted	Miles Crossed	Acres Impacted	Miles Crossed	Acres Impacted	Miles Crossed	Acres Impacted	Miles Crossed	Acres Impacted	Miles Crossed	Acres Impacted	Miles Crossed	Acres Impacted	Miles Crossed	Acres Impacted	Miles Crossed	Acres Impacted	Miles Crossed	Acres Impacted	Miles Crossed	Acres Impacted
Alternative 1	Palustrine Emergent	0.6	0.5	0.6	0.5	0.2	0.2	10.1	28.9	0.0	0.0	1.6	25.8	0.9	3.4	0.0	0.0	7.0	118.3	0.0	0.0	21.0	177.6
	Palustrine Scrub-Shrub	7.7	8.3	7.7	8.3	0.0	0.0	6.8	74.5	0.0	0.0	0.0	0.0	0.0	0.0	5.8	169.5	0.3	1.7	0.0	0.0	20.7	253.9
	Palustrine Forested	0.3	0.2	0.3	0.2	0.1	0.1	0.5	0.4	0.0	0.0	0.6	0.7	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.0	1.4	1.4
	Unconsolidated Bottom (pond)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Riverine	0.5	0.4	0.5	0.4	0.0	0.0	0.2	0.1	5.0	4.0	0.1	0.1	2.3	1.8	0.0	0.0	0.1	0.1	3.6	2.7	12.7	9.9
	Total	9.1	9.4	9.1	9.4	0.3	0.2	17.5	103.9	5.0	4.0	2.4	26.5	3.2	5.2	5.8	169.6	7.5	120.2	3.6	2.7	55.7	442.9
Alternative 2	Palustrine Emergent	0.6	0.5	0.6	0.5	0.2	0.2	10.1	28.9	0.0	0.0	1.6	25.8	0.9	3.4	0.0	0.0	7.0	118.3	0.0	0.0	21.0	177.6
	Palustrine Scrub-Shrub	7.7	8.3	7.7	8.3	0.0	0.0	6.8	74.5	0.0	0.0	0.0	0.0	0.0	0.0	5.8	169.5	0.3	1.7	0.0	0.0	20.7	253.9
	Palustrine Forested	0.3	0.2	0.3	0.2	0.1	0.1	0.5	0.4	0.0	0.0	0.6	0.7	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.0	1.4	1.4
	Unconsolidated Bottom (pond)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Riverine	0.5	0.4	0.5	0.4	0.0	0.0	0.2	0.1	5.0	4.0	0.1	0.1	2.3	1.8	0.0	0.0	0.1	0.1	3.6	2.7	12.7	9.9
	Total	9.1	9.4	9.1	9.4	0.3	0.2	17.5	103.9	5.0	4.0	2.4	26.5	3.2	5.2	5.8	169.6	7.5	120.2	3.6	2.7	55.7	442.9
Alternative 3	Palustrine Emergent	0.6	0.5	0.6	0.5	0.2	0.2	10.1	28.9	0.0	0.0	1.6	25.8	0.9	3.5	0.0	0.0	7.0	118.3	0.0	0.0	21.0	177.7
	Palustrine Scrub-Shrub	7.7	8.3	7.7	8.3	0.0	0.0	6.8	74.5	0.0	0.0	0.0	0.0	0.0	0.0	5.8	169.5	0.3	1.7	0.0	0.0	20.7	253.9
	Palustrine Forested	0.3	0.2	0.3	0.2	0.1	0.1	0.5	0.4	0.0	0.0	0.6	0.7	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.0	1.4	1.4
	Unconsolidated Bottom (pond)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Riverine	0.5	0.4	0.5	0.4	0.0	0.0	0.2	0.1	5.0	4.0	0.1	0.1	2.4	1.8	0.0	0.0	0.1	0.1	3.6	2.7	12.7	9.9
	Total	9.1	9.4	9.1	9.4	0.3	0.2	17.5	103.9	5.0	4.0	2.4	26.5	3.3	5.3	5.8	169.6	7.5	120.2	3.6	2.7	55.8	443.0
Alternative 4	Palustrine Emergent	0.6	0.5	0.6	0.5	0.2	0.2	10.3	7.5	0.0	0.0	0.2	0.2	0.1	0.0	0.0	0.0	1.4	1.2	0.0	0.0	13.4	10.1
	Palustrine Scrub-Shrub	7.7	8.3	7.7	8.3	0.0	0.0	4.2	3.0	0.0	0.0	0.0	0.0	0.0	0.0	5.8	169.5	0.1	0.1	0.0	0.0	17.8	180.9
	Palustrine Forested	0.3	0.2	0.3	0.2	0.1	0.1	0.5	0.4	0.0	0.0	0.4	0.4	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	1.2	1.2
	Unconsolidated Bottom (pond)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
	Riverine	0.5	0.4	0.5	0.4	0.0	0.0	0.1	0.1	5.0	4.0	0.1	0.1	2.3	1.6	0.0	0.0	0.2	0.1	3.6	2.7	12.7	9.8
	Total	9.1	9.4	9.1	9.4	0.3	0.2	15.1	11.0	5.0	4.0	0.7	0.7	2.4	1.7	5.8	169.6	1.8	1.4	3.6	2.7	45.1	201.9
Alternative 5	Palustrine Emergent	0.6	0.5	0.6	0.5	0.2	0.2	10.3	7.5	0.0	0.0	0.2	0.2	0.1	0.0	0.0	0.0	6.7	4.0	0.0	0.0	18.6	12.9
	Palustrine Scrub-Shrub	7.7	8.3	7.7	8.3	0.0	0.0	4.2	3.0	0.0	0.0	0.0	0.0	0.0	0.0	5.7	158.5	0.5	0.3	0.0	0.0	18.1	181.1
	Palustrine Forested	0.3	0.2	0.3	0.2	0.1	0.1	0.5	0.4	0.0	0.0	0.4	0.4	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	1.2	1.2
	Unconsolidated Bottom (pond)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Riverine	0.5	0.4	0.5	0.4	0.0	0.0	0.1	0.1	5.0	4.0	0.1	0.1	2.3	1.6	0.0	0.0	0.5	0.4	3.6	2.7	13.1	10.0
	Total	9.1	9.4	9.1	9.4	0.3	0.2	15.1	11.0	5.0	4.0	0.7	0.7	2.4	1.7	5.7	158.6	7.8	4.8	3.6	2.7	51.1	205.3

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4.3.1.3 Assumptions

No wetlands restoration other than stabilization and natural revegetation is assumed when degraded trails are closed or one alignment is hardened. Natural recovery is assumed to occur as described in Happe et al. 1998. In particular, graminoid cover (particularly *Carex* and *Eriophorum vaginatum*) increases, dwarf shrub species show little to no increase, little to no recovery is observable for soil subsidence and depth of permafrost thaw, and ponding associated with subsidence continues. Impacted sites typically stabilize on flat-lying terrain when disturbance ends. On sloped terrain or where a connection to a water course occurs on flat ground, any flow of water through the disturbance site can delay stabilization indefinitely.

Aside from the Nabesna Road and associated private land development, ORV trails are the only source of non-natural wetland disturbance within the analysis area.

ORV impacts would be comparable to existing conditions or rates of degradation along any portions of trails that would not receive trail improvements.

Re-routed motorized trails would be sited in such a way, and would be constructed using methods (including trail hardening), that would prevent trail braiding as a result of ORV use. The intent of these trail re-routes/improvements is to create a stable single-tread motorized trail; therefore, ORV impacts were calculated assuming a 6-foot tread (and therefore a 6-foot disturbance width) for all re-routed or reconstructed trails.

The majority of beneficial wetland stabilization and natural revegetation would occur from the abandonment of ORV trails that cross extensive wetlands by constructing upland trail re-routes.

4.3.1.4 Alternative 1 Effects on Wetlands

Direct and Indirect

Under Alternative 1 (No Action), the use of the trails considered within the analysis area would result in both direct and indirect effects to wetlands. Direct effects of ORV use on wetlands include loss of wetland vegetation and potential alterations to wetland functions. Indirect effects would include localized increased sediment loads to aquatic wetlands, reduced plant growth or vigor, altered biodiversity and community composition, reduction in vegetative cover, and the potential for increased invasion by exotic species.

Alternative 1 does not include any major reconstruction or re-routing of trails, and no trail hardening would be performed. Therefore, construction activities would not be a source of impacts to wetlands under this alternative.

Table 4-9 compares the estimated miles and acreage of impacts that would occur to the various wetland types under each of the alternatives as a result of past, present, and projected future ORV use. Table 4-10 summarizes the impacts to wetlands that would occur on each trail under Alternative 1 and was used to reach the conclusions for direct and indirect impacts under this alternative. The values reported in these tables are based on the existing trail footprint, including historic trail impacts, and the “greater than” symbols are added where impacts to wetlands are expected to expand.

Table 4-10. Summary of Impacts to Wetlands on Nine ORV Trails and Black Mountain Trails under Alternative 1

Trail	Projected ORV Use (round trips per year)		Action	Wetland Acres Impacted ¹
	Recreational	Subsistence		
Black Mountain	Closed	65	No improvements	>1.2
Boomerang	7	6	No improvements	9.4
Caribou Creek	121	40	No improvements	0.2
Copper Lake	30	125	No improvements	>103.9
Lost Creek	153	50	No improvements	4.0
Reeve Field	35	24	No improvements	>26.5
Soda Lake	82	35	No improvements	>5.2
Suslota	Closed	70	No improvements	>169.6
Tanada Lake	Closed	75	No improvements	>120.2
Trail Creek	162	45	No improvements	2.7

¹ Impacted acres based on wetland types overlaid with trail areas mapped by SMU (2008). These areas are expected to expand with increasing ORV use under Alternative 1 (590 recreational and 582 subsistence ORV round trips compared to 437 and 480, respectively, under current conditions), except on Trail Creek and Lost Creek trails, which cross mostly riverine wetlands.

Multiple factors (beyond just the spatial extent of direct impacts) can influence the degree that ORV use will affect wetlands. These factors include the level of ORV use within the wetland, the type of wetland impacted, the season in which the impacts occurred, which wetland functions are impacted, and the possibility of invasion by exotic plant species. The impacts that could result from the invasion by exotic plant species are discussed in detail within Section 4.3.2, the remaining factors are discussed in more detail below.

The level of trail use by ORVs would affect the degree of impact that could occur to the wetland communities found along the trails. A single pass by an ORV within wetlands can result in a permanent impact to the wetland's vegetation and soil (Ahlstrand and Racine 1990; Loomis and Liebermann 2006). Trails through emergent and low shrub wetlands are typically highly visible, as rutted tracks made by ORVs soon fill in with water, resulting in permanent standing water along the trails. In addition, as the number of passes by ORVs increases, the probability that large muck-holes would be created along these trails also increases. As discussed in Section 3.4.1.2, these muck-holes can become impassable by ORVs. Drivers often move onto adjacent lands in order to bypass these muck-holes, resulting in the expansion of trail widths (trail braiding). As the number of passes by an ORV increase, the likelihood of trail braiding increases, the vegetative cover and biodiversity decreases, and the vegetative structure is simplified. The cover, biodiversity, and structure of vegetative communities are not affected further once the number of passes exceeds 100 (Happe et al. 1998).

As shown in Table 4-1, ORV use is expected to increase under Alternative 1 by 28 percent compared to current conditions. Table 4-1 shows that at least five of the trails (Soda Lake, Caribou Creek, Copper Lake, Lost Creek, and Trail Creek) would likely have more than 100 ORV round trips (or 200 passes) each year. However, Lost Creek and Trail Creek trails occur on gravel floodplains outside of the shrub-tussock community analyzed by Ahlstrand and Racine (1990). As indicated in Table 4-10, few wetlands exist along these trails. All of the remaining analysis area trails except Boomerang are likely to have more than 100 passes per year (with Boomerang trail having 26 passes per year). The number of passes that would likely occur through wetlands encountered on the analyzed trails would result in both permanent impacts to wetland vegetation and an expansion of trail widths over time. Trail hardening has been shown to reduce trail widening and braiding by limiting the impact to soils

and preventing the creation of large muck-holes (Allen et al. 2000); however, no trail hardening has been proposed under Alternative 1. In addition, no mitigations for trail impacts would occur under this alternative.

Most wetland types are highly sensitive to disturbances from ORV use, and even limited ORV use in most wetland types can result in substantial and permanent impacts to wetlands (Ahlstrand and Racine 1990). ORV use in emergent or pond wetlands would result in direct mortality of plants due to crushing, burial, or grubbing. ORV use could also impact root systems of tree and shrub species within shrub and forested wetlands, resulting in reduced growth rates and/or eventual mortality. Emergent, pond, and scrub-shrub wetlands are highly susceptible to trail braiding; while forested wetlands are somewhat less susceptible as the trees can maintain the trail widths and prevent riders from leaving the trail. Soil subsidence, resulting from soil disturbance and loss of organic matting, can create soil conditions that further reduce wetland vegetation growth and/or survival. Even after trails are abandoned, soils (particularly in wetlands) can continue to subside (see Section 4.2.1). Studies conducted within the park have found that in wetlands containing fine-grained soils, subsidence can continue for at least 2 years after ORV passage (Ahlstrand and Racine 1990). However, impacts from ORV use in riverine wetlands would likely be limited as much of this habitat consists of unvegetated cobbly soils, which are capable of supporting ORV use and are not as susceptible to subsidence as the fine-grained organic soils found in other wetland types (see Section 4.2.1). As shown in Table 4-9, emergent wetlands are common along Black Mountain, Boomerang, Copper Lake, Reeve Field, Soda Lake, and Tanada Lake trails; shrub and forested wetlands are common along Boomerang, Copper Lake, Reeve Field, and Suslota trails; and riverine wetlands are common along Black Mountain and Soda Lake. The few acres of wetlands that exist along Lost Creek and Trail Creek trails also are riverine wetlands.

Wetland communities are more susceptible to ORV use during spring and summer months, due to the effects of warmer temperatures and increased precipitation on the soils' ability to support ORVs (Loomis and Liebermann 2006). The majority of wetland impacts have occurred along Suslota trail, Tanada Lake trail, and the portion of the Copper Lake trail located south of the Boomerang trail junction, due to the abundance of emergent and scrub-shrub wetlands along these trails (Table 4-9). Under Alternative 1, these three trail segments would be seasonally closed to recreational users, resulting in approximately 30 percent of the total miles crossed by trails being closed to recreational ORV use during warmer months. However, these trails would still be open to subsistence users year-round. These seasonal closures for recreational users would likely reduce the extent of trail braiding that would occur if these seasonal closures were not implemented; however, as subsistence users still would have access to these trails year-round, some trail braiding during warmer months is likely to continue. In addition, both subsistence and recreational ORV use would be allowed year-round along the remaining trails, which could result in adverse impacts along wetland portions of the Soda Lake and Reeve Field trails because trail braiding into wetland areas would continue.

As no major improvements to trails are proposed under Alternative 1, the impacts to wetland functions under this alternative would likely continue to occur as described for the existing wetland conditions in Section 3.4.1.2. Impacts to wetlands located on slopes would continue to reduce these wetlands' ability to control erosion and stabilize sediments. This would continue to result in increased sediment loads to adjacent waterbodies (see Section 3.4.3). Trails located within wetlands would continue to degrade the quality of wildlife habitat that may be provided by those wetlands (see Sections 3.4.3 and 3.4.4).

Although wetlands are highly susceptible to ORV impacts, they typically have a high rate of recovery compared to the other vegetative communities found within the analysis area (see Section 4.3.2). However, previously impacted areas that have been closed to ORV use do not experience a complete

recovery to pre-disturbance conditions. The microtopography, soil conditions, hydrological pathways, and species compositions in “recovering” wetlands differ from adjacent undisturbed areas (Happe et al. 1998). Therefore, recovery should be considered as a functional recovery of the wetland system, but not a full recovery of the original wetland habitat. This means that wetland impacts would be considered permanent in regards to wetland habitat, while impacts to wetland function would be considered temporary for those wetlands that are allowed to recover.

Little to no wetland recovery would occur under Alternative 1 because no re-routes, reconstruction, or trail hardening would be conducted. Only existing trail closures (for recreational ORV use) would remain in place, which would not allow enough time for wetlands to recover. Trail widening/braiding would likely continue to occur at areas outside of the seasonally closed trails, or within seasonally closed areas as a result of subsistence ORV use. These conditions would result in moderate, long-term, adverse direct and indirect impacts to wetland resources in the analysis area under Alternative 1. Moderate, long-term, adverse impacts would occur along Soda Lake trail because of the considerable number of ORV round trips expected on these trails and the lack of trail improvements. Moderate impacts also would occur along Suslota, Tanada Lake, and Copper Lake trails because of the prevalence of emergent and scrub-shrub wetlands, the lack of trail improvements, and the expanding trail braiding from subsistence use during spring and summer months. Moderate impacts to wetlands would occur along Black Mountain and Reeve Field trails because of the existing and expected trail braiding within emergent wetlands along these trails and the lack of trail improvements. Impacts would be minor on Boomerang trail because total ORV use is low, minor on Caribou Creek because of the lack of wetland areas, and negligible on Lost Creek and Trail Creek trails because these two trails consists predominantly of riverine wetland types, which are able to support ORV use and are not expected to be substantially impacted. Because of the extent of trails with moderate impacts, the overall impact to wetlands from Alternative 1 would be moderate.

Cumulative

This cumulative effects analysis assesses the impacts of past, present, and reasonable foreseeable future actions within the analysis area. Past and present actions consist of the construction and use of the ORV trail network; the Nabesna Road; scattered private inholdings; the Nabesna Mine; and park developments such as ranger station, a public-use cabin, picnic areas, private landing strips, and a few lodges/bed-and-breakfasts. These past and present actions have shaped the current conditions within the analysis area (see Chapter 3).

As discussed in Section 3.3.2.1, there are approximately 94 miles of other motorized trails in the analysis area (in addition to the nine trails assessed within this EIS). Wetlands have not been mapped along these specific trail corridors; however, based on trail location and inventory information (Connery 1987) and NWI wetlands mapping for the area, it is estimated that approximately 20 percent of these trails occur in wetlands. This Inventory and Assessment (Connery 1987) described portions of the trails with wetland impacts, including mud/muck-holes and subsidence. Because of very light use on most of these other trails, these sections are contained and not expanding. The 1986 inventory notes that “depth changes are visible, but haven’t reduced the opportunity for revegetation of similar species from the unaffected areas bordering the trails or for water-tolerant species to revegetate areas where subsidence and ponding have occurred” (Connery 1987). However, the Batzulnetas trail receives consistently heavy use (greater than 200 passes per year) and has segments with moderate wetland impacts. Overall, because degraded areas are localized and contained, the cumulative impacts on wetlands associated with these additional trails would be minor.

The Wrangell-St. Elias National Park and Preserve is considering options for the clean-up of mine tailings at the Nabesna Mine. The current options considered for clean-up include capping materials

on site, or hauling tailings out of the area via the Nabesna Road. If mine tailings are hauled out of the area via the Nabesna Road, then some fugitive dust would likely be generated by these transport trucks and could be deposited along the road. Adverse effects of fugitive dust deposits on wetland vegetation include a reduction in photosynthetic capacity and, in extreme cases, the complete burial of plants. These effects can lead to changes in species composition in the areas most heavily affected. In addition, if the trucks were uncovered and tailings were to be included as a component of the fugitive dust, the dust could contain high levels of heavy metals, which have been shown to impact vegetation. These impacts include the alteration of soil and water pH, desiccation of plant materials, and the toxic effects of elevated metal levels within intercellular plant structures (Foy 1978, Auerbach 1997). These impacts would be minor because they would be limited to small wetland areas along the Nabesna Road and any trailheads that are located along this road. Assuming a 5-foot area along each side of the 42-mile length of the Nabesna Road, the total area that could be impacted would be approximately 50 acres, and much of that area is outside of mapped wetlands (see Figure 3-10). ORVs traveling from the Nabesna Road down the trails could transport some of this fugitive dust along the trail networks (via their wheels); however, the amount of fugitive mine dust transported via ORV down these trails would likely be limited and lessen with distance from the fugitive dust source.

Global climate change could result in additional impacts to wetland habitats. Global climate change could alter the conditions found in southeastern Alaska in such a way as to increase the potential for invasion by exotic weed species, by increasing the average annual temperatures and length of the growing season found within this region. This topic is addressed in detail within Section 4.3.2. Although global climate change is expected to increase the rates of precipitation within Alaska, the increase in temperatures could result in an elevated rate of evaporation, which could result in an increased loss of wetlands and waterbodies within Alaska (Karl et al. 2009). This loss could result in an increased impact to wetland habitats within the Wrangell-St. Elias National Park and Preserve, through loss of wetland habitat and alterations to the water regimes. Because of the gradual nature of any changes, over the 20-year planning period, impacts to wetlands from climate change are expected to be minor.

The combined effect of these other foreseeable future actions would be minor; however, in combination with the moderate, long-term, adverse direct and indirect impacts to wetlands under Alternative 1, cumulative impacts would result in net long-term, moderate, adverse cumulative impacts to wetlands in the analysis area.

Conclusion

Continued subsistence ORV use without trail improvements would allow trails to continue moving into previously undisturbed areas, altering the function and characteristics of wetland communities along the Copper Lake, Tanada Lake, and Suslota trails. Continued recreational and subsistence ORV use on the other unimproved trails and continued subsistence ORV use on the Black Mountain trails would result in moderate to negligible impacts to wetlands because these trails pass through fewer wetlands (i.e., fewer than 30 acres of wetlands would be impacted on these trails). This alternative would have moderate direct, indirect, and cumulative effects on wetlands.

The moderate impacts to wetlands anticipated from this alternative would not result in an impairment of park resources that fulfill specific purposes identified in the establishing legislation or that are essential to the integrity of the park.

4.3.1.5 Alternative 2 Effects on Wetlands

Direct and Indirect

Under Alternative 2, the use of the trails considered within the analysis area would result in both direct and indirect effects to wetlands. Direct effects of ORV use on wetlands include loss of wetland vegetation and potential alterations to wetland functions. Indirect effects would include localized increased sediment loads to aquatic wetlands, reduced plant growth or vigor, altered biodiversity and community composition, reduction in vegetative cover, and the potential for increased invasion by exotic species. Alternative 2 would not include reconstruction or re-routing of trails, nor would any trail hardening be performed. Therefore, construction activities would not be a source of impacts to wetlands under this alternative.

Table 4-9 compares the estimated miles and acreage of impacts that would occur to the various wetland types under each of the alternatives, as a result of past, present, and projected future ORV use. Table 4-11 summarizes the impacts to wetlands that would occur on each trail under Alternative 2 and was used to reach the conclusions for direct and indirect impacts under this alternative. The values reported in these tables are based on the existing trail footprint, including historic trail impacts, and the “greater than” symbols are added where impacts to wetlands are expected to expand.

Table 4-11. Summary of Impacts to Wetlands on Nine ORV Trails and Black Mountain Trails under Alternative 2

Trail	Projected ORV Use (round trips per year)		Action	Wetland Acres Impacted ¹
	Recreational	Subsistence		
Black Mountain	Closed	55	No improvements	>1.2
Boomerang	4	4	No improvements	9.4
Caribou Creek	92	40	No improvements	0.2
Copper Lake	35	110	No improvements	>103.9
Lost Creek	121	47	No improvements	4.0
Reeve Field	21	24	No improvements	>26.5
Soda Lake	49	20	No improvements	5.2
Suslota	85	62	No improvements	>169.6
Tanada Lake	105	73	No improvements	>120.2
Trail Creek	138	41	No improvements	2.7

¹ Impacted acres based on wetland types overlaid with trail areas mapped by SMU (2008). These areas are expected to expand with increasing ORV use under Alternative 2 (650 recreational and 521 subsistence ORV round trips compared to 437 and 480, respectively, under current conditions), except on Trail Creek and Lost Creek trails, which cross mostly riverine wetlands.

As shown in Table 4-1, ORV use is expected to increase by 28 percent under Alternative 2 compared to current conditions. Table 4-1 shows that six trails (Caribou Creek, Copper Lake, Lost Creek, Suslota, Tanada Lake, and Trail Creek) would have more than 100 ORV round trips (or 200 passes) each year. However, Lost Creek and Trail Creek trails occur on gravel floodplains outside of the shrub-tussock community analyzed by Ahlstrand and Racine (1990). Few wetlands exist along these trails. All but Boomerang and Reeve trails are likely to have more than 100 ORV passes per year. As the number of ORV passes increases, the likelihood of trail braiding increases, the vegetative cover and biodiversity decreases, and the vegetative structure is simplified. The cover, biodiversity, and structure of vegetative communities are not affected further once the number of passes exceeds 100 (Happe et al. 1998). Emergent, pond, and scrub-shrub wetlands are highly sensitive to ORV use. These are common along Black Mountain, Boomerang, Copper Lake, Reeve Field, Soda Lake, and Tanada Lake trails (Table 4-9). Forested wetlands are less sensitive to ORV use due to the reduced rate of trail braiding. Shrub and forested wetlands are common along Boomerang, Copper Lake,

Reeve Field, and Suslota trails. Riverine wetlands typically are able to support ORV use because they lack vegetation and have cobbly soils that are not susceptible to subsidence. These are common along Black Mountain and Soda Lake. The few acres of wetlands that exist along Lost Creek and Trail Creek trails also are riverine wetlands.

Little to no wetland recovery would occur under Alternative 2, as no re-routes, reconstruction, or trail hardening would be conducted. With no trail improvements, impacts to wetland functions would continue to occur as described for the existing wetland conditions in Section 3.4.1.2. Impacts to wetlands located on slopes would continue to reduce these wetlands' ability to control erosion and stabilize sediments, resulting in increased sediment loads to adjacent waterbodies (see Section 3.4.3). Trails located within wetlands would continue to degrade the quality of wildlife habitat that may be provided by those wetlands (see Sections 3.4.3 and 3.4.4). Because of ORV use levels, trail widening/braiding would likely continue along all trails except for Lost Creek and Trail Creek. Impacts would be negligible on Lost Creek and Trail Creek trails because these trails predominantly consist of riverine wetland types, which are able to support ORV use. Because of existing trail conditions, considerable projected level of ORV use, prevalence of emergent and scrub-shrub wetlands, and the lack of trail improvements, adverse impacts to wetlands would be major and long-term on Copper Lake, Suslota, and Tanada Lake trails. Moderate, long-term, adverse impacts also would occur along Soda Lake trails as a result of the considerable projected level of ORV use and the lack of trail improvements. Because of the prevalence of emergent or scrub-shrub wetlands, continued ORV use, and the lack of trail improvements, impacts to wetlands would be moderate and long-term along Black Mountain and Reeve Field trails. Direct and indirect impacts would be minor on Boomerang trail because ORV use is low and on Caribou Creek trail because of the small extent of wetlands. Because of the extent of trails with major direct and indirect impacts, the impacts to wetlands would be major under Alternative 2.

Cumulative

The impacts of other nearby past, present, and foreseeable future actions on wetlands are described under Alternative 1 and would result in minor, long-term, adverse impacts on wetlands. The net effect of these impacts in combination with the direct and indirect impacts likely under Alternative 2 would be long-term, major, adverse cumulative impacts to wetlands.

Conclusion

There would be no construction impacts associated with Alternative 2, as no trail reconstruction, re-routing, or trail hardening would occur. The trails experiencing the greatest extent of trail braiding (Suslota, Tanada Lake, and Copper Lake trails) would be open to both recreational and subsistence ORV use during the months when trail braiding would be most likely to occur. The result would be an increase in the extent of trail braiding, which would impact new previously undisturbed areas. In addition, no recovery of impacted trails would occur under this alternative. Based on the likely continuation of trail braiding into previously undisturbed wetland communities (which would result in permanent impacts), and the lack of wetland recovery, Alternative 2 would result in major, long-term, adverse effects to wetland resources.

This alternative would result in major impacts to wetlands. These impacts are not considered an impairment of park resources and values for the following reasons:

- Major impacts to wetlands are projected to occur on 421 acres. This represents 0.19 percent of the mapped wetlands within the analysis area and would not result in large-scale loss of wetland function or integrity.

- While the impacts described above have an obvious effect on the natural state of the landscape, they do not occur at a scale that threatens intact native ecological communities.
- Impacts to wetlands at the scale described for this alternative are not key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park.

4.3.1.6 Alternative 3 Effects on Wetlands

Direct and Indirect

Alternative 3 would include a re-routing of the Soda Lake trail and the construction of a non-motorized trail (Rock Creek trail). Table 4-9 compares the estimated miles and acreage of impacts that would occur to the various wetland types under each of the alternatives, as a result of past, present, and projected future ORV use. Table 4-12 summarizes the impacts to wetlands that would occur on each trail under Alternative 3 and was used to reach the conclusions for direct and indirect impacts under this alternative. The values reported in these tables are based on the existing trail footprint, including historic trail impacts. It is assumed that re-routed motorized trails would be sited in such a way and would be constructed using methods (including trail hardening) that would prevent trail braiding. The intent of these trail re-routes/improvements is to create a stable single-tread motorized trail; therefore, future ORV impacts were calculated assuming 6-foot trail disturbances for all re-routed and new motorized trail segments, while existing impacts were used for the portions of trails where improvements were not implemented. Where trail construction is proposed, the Acres Allowed to Recover column in Table 4-12 lists the estimated acreage of currently impacted wetlands that would be allowed to recover under this alternative.

Table 4-12. Summary of Impacts to Wetlands on Nine ORV Trails and Black Mountain Trails under Alternative 3

Trail	Projected ORV Use (round trips per year)		Actions Proposed under this Alternative	Wetland Acres Impacted ¹	Acres Allowed to Recover ²	
	Recreational	Subsistence			Due to Re- Routes	Due to Trail Improvements
Black Mountain	Closed	65	No improvements	1.2	0	0
Boomerang	Closed	6	No improvements	9.4	0	0
Caribou Creek	Closed	40	No improvements	0.2	0	0
Copper Lake	Closed	125	No improvements	103.9	0	0
Lost Creek	Closed	50	No improvements	4.0	0	0
Reeve Field	Closed	24	No improvements	26.5	0	0
Soda Lake	Closed	35	Constructed re-route with closure of old degraded trail	5.3	5.2	0
Suslota	Closed	70	No improvements	169.6	0	0
Tanada Lake	Closed	75	No improvements	120.2	0	0
Trail Creek	Closed	45	No improvements	2.7	0	0

¹ Impacted acres based on wetland types overlaid with trail areas mapped by SMU (2008). These areas are not expected to increase substantially with similar or decreasing ORV use under Alternative 3 (0 recreational and 582 subsistence ORV round trips compared to 437 and 480, respectively, under current conditions).

² Under Alternative 3, only Soda Lake trail would be re-routed. These columns represent estimates of the acres of wetlands along the original trail that would recover after that original trail was closed, and the acres of wetlands that would recover near trail improvements. They are based on current impacts along trails that would be closed due to reroutes, as well as existing impacts located near proposed trail improvements.

Recreational use would not be permitted under Alternative 3. This would reduce the use of trails by ORVs by 37 percent compared to current conditions (see Table 4-1). Annual ORV use is estimated at approximately 582 round trips under Alternative 3, compared to 917 round trips under current conditions. This reduction in ORV use would likely reduce impacts to wetlands (compared to current conditions) due to the reduced number of ORV passes that would occur along each trail. However, five of the trails (Black Mountain, Copper Lake, Lost Creek, Suslota, and Tanada Lake) are likely to experience more than 100 passes per year, and Trail Creek and Caribou Creek trails would likely experience just under 100 passes per year. However, Lost Creek and Trail Creek trails occur on gravel floodplains outside of the shrub-tussock community analyzed by Ahlstrand and Racine (1990). Few wetlands exist along these trails. Subsistence ORV use would occur at levels that could result in long-term, adverse impacts to sensitive wetlands along these trails. Expansion of impacts to wetland functions would be minimized because of the monitoring/management actions proposed to correct and prevent new impacts to resources on unimproved trails (see Section 2.4.3).

Emergent, pond, and scrub-shrub wetlands are highly sensitive to ORV use. These are common along Black Mountain, Boomerang, Copper Lake, Reeve Field, Soda Lake, and Tanada Lake trails (Table 4-9). Forested wetlands are less sensitive to ORV use due to the reduced rate of trail braiding. Shrub and forested wetlands are common along Boomerang, Copper Lake, Reeve Field, and Suslota trails. Riverine wetlands typically are able to support ORV use because they lack vegetation and have cobbly soils that are not susceptible to subsidence. These are common along Black Mountain and Soda Lake. The few acres of wetlands that exist along Lost Creek and Trail Creek trails also are riverine wetlands.

Construction under Alternative 3 would result in approximately 12.8 acres of general construction disturbances (see Table 4-2); the majority of the disturbance would occur along the Soda Lake Re-route. The exact acreage of impacts that would occur to wetlands during construction is unknown at this time, but would be determined during a detailed wetland delineation that would be conducted prior to obtaining a Section 404 permit. Construction through emergent and riverine wetlands that were previously undisturbed would result in short-term increases in sedimentation to adjacent waterbodies, temporary loss of vegetation, and impacts to the wetlands ability to serve as wildlife habitat (see Sections 4.3.3 and 4.3.4). The Soda Lake trail re-route would include trail hardening along the portion of the new trail that crosses through an emergent wetland, using GeoBlock (porous pavement panels), which would not require gravel fill and would allow wetland vegetation to re-establish. The trail siting process for the Soda Lake Re-route avoided wetlands to the extent practical, and the impact to wetlands along the Soda Lake Re-route would occur primarily in a riverine wetland that contains rocky alluvial fan soils that would likely support ORV use (as discussed in Section 3.4.1). Therefore, impacts to this riverine wetland would be minor. Wetland areas located outside of the direct trail bed that were disturbed by construction would be expected to recover quickly once construction disturbances ceased.

The re-routing of the Soda Lake trail and closure of the original trail bed would allow the disturbed wetlands found along the original trail's route to recover. The re-route would allow the stabilization and natural revegetation of approximately 3.4 acres of emergent wetland and 1.8 acres of riverine wetland. Impacted wetlands that are closed to ORV use typically do not experience a complete recovery to pre-disturbance conditions. The microtopography, soil conditions, hydrological pathways, and species compositions differ from adjacent undisturbed areas (Loomis and Liebermann 2006). Therefore, recovery is defined as a functional recovery of the wetland system, but not a full recovery of original wetland habitat. Where wetlands are allowed to recover, impacts related to wetland habitat would persist, while impacts related to wetland function would improve.

Because of the continued use of ORV trails at levels that could result in permanent impacts (although reduced compared to current conditions) and the lack of trail improvements along the most degraded trails, the direct and indirect impacts to wetlands under this alternative would be considered moderate. Moderate adverse impacts would occur along Black Mountain, Suslota, Tanada Lake, and Copper Lake trails because of the prevalence of emergent or scrub-shrub wetlands along these trails and the lack of trail improvements. Impacts would be minor on Boomerang trail, Caribou Creek, Reeve Field, and Soda Lake trails, due to reduced ORV use and implementation of the monitoring/management program. Negligible impacts would occur along Lost Creek and Trail Creek trails, as these two trails consists predominantly of riverine wetland types, which are able to support ORV use.

Cumulative

The impacts of other nearby past, present, and foreseeable future actions are described under Alternative 1 and would result in minor, long-term, adverse impacts on wetlands. The net effect of these impacts in combination with the direct and indirect impacts likely under Alternative 3 would be long-term, moderate, adverse cumulative impacts to wetlands.

Conclusion

Impacts to wetland function and values would be less than those experienced under existing conditions, due to reduced ORV use, one trail improvement, and the implementation of the monitoring/management actions described in Section 2.4.3. Closing trails to recreational ORV use would minimize future wetland impacts by reducing the likelihood of trail braiding. Subsistence ORV use along unimproved segments through emergent or scrub-shrub wetlands along Black Mountain, Suslota, Tanada Lake, and Copper Lake trails would result in moderate impacts to wetlands. Impacts to wetlands would be minor on Boomerang trail, Caribou Creek, Reeve Field, and Soda Lake trails, and negligible on Lost Creek and Trail Creek trails, due to reduced ORV use and smaller areas of sensitive wetlands. Based on the potential for moderate impacts along the most degraded trails, Suslota, Tanada Lake, and Copper Lake, Alternative 3 would result in moderate, long-term, adverse effects to wetland resources.

The moderate impacts to wetlands anticipated from this alternative would not result in an impairment of park resources that fulfill specific purposes identified in the establishing legislation or that are essential to the integrity of the park.

4.3.1.7 Alternative 4 Effects on Wetlands

Direct and Indirect

Under Alternative 4, eight of nine trails (all but Suslota) would be improved to at least a maintainable condition (see Section 2.4.4 for a definition of “design-sustainable” and “maintainable condition”). This would include re-routing trails, trail reconstruction, and installation of trail hardening. Wilderness trails (including Black Mountain trail system and the trails south of Tanada Lake) would also be improved. In addition, new non-motorized trails and routes would be created.

Table 4-9 compares the estimated miles and acreage of impacts that would occur to the various wetland types under each of the alternatives, as a result of past, present, and projected future ORV use. Table 4-13 summarizes the impacts to wetlands that would occur on each trail under Alternative 4 and was used to reach the conclusions for direct and indirect impacts under this alternative. The values reported in these tables are based on the existing trail footprint, including historic trail impacts,

and the “less than” symbols are added where impacts to wetlands are expected to decrease. It is assumed that re-routed motorized trails would be sited in such a way, and would be constructed using methods (including trail hardening) that would prevent trail braiding. The intent of these trail re-routes/improvements is to create a stable single-tread motorized trail; therefore, future ORV impacts were calculated assuming 6-foot trail disturbances for all re-routed and new motorized trail segments. Existing impacts were used for the portions of trails where improvements were not implemented. Proposed management tools would be implemented proactively if monitoring identified an expansion of trails or impacts to resources under Alternative 4 (see Section 2.4.4). As a result, trail braiding is unlikely to occur on any improved trails or re-routes. Where trail construction is proposed, the Acres Allowed to Recover column in Table 4-13 lists the estimated acreage of currently impacted wetlands that would be allowed to recover under this alternative.

Table 4-13. Summary of Impacts to Wetlands on Nine ORV Trails and Black Mountain Trails under Alternative 4

Trail	Projected ORV Use (round trips per year)		Actions Proposed under this Alternative	Wetland Acres Impacted ¹	Acres Allowed to Recover ²	
	Recreational	Subsistence			Due to Re- Routes	Due to Trail Improvements
Black Mountain trails	Closed	144	Spot hardening and minor re-route construction using hand crews	<1.2	0	Unknown, but could be substantial
Boomerang	Closed	6	Improvement of river ramp	<9.4	0	Minimal
Caribou Creek	180	25	Major trail hardening and some re-alignment	<0.2	0	Minimal
Copper Lake	Closed	274	Constructed re-route and hardening with old trail closure.	11.0	52.9	6.3
Lost Creek	153	50	Bladed trail to minimize crossings	<4.0	0	Minimal
Reeve Field	50	24	Re-route with closure of old degraded trail.	0.7	25.9	0
Soda Lake	126	25	Constructed re-route with closure of old degraded trail	1.7	3.4	0
Suslota	Closed	70	No improvements	169.6	0	0
Tanada Lake	Closed	265	Constructed re-route with closure of old trail.	1.4	110.7	0
Trail Creek	162	45	Bladed trail to minimize crossings	<2.7	0	Minimal

¹ Impacted acres based on wetland types overlaid with trail areas mapped by SMU (2008). Because of trail improvements, these areas are not expected to expand substantially with increasing ORV use under Alternative 4 (671 recreational and 1,100 subsistence ORV round trips compared to 437 and 480, respectively, under current conditions).

² Under Alternative 4, portions of Copper Lake, Reeve Field, Soda Lake, and Tanada Lake trails would be re-routed. This column represents the estimate of the acres of wetlands along the original trails that would recover after those trail segments were closed. They are based on current impacts along trails that would be closed due to reroutes, as well as existing impacts located near proposed trail improvements.

Under Alternative 4, recreational use would not be allowed on Suslota, Tanada Lake, and Copper Lake trails, the wilderness trail systems, and the Boomerang trail. However, because of increased recreational ORV use on other trails and increased subsistence ORV use on most trails, overall trail

use by ORVs would increase by 93 percent over current conditions under this alternative. ORV use is estimated at approximately 1,771 round trips under Alternative 4, compared to 917 round trips under current conditions (Table 4-1). This increase in trail use compared to current conditions could increase the potential for impacts to wetland vegetation, by creating more opportunities for soil disturbances and/or direct damage to vegetation. Generally, as the number of ORV users increase, the likelihood of increased trail braiding on unimproved trails also increases. Use of the wilderness trails (Black Mountain trail system and the trails south of Tanada Lake) by subsistence ORV users is projected to at least double under this alternative. With no controls on off-trail use by subsistence ORV users, it is expected that there would be an increase in off-trail wetlands impacts such as vegetation stripping, soil churning, subsidence, and mud/muck-holes, particularly along the Black Mountain trail system. However, all but the Suslota trail would be improved to at least a maintainable condition, which would reduce the likelihood that off-trail use and related impacts would spread to adjacent areas. In addition, new trail braiding or additional adverse impacts to wetlands would be limited through trail improvement actions and the implementation of the monitoring/management program. The management tools that would be employed if additional braiding or other adverse wetland impacts occurred are outlined in Table 2-3 (Section 2.5.4), and would include additional trail hardening/maintenance, vehicle class restrictions, restriction of access to impacted trails, and closures if needed.

Emergent, pond, and scrub-shrub wetlands are highly sensitive to ORV use. These are common along Black Mountain, Boomerang, Copper Lake, Reeve Field, Soda Lake, and Tanada Lake trails (Table 4-9). Forested wetlands are less sensitive to ORV use due to the reduced rate of trail braiding. Shrub and forested wetlands are common along Boomerang, Copper Lake, Reeve Field, and Suslota trails. Riverine wetlands typically are able to support ORV use because they lack vegetation and have cobbly soils that are not susceptible to subsidence. These are common along Black Mountain and Soda Lake. The few acres of wetlands that exist along Lost Creek and Trail Creek trails also are riverine wetlands.

Construction and trail improvement activities would result in approximately 119.5 acres of general construction disturbances (Table 4-2); the majority of general construction disturbances would occur along the Tanada Lake and Copper Lake re-routes. The trail siting process avoided wetlands to the greatest extent practical; however, some wetlands were unavoidable. The exact acreage of impacts that would occur to wetlands during construction is unknown at this time, but would be determined during a detailed wetland delineation that would be conducted prior to obtaining a Section 404 permit. Construction in these wetland areas would result in short-term increases in sedimentation to adjacent waterbodies, temporary loss of vegetation, and impacts to the wetlands ability to serve as wildlife habitat (see Sections 4.3.3 and 4.3.4). The wetland areas located outside of the direct trail bed that would be disturbed by construction would be expected to recover quickly once construction disturbances ceased. The ability of wetland vegetation located within the direct trail bed to recover would depend on the type of trail hardening that was used. Trail hardening materials such as GeoBlock (a porous pavement panel) would stabilize soils and contain a structural form that would allow vegetation to re-establish itself through the materials. In places where gravel is used instead of materials such as GeoBlock, wetland vegetation would be permanently impacted. In addition, the risk of invasion by exotic species would increase if the gravels were not free of weed seeds or parts (see Section 4.3.2).

The Copper Lake, Reeve Field, and Tanada Lake re-routes would allow subsistence ORV users access to new forested and scrub-shrub wetlands, resulting in a decline in the habitat quality of these wetlands types for some wildlife species, due to the increased disturbance from ORVs (see Section 4.3.4). For example, hunters have reported that moose have been displaced from former hunting grounds by ORVs, and these new re-routed trails would create access to previously undisturbed areas,

which could lead to displacement of moose from suitable habitats (see Section 4.3.4). In addition, the ability of any vegetated wetland type that is located near a waterbody to control erosion and stabilize sediments would be impacted along the re-routed trails (Copper Lake, Reeve Field, Soda Lake, and Tanada Lake), due to the reduction in vegetation cover adjacent to the waterbody (see Section 4.3.3). This impact would be minor, however, due to limited disturbance and the use of trail hardening, which would result in soil stabilization. In addition, the net functions of wetlands in the area would increase under this alternative, due to the closures of the original Copper Lake, Reeve Field, Soda Lake, and Tanada Lake trails, thereby allowing the functions of these degraded trails to return.

Trail improvements and re-routes would allow some disturbed wetlands to stabilize and naturally revegetate. The acreages of currently disturbed vegetation that would be allowed to recover as a result of trail re-routes are listed in Table 4-14. In addition to re-routes, trail improvements would allow restoration of approximately 6.3 acres along the Copper Lake trail, much of which would consist of palustrine scrub-shrub wetland types. Only minimal recovery would occur along Boomerang trail, due to the trail hardening that would be performed along the existing boat ramp. Trail improvements along the Caribou Creek, Trail Creek, and Lost Creek trails would not result in substantial recovery of wetland impacts because few wetlands are affected along these trails. Trail improvements could result in substantial recovery of wetlands along Black Mountain trail, as numerous wetlands are crossed along this trail. As discussed under Alternative 1, any recovery of wetlands due to trail closures or improvements would be considered a functional recovery of the wetland system, but not a full recovery of the original wetland habitat.

Table 4-14. Acres of Currently Impacted Wetlands that Would be Allowed to Recover under Alternative 4, Due to Re-routes¹

Wetland Type	Copper Lake Trail; Acres Impacted	Reeve Field Trail; Acres Impacted	Soda Lake Trail; Acres Impacted	Tanada Lake Trail; Acres Impacted
Palustrine Emergent	4.1	25.6	3.4	108.8
Palustrine Scrub-Shrub	48.8	0.0	0.0	1.8
Palustrine Forested	0.0	0.3	0.0	0.1
Unconsolidated Bottom (pond)	0.0	0.0	0.0	0.0
Riverine	0.0	0.0	0.0	0.1
Total	52.9	25.9	3.4	110.7

¹ This table reflects recovery along portions of trails that would be closed because of proposed re-routes. Additional recovery would occur during trail improvements including along Caribou Creek, Lost Creek, Trail Creek, Copper Lake, and Boomerang trails, and improvements in the Black Mountain trails and wilderness trails south of Tanada Lake. Trail improvement data are not in a format that would allow overlay with wetlands in GIS.

The direct and indirect impacts to wetlands under this alternative would be considered minor. Adverse impacts would be minor along Black Mountain, Boomerang, Caribou Creek, Copper Lake, Reeve Field, Soda Lake, and Tanada Lake trails because of trail improvements, trail re-routes, and the proposed monitoring/management program. Impacts would be contained within the existing trail footprint along the Suslota trail, due to the implementation of the proposed monitoring/management program. Impacts would be negligible along Lost Creek or Trail Creek trails, as these two trails consist predominantly of riverine wetland types, which are able to support ORV use.

Cumulative

The impacts of other nearby past, present, and foreseeable future actions on wetlands are described under Alternative 1 and would result in minor, long-term, adverse impacts on wetlands. The net effect of these impacts, in combination with the direct and indirect impacts likely under Alternative 4, would result in long-term, minor, adverse impacts to wetlands.

Conclusion

Because all but one trail would be improved to at least a maintainable condition and a monitoring/management program would be implemented to prevent impacts from spreading beyond the width of the trail, additional trail widening and braiding would be minimal or non-existent under this alternative. Under this alternative, some limited impacts would occur to wetlands from construction of trail re-routes and improvements; however, the effects would likely only be perceptible in small, localized areas and last only the duration of construction activities. Therefore, Alternative 4 would have a net, long-term, minor adverse impact to wetland resources.

The minor impacts to wetlands anticipated from this alternative would not result in an impairment of park resources that fulfill specific purposes identified in the establishing legislation or that are essential to the integrity of the park.

4.3.1.8 Alternative 5 Effects on Wetlands

Direct and Indirect

This alternative would improve most degraded segments of the trails to at least a maintainable condition. On unimproved trails or trail segments, impact standards (as described in Section 2.4.5) would be applied to ensure that impacts do not expand beyond current conditions. The trail improvements that would occur on most trails would include re-routing trails, trail reconstruction, and installation of trail hardening. In addition, new non-motorized trails and routes would be created under this alternative.

Table 4-9 compares the estimated miles and acreage of impacts that would occur to the various wetland types under each of the alternatives, as a result of past, present, and projected future ORV use. The values reported in these tables are based on the existing trail footprint, including historic trail impacts, and the “less than” symbols are added where impacts to wetlands are expected to decrease. It is assumed that re-routed motorized trails would be sited in such a way, and would be constructed using methods (including trail hardening), that would prevent trail braiding. The intent of these trail re-routes/improvements is to create a stable single-tread motorized trail; therefore, future ORV impacts were calculated assuming 6-foot trail disturbance for all re-routed and new motorized trails, while existing impacts were used for the portions of trails where improvements were not implemented. Proposed management tools to respond to monitoring of improved trails would be proactive under Alternative 5 (see Section 2.4.5). As a result, trail braiding is unlikely to occur on any improved trails or re-routes. Where trail construction is proposed, the Acres Allowed to Recover column in Table 4-15 lists the estimated acreage of currently impacted wetlands that would be allowed to recover.

Trail use is expected to increase under this alternative, although recreational ORV use would not be allowed on the Suslota trail. ORV use is estimated at approximately 1,679 round trips under Alternative 5, compared to 917 round trips under current conditions (Table 4-1). This increase in trail use could increase the impacts to wetland vegetation due to increased opportunities for disturbances to soil and vegetation. As the number of ORV users increase, the likelihood of increased trail braiding also increases. However, new trail braiding or additional adverse impacts to wetlands would be limited through trail improvement and the proposed monitoring/management program. These management tools include additional trail hardening/maintenance, vehicle class restrictions, restriction of access to impacted trails, and closures if needed. For the wilderness trails systems, improved trails would be designated for subsistence ORV users, and travel off the trails would not be permitted, which would reduce the potential for any off-trail impacts to wetlands along these trails.

Table 4-15. Summary of Impacts to Wetlands on Nine ORV Trails and Black Mountain Trails under Alternative 5

Trail	Projected ORV Use (round trips per year)		Actions Proposed under this Alternative	Wetland Acres Impacted ¹	Acres Allowed to Recover ²	
	Recreational	Subsistence			Due to Re- Routes	Due to Trail Improvements
Black Mountain	Closed	90	Spot hardening and minor re-route construction using hand crews	<1.2	0	Unknown, but could be substantial
Boomerang	7	6	Improvement of river ramp	<9.4	0	Minimal
Caribou Creek	180	25	Major trail hardening and some re-alignment	<0.2	0	Minimal
Copper Lake	125	171	Constructed re-route and hardening with old trail closure.	11.0	52.9	6.3
Lost Creek	153	50	Bladed trail to minimize crossings	<4.0	0	Minimal
Reeve Field	50	24	Re-route with closure of old degraded trail.	0.7	25.9	0
Soda Lake	126	25	Constructed re-route with closure of old degraded trail	1.7	3.4	0
Suslota	Closed	80	Spot hardening of degraded meadows and stream crossings	<158.6	0	10.0
Tanada Lake	234	78	Constructed re-route with closure of old trail.	4.8	38.0	222.8
Trail Creek	162	45	Bladed trail to minimize crossings	<2.7	0	Minimal

¹ Impacted acres based on wetland types overlaid with trail areas mapped by SMU (2008). Because of trail improvements, these areas are not expected to expand substantially with increasing ORV use under Alternative 5 (1,037 recreational and 642 subsistence ORV round trips compared to 437 and 480, respectively, under current conditions).

² Under Alternative 5, portions of Copper Lake, Reeve Field, Soda Lake, and Tanada Lake trails would be re-routed. This column represents the estimate of the acres of wetlands along the original trails that would recover after those trail segments were closed. They are based on current impacts along trails that would be closed due to reroutes, as well as existing impacts located near proposed trail improvements.

Emergent, pond, and scrub-shrub wetlands are highly sensitive to ORV use. These are common along Black Mountain, Boomerang, Copper Lake, Reeve Field, Soda Lake, and Tanada Lake trails (Table 4-9). Forested wetlands are less sensitive to ORV use due to the reduced rate of trail braiding. Shrub and forested wetlands are common along Boomerang, Copper Lake, Reeve Field, and Suslota trails. Riverine wetlands typically are able to support ORV use because they lack vegetation and have cobbly soils that are not susceptible to subsidence. These are common along Black Mountain and Soda Lake. The few acres of wetlands that do exist along Lost Creek and Trail Creek trails also are riverine wetlands.

Trail relocations and improvement activities would result in approximately 139.2 acres of general construction disturbances (Table 4-2); the majority of construction disturbances would occur along the Copper Lake re-route, the Tanada Lake trail reconstruction, and the new non-motorized Mentasta Traverse trail. The trail siting process avoided wetlands to the greatest extent practical; however, some wetlands were unavoidable. The exact acreage of impacts that would occur to wetlands during construction is unknown at this time, but would be determined during a detailed wetland delineation that would be conducted prior to obtaining a Section 404 permit. Construction in these wetland areas

would result in short-term increases in sedimentation to adjacent waterbodies, temporary loss of vegetation, and impacts to the wetlands ability to serve as wildlife habitat (see Sections 4.3.3 and 4.3.4). The wetland areas located outside of the direct trail bed that would be disturbed by construction would typically recover quickly once construction disturbances ceased. The ability of wetland vegetation located within the direct trail bed to recover would depend on the type of trail hardening that was used. Trail hardening materials such as GeoBlock (a porous pavement panel) would stabilize soils and contain a structural form that would allow vegetation to re-establish itself through the materials. Where gravel is used instead of materials such as GeoBlock, wetland vegetation would be permanently impacted. In addition, the risk of invasion by exotic species would increase if the gravels were not free of weed seeds or parts (see Section 4.3.2).

Alternative 5 would consist of a major reconstruction of the Tanada Lake trail, which could impact wetland function. The first 10 miles of the re-construction (starting at its northern end) would be spot hardened with porous pavement panels or other structural trail hardening methods. Reconstruction along the remaining length of the Tanada Lake trail (about 8.7 miles) would consist of ditching and elevating the existing trail, capping the new elevated trail with gravel, and installing culverts along the raised trail to maintain wetland connectivity and hydrology. The source materials for the gravel would be developed at three locations along the trail length. The gravel pits could further impact wetlands if they contained exotic weed seeds or parts, or if they were located within wetlands or in areas that were hydrologically linked to wetlands. The degree of impact that the raising of the trail beds would have on adjacent wetlands' connectivity and hydrology would depend on the number, type, size, and location of culverts that would be installed along the raised trail bed. If the culverts are installed in an appropriate manner (number, type, size, location) then impacts to the wetlands connectivity would likely be minor; however, if the culverts are not installed properly, then wetlands could become disconnected and wetlands located down-flow could become desiccated.

The Copper Lake and Reeve Field re-routes would allow subsistence ORV users access to previously undisturbed forested and scrub-shrub wetlands, resulting in a decline in the habitat quality of these wetlands types for some wildlife species, due to the increased disturbance from ORVs (see Section 4.3.4). In addition, the ability of any vegetated wetland type that is located near a waterbody to control erosion and stabilize sediments would be impacted along the re-routed trails (Copper Lake, Reeve Field, and Soda Lake), due to the reduction in vegetation cover adjacent to the waterbody (see Section 4.3.3). This impact would be minor, however, due to limited disturbance and the use of trail hardening, which would result in soil stabilization. In addition, the net functions of wetlands in the area would increase under this alternative, due to the closures of the original Copper Lake, Reeve Field, and Soda Lake trails, thereby allowing the functions of these degraded trails to return.

Trail improvements and re-routes would allow some disturbed wetlands to stabilize and naturally revegetate. Under Alternative 5, approximately 120.2 acres of vegetation would be allowed to stabilize and naturally revegetate after construction of the trail re-routes (see Table 4-16). In addition to re-routes, trail improvements would allow restoration of approximately 222.8 acres (including disturbed wetlands) along the Tanada Lake trail, 6.3 acres along the Copper Lake trail, and 10.0 acres along the Suslota trail (Table 4-15). Only minimal recovery would occur along Boomerang trail, due to the trail hardening that would be performed along the existing ramp. Although the exact breakdown of restored acreage by wetland type is uncertain, the vast majority would likely consist of palustrine scrub-shrub wetland types. Trail improvements along the Caribou Creek, Trail Creek, and Lost Creek trails would not result in substantial recovery of impacts because few wetlands are affected along these trails. Trail improvements could result in substantial recovery of wetlands along Black Mountain trail, as numerous wetlands are crossed along this trail. As discussed under Alternative 1, any recovery of wetlands due to trail closures or improvements would be considered a functional recovery of the wetland system, but not a full recovery of the original wetland habitat.

Table 4-16. Acres of Currently Impacted Wetlands that Would be Allowed to Recover under Alternative 5, Due to Re-routes¹

Wetland Type	Copper Lake Trail; Acres Impacted	Reeve Field Trail; Acres Impacted	Soda Lake Trail; Acres Impacted	Tanada Lake Trail; Acres Impacted
Palustrine Emergent	4.1	25.6	3.4	38.0
Palustrine Scrub-Shrub	48.8	0.0	0.0	0.0
Palustrine Forested	0.0	0.3	0.0	0.1
Unconsolidated Bottom (pond)	0.0	0.0	0.0	0.0
Riverine	0.0	0.0	0.0	0.0
Total	52.9	25.9	3.4	38.0

¹ This table reflects recovery along portions of trails that would be closed because of proposed re-routes. Additional recovery would occur during trail improvements including along Caribou Creek, Lost Creek, Suslota, Trail Creek, Tanada Lake, Copper Lake, and Boomerang trails, and improvements in the Black Mountain trails and wilderness trails south of Tanada Lake. Trail improvement data are not in a format that would allow overlay with wetlands in GIS.

The direct and indirect impacts to wetlands under this alternative would be considered minor. Adverse impacts would be minor along Black Mountain, Boomerang, Caribou Creek, Copper Lake, Reeve Field, Soda Lake, Suslota, and Tanada Lake trails because of trail improvements, re-routes, and the proposed monitoring/management program. Impacts to wetlands resulting from the Tanada Lake trail improvement meet the criteria for minor because approximately 4.8 acres of wetlands would be disturbed, allowing long-term recovery of approximately 222.8 acres of wetlands by maintaining one trail alignment. Gravel pits necessary to support reconstruction efforts would not be located in wetlands. Impacts would be negligible along Lost Creek or Trail Creek trail, as these two trails consists predominantly of riverine wetland types, which are able to support ORV use.

Cumulative

The impacts of other nearby past, present, and foreseeable future actions on wetlands are described under Alternative 1 and would result in minor, long-term, adverse impacts on wetlands. The net effect of these impacts, in combination with the direct and indirect impacts likely under Alternative 5, would be long-term, minor, adverse impacts to wetlands.

Conclusion

Because most trails would be improved to at least a maintainable condition and a monitoring/management program would be implemented to prevent impacts from spreading beyond the width of the trail, it is expected that future trail widening and braiding would be minimal under this alternative. Under this alternative, limited, short-term impacts would occur to wetlands during construction, although the effects would be perceptible in small, localized areas and last only the duration of construction activities. Therefore, Alternative 5 would have a net, long-term, minor adverse impact to wetland resources.

The minor impacts to wetlands anticipated from this alternative would not result in an impairment of park resources that fulfill specific purposes identified in the establishing legislation or that are essential to the integrity of the park.

4.3.2 *Vegetation*

4.3.2.1 **Methodology**

This section describes the direct, indirect, and cumulative impacts to vegetation that would likely occur as a result of the proposed alternatives. This analysis was based on published literature and existing impacts that have occurred within the Wrangell-St. Elias National Park and Preserve, including Ahlstrand and Racine (1990) and Happe et al. (1998). Data used during the assessment included the national vegetation/wetland mapping data collected from the park by St. Mary's University (SMU 2008), as well as the remote sensing data collected by Stumpf (2007).

4.3.2.2 **Impact Threshold Criteria**

To determine the significance of effects on vegetation the impacts are compared against the following threshold criteria:

Negligible: Individual plants may be affected, but measurable or perceptible changes in the natural function and character of the plant community in terms of growth, abundance, reproduction, distribution, structure, or diversity of native species would not occur.

Minor: Effects on multiple plants would be measurable or perceptible. However, the natural function and character of plant communities in terms of growth, abundance, reproduction, distribution, structure, or diversity of native species would only be perceptible in small, localized areas. Impacts would be short term.

Moderate: A change would occur in the natural function and character of the plant communities in terms of growth, abundance, reproduction, distribution, structure, or diversity of native species, but not to the extent that plant community properties (i.e., size, integrity, or continuity) change. Impacts would occur over many locations.

Major: Effects on plant community properties would be readily apparent, long lasting, and would substantially change the natural function and character of the vegetation community.

4.3.2.3 **Assumptions**

For vegetation types mapped along the trail corridors, average species cover values are assumed as described in "The Alaska Vegetation Classification" (Vioreck et al. 1992).

For trail construction or re-construction, the amount of construction disturbance to vegetation is calculated based on the information summarized in Table 4-2. The impacted areas are based on specific disturbance widths for the different trail segments. The data sources are footnoted on Table 4-2.

Future ORV impacts were assumed to be comparable to existing conditions or rates of degradation along any portions of the trails that would not receive trail improvements or other alternative prescriptions.

Re-routed motorized trails would be sited in such a way, and would be constructed using methods (including trail hardening), that would prevent trail braiding as a result of ORV use. The intent of these trail re-routes/improvements is to create a stable single-tread motorized trail; therefore, ORV impacts were calculated assuming a 6-foot trail disturbance for all re-routed and new motorized trails.

The majority of recovery to impacted areas would occur due to trail re-routes.

4.3.2.4 Alternative 1 Effects on Vegetation

Direct and Indirect

Use of the trails considered within the analysis area would result in both direct and indirect effects to vegetation under Alternative 1 (No Action). Direct effects of ORV use on vegetation include abrasion, crushing, and breakage of plant tissues, as well as disruption of root systems and plant mortality. Indirect effects would include increased fugitive dust, increased erosion, reduced plant growth or vigor, altered biodiversity and community composition, reduction in vegetative cover, and the potential for increase invasion by exotic species.

Alternative 1 does not include any major reconstruction or re-routing of trails, and no trail hardening would be performed. Therefore, there would not be any construction impacts to vegetation resulting from this alternative.

Table 4-17 compares the estimated miles and acreage of impacts that would occur to the various vegetation types under each of the alternatives, as a result of past, present, and projected future ORV use. Table 4-18 summarizes the impacts to vegetation that would occur on each trail under Alternative 1 and was used to reach the conclusions for direct and indirect impacts under this alternative. The values reported for Alternative 1 are based on the existing trail footprint, including historic trail impacts, and the “greater than” symbols are added where impacts to vegetation are expected to expand.

The level of trail use by ORVs affects the degree of impact that could occur to the vegetative communities along the trails. A single pass by an ORV within the more mesic vegetation types can have a permanent impact (see Section 4.3.1). On average, though, the majority of impacts to vegetative communities occur within the first 20 passes of an ORV (Ahlstrand and Racine 1990, Loomis and Liebermann 2006). As the number of passes by an ORV increase, the likelihood of trail braiding increases, the vegetative cover and biodiversity decreases, and the vegetative structure is simplified. However, the cover, biodiversity, and structure of vegetative communities do not appear to be affected further once the number of passes exceeds 100 (Happe et al. 1998). Table 4-1 shows that at least five of the trails (Soda Lake, Caribou Creek, Copper Lake, Lost Creek, and Trail Creek) would have more than 100 ORV round trips (or 200 passes). However, Lost Creek and Trail Creek trails occur on gravel floodplains outside of the shrub-tussock community analyzed by Ahlstrand and Racine (1990). As indicated in Table 4-18, few acres of vegetation would be impacted along these trails. All of the remaining analysis area trails except Boomerang would receive more than 100 passes per year, which exceeds the number of passes associated with moderate impacts to vegetation (Happe et al. 1998). Changes in the natural function and character of the plant communities would occur over many locations along these trails. Impacts along Boomerang trail would be localized, and therefore minor, with 26 passes per year.

As discussed in Section 3.4.2, not all vegetative communities are equally sensitive to ORV use. Of the vegetation types listed in Table 4-17, the herbaceous and low shrub communities typically experience a greater area of impact per mile because trail braiding is more likely to occur within these communities (see Section 3.4.2). Trail hardening has been shown to reduce trail braiding (Allen et al. 2000); however, no trail hardening has been proposed under Alternative 1. Impacts to herbaceous and low shrub communities typically result in a greater degree of plant mortality compared to the other vegetation types found within the analysis area (Ahlstrand and Racine 1990; Happe et al. 1998). Although the tall shrub, dwarf shrub, and forest communities have fewer impacts per mile of trail, as

a result of the lack of trail braiding, they typically experience a greater loss of vegetation cover compared to the herbaceous and low shrub communities. The difference in loss results from the sensitivity of species within these three communities to the direct impact of ORV use, such as the breaking or loss of branches, as well as the slow growth rate of many species within these communities (Happe et al. 1998). The types of impacts to vegetative communities that would occur under Alternative 1 would be similar to the current conditions, as no new construction or re-routes would be implemented; however, continued trail widening through braiding would likely occur (impacting new areas).

Vegetative communities are more susceptible to ORV use during spring and summer months, due to the effects of warmer temperatures and increased precipitation on the soils' ability to support ORVs (Loomis and Liebermann 2006). Under Alternative 1, the Suslota trail, Tanada Lake trail, and the portion of the Copper Lake trail located north of the Boomerang trail would remain closed to recreational ORV use. The continued closures of these three trails to recreational users would reduce soil churning, root damage, and subsidence on those trails during warm wet months. However, subsistence users would still have access to these trails year-round, resulting in some trail braiding during warmer months. Most of the herbaceous and low shrub communities impacted by trail braiding occur along the Suslota, Tanada Lake, and Copper Lake trails (see Table 4-17), and continued subsistence ORV use would allow trail braiding to continue, resulting in moderate impacts to vegetation. ORV use during warmer months on most of the remaining trails that are not seasonally closed to recreational users would result in moderate impacts to vegetation because of trail braiding. Because trail braiding does not occur on Lost Creek and Trail Creek trails, impacts to vegetation would be minor.

Some limited natural vegetative recovery would occur because of the closures to recreational ORV use of Suslota trail, Tanada Lake trail, and the portion of the Copper Lake trail located south of the Boomerang trail junction. Recovery in these areas would likely consist of graminoid species, and recovery would be limited because subsistence ORV use and access to inholdings using ORVs would continue (a detailed discussion of long-term recovery rates is presented under Alternative 3, as no long-term recovery would occur under Alternatives 1 and 2). Ten exotic plant species have been documented within the analysis area along the Nabesna Road (Table 3-8; Figure 3-11). The exotic species found along this road could be dispersed throughout the trail network as all of the trails found within the analysis area are either accessed from the Nabesna Road or by other trails that are accessed by the Nabesna Road. ORVs can serve as vectors for exotic plant dispersal by transporting seeds or other plant materials along the linear trail network (Loomis and Liebermann 2006). In addition, the soil disturbance and reduction in vegetative cover from ORV use can create conditions that promote exotic plant establishment. These factors indicate that exotic plant species would likely spread into the trail network. Once established, these exotics could impact the vegetative communities by competing for resources, altering habitat for wildlife, and changing the biodiversity of areas recovering from disturbances. In addition, some exotic species are capable of altering local conditions such that a vegetative community could transition from one type to another. For example, invasive grasses have altered local fire regimes in some areas of the lower 48 states such that shrublands transition to grasslands.

Table 4-17. Estimated Impact to Vegetation from ORV use of the Nine Trails Analyzed (by Alternative)

Alternative	Vegetation Type	Sub-Type	Black Mountain Trails		Boomerang Trail		Caribou Creek Trail		Copper Lake Trail		Lost Creek Trail		Reeve Field Trail		Soda Lake Trail		Suslota Trail		Tanada Lake Trail		Trail Creek Trail		Total Impacts	
			Miles Crossed	Acres Impacted	Miles Crossed	Acres Impacted	Miles Crossed	Acres Impacted	Miles Crossed	Acres Impacted	Miles Crossed	Acres Impacted	Miles Crossed	Acres Impacted	Miles Crossed	Acres Impacted	Miles Crossed	Acres Impacted	Miles Crossed	Acres Impacted	Miles Crossed	Acres Impacted	Miles Crossed	Acres Impacted
Alternative 1	Forest	Broadleaf Forest	0.1	0.0	0.0	0.0	0.1	0.1	0.1	0.3	0.1	0.1	0.5	1.8	0.4	0.4	0.1	2.1	0.5	2.4	0.5	0.4	2.3	7.5
		Needleleaf Forest	1.9	1.6	8.2	7.7	1.5	1.2	9.9	30.2	0.9	0.7	2.8	19.1	4.7	5.7	3.5	43.9	4.7	44.6	1.3	1.0	39.3	155.6
		Mixed Forest	0.1	0.1	0.4	0.3	0.3	0.2	1.1	2.8	0.4	0.3	0.9	0.8	0.3	0.2	0.2	2.4	0.5	2.1	0.4	0.3	4.6	9.6
	Shrub	Tall Shrub	0.1	0.1	0.1	0.1	0.4	0.7	0.4	1.4	0.4	0.4	0.0	0.0	0.6	0.5	0.3	9.8	0.3	4.2	1.2	1.0	4.0	17.9
		Low Shrub	1.8	1.4	4.7	4.8	1.3	1.3	16.6	140.4	0.2	0.2	0.5	7.5	3.4	5.5	3.0	122.8	7.9	134.9	0.6	0.5	39.9	419.2
		Dwarf Shrub	0.0	0.0	0.3	0.4	0.0	0.0	1.1	6.8	0.0	0.0	0.1	0.1	0.3	0.5	0.0	0.7	0.4	9.7	0.0	0.0	2.2	18.2
		Mixed Shrub	0.2	0.2	0.0	0.0	0.0	0.0	0.6	3.5	0.1	0.1	0.0	0.0	0.1	0.3	0.0	0.1	0.1	2.4	0.1	0.1	1.2	6.6
	Herbaceous	Byroid	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1
		Forb	0.2	0.1	0.2	0.1	0.0	0.0	0.2	1.0	0.4	0.3	0.0	0.0	0.2	0.2	0.0	0.0	0.1	2.8	0.4	0.3	1.7	4.9
		Graminoid	0.4	0.3	1.8	2.5	0.0	0.2	5.9	48.3	0.0	0.0	0.0	0.0	0.8	1.0	0.2	8.0	2.3	58.2	0.1	0.1	11.6	118.6
	Total		4.7	3.7	15.8	16.1	3.6	3.6	36.1	234.7	2.4	2.0	4.9	29.3	10.8	14.1	7.3	190.0	16.8	261.2	4.6	3.7	107.0	758.3
Alternative 2	Forest	Broadleaf Forest	0.1	0.0	0.0	0.0	0.1	0.1	0.1	0.3	0.1	0.1	0.5	1.8	0.4	0.4	0.1	2.1	0.5	2.4	0.5	0.4	2.3	7.5
		Needleleaf Forest	1.9	1.6	8.2	7.7	1.5	1.2	9.9	30.2	0.9	0.7	2.8	19.1	4.7	5.7	3.5	43.9	4.7	44.6	1.3	1.0	39.3	155.6
		Mixed Forest	0.1	0.1	0.4	0.3	0.3	0.2	1.1	2.8	0.4	0.3	0.9	0.8	0.3	0.2	0.2	2.4	0.5	2.1	0.4	0.3	4.6	9.6
	Shrub	Tall Shrub	0.1	0.1	0.1	0.1	0.4	0.7	0.4	1.4	0.4	0.4	0.0	0.0	0.6	0.5	0.3	9.8	0.3	4.2	1.2	1.0	4.0	17.9
		Low Shrub	1.8	1.4	4.7	4.8	1.3	1.3	16.6	140.4	0.2	0.2	0.5	7.5	3.4	5.5	3.0	122.8	7.9	134.9	0.6	0.5	39.9	419.2
		Dwarf Shrub	0.0	0.0	0.3	0.4	0.0	0.0	1.1	6.8	0.0	0.0	0.1	0.1	0.3	0.5	0.0	0.7	0.4	9.7	0.0	0.0	2.2	18.2
		Mixed Shrub	0.2	0.2	0.0	0.0	0.0	0.0	0.6	3.5	0.1	0.1	0.0	0.0	0.1	0.3	0.0	0.1	0.1	2.4	0.1	0.1	1.2	6.6
	Herbaceous	Byroid	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1
		Forb	0.2	0.1	0.2	0.1	0.0	0.0	0.2	1.0	0.4	0.3	0.0	0.0	0.2	0.2	0.0	0.0	0.1	2.8	0.4	0.3	1.7	4.9
		Graminoid	0.4	0.3	1.8	2.5	0.0	0.2	5.9	48.3	0.0	0.0	0.0	0.0	0.8	1.0	0.2	8.0	2.3	58.2	0.1	0.1	11.6	118.6
	Total		4.7	3.7	15.8	16.1	3.6	3.6	36.1	234.7	2.4	2.0	4.9	29.3	10.8	14.1	7.3	190.0	16.8	261.2	4.6	3.7	107.0	758.3
Alternative 3	Forest	Broadleaf Forest	0.1	0.0	0.0	0.0	0.1	0.1	0.1	0.3	0.1	0.1	0.5	1.8	0.4	0.4	0.1	2.1	0.5	2.4	0.5	0.4	2.3	7.5
		Needleleaf Forest	1.9	1.6	8.2	7.7	1.5	1.2	9.9	30.2	0.9	0.7	2.8	19.1	2.7	2.0	3.5	43.9	4.7	44.6	1.3	1.0	37.3	151.9
		Mixed Forest	0.1	0.1	0.4	0.3	0.3	0.2	1.1	2.8	0.4	0.3	0.9	0.8	0.3	0.3	0.2	2.4	0.5	2.1	0.4	0.3	4.7	9.6
	Shrub	Tall Shrub	0.1	0.1	0.1	0.1	0.4	0.7	0.4	1.4	0.4	0.4	0.0	0.0	0.6	0.5	0.3	9.8	0.3	4.2	1.2	1.0	4.0	17.9
		Low Shrub	1.8	1.4	4.7	4.8	1.3	1.3	16.6	140.4	0.2	0.2	0.5	7.5	3.6	2.7	3.0	122.8	7.9	134.9	0.6	0.5	40.1	416.4
		Dwarf Shrub	0.0	0.0	0.3	0.4	0.0	0.0	1.1	6.8	0.0	0.0	0.1	0.1	0.2	0.2	0.0	0.7	0.4	9.7	0.0	0.0	2.2	17.9
		Mixed Shrub	0.2	0.2	0.0	0.0	0.0	0.0	0.6	3.5	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.1	2.4	0.1	0.1	1.2	6.4
	Herbaceous	Byroid	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1
		Forb	0.2	0.1	0.2	0.1	0.0	0.0	0.2	1.0	0.4	0.3	0.0	0.0	0.2	0.2	0.0	0.0	0.1	2.8	0.4	0.3	1.7	4.9
		Graminoid	0.4	0.3	1.8	2.5	0.0	0.2	5.9	48.3	0.0	0.0	0.0	0.0	0.5	0.2	0.2	8.0	2.3	58.2	0.1	0.1	11.3	117.9
	Total		4.7	3.7	15.8	16.1	3.6	3.6	36.1	234.7	2.4	2.0	4.9	29.3	8.6	6.4	7.3	190.0	16.8	261.2	4.6	3.7	104.8	750.6
Alternative 4	Forest	Broadleaf Forest	0.1	0.0	0.0	0.0	0.1	0.1	0.3	0.2	0.1	0.1	1.6	1.2	0.4	0.4	0.1	2.1	1.0	0.7	0.5	0.4	4.1	5.2
		Needleleaf Forest	1.9	1.6	8.2	7.7	1.5	1.2	13.8	10.0	0.9	0.6	2.4	2.0	2.7	2.0	3.5	43.9	4.0	3.0	1.3	1.0	40.1	73.0
		Mixed Forest	0.1	0.1	0.4	0.3	0.3	0.2	2.3	1.7	0.4	0.3	0.9	0.7	0.3	0.3	0.2	2.4	0.5	0.3	0.4	0.3	5.8	6.6
	Shrub	Tall Shrub	0.1	0.1	0.1	0.1	0.4	0.7	0.5	0.4	0.4	0.3	0.3	0.2	0.6	0.5	0.3	9.8	4.8	3.5	1.2	1.0	8.8	16.4
		Low Shrub	1.8	1.4	4.7	4.8	1.3	1.3	11.7	8.5	0.2	0.1	0.2	0.3	3.6	2.7	3.0	122.8	7.8	5.9	0.6	0.5	34.8	148.3
		Dwarf Shrub	0.0	0.0	0.3	0.4	0.0	0.0	1.2	0.9	0.0	0.0	0.1	0.1	0.2	0.2	0.0	0.7	1.9	1.4	0.0	0.0	3.7	3.6
		Mixed Shrub	0.2	0.2	0.0	0.0	0.0	0.0	0.6	0.5	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.2	0.1	0.1	1.3	1.1
	Herbaceous	Byroid	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.1	0.0	0.0	0.3	0.2

Table 4-17. Estimated Impact to Vegetation from ORV use of the Nine Trails Analyzed (by Alternative)

Alternative	Vegetation Type	Sub-Type	Black Mountain Trails		Boomerang Trail		Caribou Creek Trail		Copper Lake Trail		Lost Creek Trail		Reeve Field Trail		Soda Lake Trail		Suslota Trail		Tanada Lake Trail		Trail Creek Trail		Total Impacts	
			Miles Crossed	Acres Impacted	Miles Crossed	Acres Impacted	Miles Crossed	Acres Impacted	Miles Crossed	Acres Impacted	Miles Crossed	Acres Impacted	Miles Crossed	Acres Impacted	Miles Crossed	Acres Impacted	Miles Crossed	Acres Impacted	Miles Crossed	Acres Impacted	Miles Crossed	Acres Impacted	Miles Crossed	Acres Impacted
		Forb	0.2	0.1	0.2	0.1	0.0	0.0	0.2	0.2	0.4	0.3	0.0	0.0	0.2	0.2	0.0	0.0	0.1	0.0	0.4	0.3	1.6	1.3
		Graminoid	0.4	0.3	1.8	2.5	0.0	0.2	5.8	4.2	0.0	0.0	0.0	0.0	0.5	0.2	0.2	8.0	3.0	2.2	0.1	0.1	11.8	17.8
	Total		4.7	3.7	15.8	16.1	3.6	3.6	36.4	26.5	2.4	1.8	5.4	4.5	8.6	6.4	7.3	190.0	23.4	17.3	4.6	3.7	112.1	273.6
Alternative 5	Forest	Broadleaf Forest	0.1	0.0	0.0	0.0	0.1	0.1	0.3	0.2	0.1	0.1	1.6	1.2	0.4	0.4	0.1	2.1	0.8	0.6	0.5	0.4	3.9	5.1
		Needleleaf Forest	1.9	1.6	8.2	7.7	1.5	1.2	13.9	10.1	0.9	0.6	2.4	2.0	2.7	2.0	3.5	43.9	5.4	4.0	1.3	1.0	41.6	74.1
		Mixed Forest	0.1	0.1	0.4	0.3	0.3	0.2	2.3	1.7	0.4	0.3	0.9	0.7	0.3	0.3	0.2	2.4	0.4	0.3	0.4	0.3	5.7	6.6
	Shrub	Tall Shrub	0.1	0.1	0.1	0.1	0.4	0.7	0.5	0.4	0.4	0.3	0.3	0.2	0.6	0.5	0.3	9.8	2.8	2.0	1.2	1.0	6.7	14.9
		Low Shrub	1.8	1.4	4.7	4.8	1.3	1.3	11.7	8.5	0.2	0.1	0.2	0.3	3.6	2.7	3.0	122.8	7.9	6.0	0.6	0.5	34.9	148.4
		Dwarf Shrub	0.0	0.0	0.3	0.4	0.0	0.0	1.2	0.9	0.0	0.0	0.1	0.1	0.2	0.2	0.0	0.7	0.4	0.3	0.0	0.0	2.2	2.6
		Mixed Shrub	0.2	0.2	0.0	0.0	0.0	0.0	0.6	0.5	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.1	0.1	0.1	1.3	1.1
	Herbaceous	Byroid	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1
		Forb	0.2	0.1	0.2	0.1	0.0	0.0	0.2	0.1	0.4	0.3	0.0	0.0	0.2	0.2	0.0	0.0	0.3	0.2	0.4	0.3	1.9	1.4
		Graminoid	0.4	0.3	1.8	2.5	0.0	0.2	5.8	4.2	0.0	0.0	0.0	0.0	0.5	0.2	0.2	8.0	2.5	1.9	0.1	0.1	11.3	17.4
	Total		4.7	3.7	15.8	16.1	3.6	3.6	36.5	26.5	2.4	1.8	5.4	4.5	8.6	6.4	7.3	190.0	20.7	15.4	4.6	3.7	109.7	271.8

¹. This table reflects existing impacts and trail re-routes only. Trail improvements are evaluated in the text based on total acres impacted; the data are not in a format that would allow overlay of trail improvement areas with vegetation in GIS.

Table 4-18. Summary of Impacts to Vegetation on Nine ORV Trails and Black Mountain Trails under Alternative 1

Trail	Projected ORV Use (round trips per year)		Action	Vegetation Acres Impacted ¹
	Recreational	Subsistence		
Black Mountain	Closed	65	No improvements	>3.7
Boomerang	7	6	No improvements	16.1
Caribou Creek	121	40	No improvements	>3.6
Copper Lake	30	125	No improvements	>234.7
Lost Creek	153	50	No improvements	2.0
Reeve Field	35	24	No improvements	>29.3
Soda Lake	82	35	No improvements	>14.1
Suslota	Closed	70	No improvements	>190.0
Tanada Lake	Closed	75	No improvements	>261.2
Trail Creek	162	45	No improvements	3.7

¹ Impacted acres based on vegetation types overlaid with trail areas mapped by SMU (2008). These areas are expected to expand with increasing ORV use under Alternative 1 (590 recreational and 582 subsistence ORV round trips compared to 437 and 480, respectively, under current conditions).

Not all exotic species are detrimental to habitat quality or biodiversity. Federal and state agencies have established various noxious weed lists that identify any exotic species that may be injurious to the public health, agriculture, recreation, wildlife habitat, or the biodiversity of native habitats. Although none of the 10 exotic plant species found within the analysis area have been classified as a noxious weed by the USDA (Table 3-8), white sweetclover is a species whose presence is of concern to park managers. This species is a highly invasive plant that has been documented colonizing natural riverine habitats in southeast Alaska (NPS 2007b). It successfully out-competes most other herbaceous species along the park's road systems, due to its rapid growth, deep tap root, and high seed output. The NPS has conducted control efforts for white sweetclover, with some success; however, this species has continued to spread throughout the park's road systems, and will likely continue to do so.

The fact that no noxious weeds were detected during surveys does not indicate that noxious weeds or other exotic species are not present within the analysis area, as comprehensive presence/absence surveys have not been conducted within the entire analysis area, and some weed species may have been dormant during surveys. The NPS plans to continue surveying and monitoring exotic species with the Wrangell-St. Elias National Park and Preserve (including the analysis area).

The AKNHP lists 90 rare plants, having state ranks of between S1 to S3, within the Wrangell-St. Elias National Park and Preserve (Appendix D; Cook et al. 2007). The NPS has conducted detailed inventories of the vascular flora found within Wrangell-St. Elias (Cook et al. 2007); however, comprehensive presence/absence surveys have not been conducted throughout the park. Therefore, the list of rare plant species found within the park and their recorded locations represent known occurrences, and do not indicate the absence of a rare plant species. No re-routes or new trails are proposed under Alternative 1; therefore, there would be no risk of disturbing rare plants via trail construction. However, if rare plants were located adjacent to existing trails currently experiencing expanding widths due to braiding, then these rare plants could be impacted.

The direct and indirect impacts to vegetation within the analysis area would be considered moderate, under this alternative. Despite continued closures to recreational ORV use in Suslota, Tanada Lake, and portions of Copper Lake trails, continued subsistence ORV use on these trails would result in

moderate effects to vegetation. Moderate, long-term, adverse effects would occur along Black Mountain, Caribou Creek, Reeve Field, and Soda Lake trails, due to an increase in the number of expected ORV users along these trails compared to current conditions lack of proposed trail improvements, and expected expansion of impacts in braided areas. Impacts along Boomerang trail would be minor due to the lower expected ORV use (13 round trips) and lack of trail improvements. Impacts along Lost Creek and Trail Creek trails would be minor because, despite increasing ORV use levels, trails would not expand into previously undisturbed areas.

Cumulative

Current developments along the Nabesna Road include a ranger station, a public-use cabin, picnic areas, private landing strips, and a few lodges/bed-and-breakfasts. The Wrangell-St. Elias National Park and Preserve is in the process of initiating a front-country planning effort, which would include the development of new campground improvements (six additional campsites), a new 12-unit campground, parking and boat launch, expansions and/or improvements of existing trailheads, and one additional wayside/outhouse; all located along or near the Nabesna Road. In addition, private inholdings, located within the analysis area, will likely alter or add to existing landscaping. All of these factors would increase the rate of invasion by exotic species within the analysis area, by either creating new ground disturbances or serving as sources for the introduction of additional non-native species to the area. Human developments could also increase the rate of use of this area by humans, resulting in an increase in the direct and indirect impacts to vegetative communities. Because impacts are localized and contained, the cumulative impacts on vegetation associated with these developments would be minor.

In recent decades, Alaska's climate has shown a more rapid warming trend than elsewhere in the United States (Parson 2001). Alaska has also grown substantially wetter over this time period. Over the long term, climate change in Alaska is likely to result in ecosystem-level shifts associated with the northward expansion of the boreal forest (somewhat offset by increases in summer moisture stress, fire, and insect outbreaks) into the tundra zone, as well as landscape-level vegetation changes within these regions (e.g., shifts in plant dominance).

Alterations to Alaska's climate, due to global climate change, could change local environmental conditions by increasing the growing season and creating a climate more tolerable to exotic species such that exotics are more capable of establishing themselves within Alaskan ecosystems (Bauder and Heys 2004, McKee 2006). Global climate change is also expected to alter the severity of insect outbreaks in Alaska (Karl et al. 2009). South-central Alaska has recently experienced the largest outbreak of spruce beetles in the world. This elevated rate of insect outbreaks is likely due to the increased average temperatures in Alaska (due to global climate change), which have allowed this beetle to survive over the winter months and complete their life cycle in a single year, instead of the 2-year period that has been normal in Alaska (Karl et al. 2009). As the analysis area contains a high percentage of spruce species, an outbreak of spruce beetles could adversely impact spruce forest/woodlands. An increase in other insect populations could have adverse impacts on other vegetative communities as well (depending on the species of insect). The severity of impacts to vegetation from climate change is uncertain. Because of the gradual nature of any changes, over the 20-year planning period, impacts to vegetation from climate change are expected to be minor.

As discussed in Section 3.3.2.1, there are approximately 94 miles of other motorized trails in the analysis area (in addition to the nine trails assessed within this EIS). Impacts to vegetation by these trails include abrasion, crushing, and breakage of plant tissues, as well as disruption of root systems and plant mortality. Because of very light use on most of these other trails, vegetation impacts are contained and not expanding. The 1986 inspection notes for many of these trails indicate

revegetation within the trail tread (Connery 1987). However, the Batzulnetas trail receives consistently heavy use (greater than 200 passes per year) and has segments in degraded and very degraded condition, with associated impacts such as increased bare ground and changes in plant composition. Because impacts are localized and contained, the cumulative impacts on vegetation associated with these additional trails would be minor.

The Wrangell-St. Elias National Park and Preserve is considering options for the clean-up of mine tailings at the Nabesna Mine. The current options considered for clean-up include capping materials on site, or hauling tailings out of the area via the Nabesna Road. If mine tailings are hauled out of the area via the Nabesna Road, then some fugitive dust would likely be generated by these transport trucks and be deposited along the road. Adverse effects of fugitive general dust deposits on vegetation include a reduction in photosynthetic capacity and, in extreme cases, the complete burial of plants. These effects can lead to changes in species composition in the areas most heavily affected. In addition, if the trucks were uncovered and tailings were to be included as a component of the fugitive dust, the dust could contain high levels of heavy metals, which have been shown to impact vegetation. These impacts include the alteration of soil pH, desiccation of plant materials, and the toxic effects of elevated metal levels within intercellular plant structures (Foy 1978, Auerbach 1997). These impacts would be minor because they would be limited to small areas adjacent to the Nabesna Road and the trailheads along this road. Assuming a 5-foot area along each side of the 42-mile length of the Nabesna Road, the total area that could be impacted would be approximately 50 acres. ORVs traveling from the Nabesna Road down the trails could transport some of this fugitive dust along the trail networks (via their wheels); however, the amount of fugitive mine dust transported via ORV down these trails would likely be limited and lessen with distance from the fugitive dust source.

The net effect of these other past, present, and foreseeable future actions on vegetation would be minor; however, in combination with the moderate, long-term, adverse direct and indirect impacts to vegetation under Alternative 1, cumulative impacts would result in net long-term, moderate, adverse cumulative impacts to vegetation in the analysis area.

Conclusion

Continued subsistence ORV use without trail improvements would allow trails to continue moving into previously undisturbed areas, resulting in moderate, long-term, adverse impacts to vegetation along the Copper Lake, Tanada Lake, and Suslota trails. The lack of trail improvements and the lack of vegetative recovery from closing trails to recreational ORV use, combined with the continued ORV use on the Black Mountain, Caribou Creek, Reeve Field, and Soda Lake trails, would result in moderate adverse impacts to vegetation. Because of very limited use (13 round trips per year), impacts along Boomerang trail would be contained within the existing trail footprint, and therefore minor. Because of the lack of trail braiding, impacts to vegetation along Lost Creek and Trail Creek trails would be minor. Without trail improvements, trail widening would likely continue to occur within low shrub and herbaceous communities (even on trails closed to recreational ORV use), resulting in long-term impacts to previously undisturbed vegetative communities. Therefore, this alternative would have a net moderate long-term, adverse impact on vegetation.

The moderate impacts to vegetation anticipated from this alternative would not result in an impairment of park resources that fulfill specific purposes identified in the establishing legislation or that are essential to the integrity of the park.

4.3.2.5 Alternative 2 Effects on Vegetation

Direct and Indirect

Alternative 2 does not include any reconstruction or re-routing of trails, nor any trail improvements. Therefore, construction activities would not be a source of impacts to vegetation under this alternative.

Table 4-17 compares the estimated miles and acreage of impacts that would occur to the various vegetation types under each of the alternatives, as a result of past, present, and projected future ORV use. Table 4-19 summarizes the impacts to vegetation that would occur on each trail under Alternative 2 and was used to reach the conclusions for direct and indirect impacts under this alternative. The values reported for Alternative 2 are based on the existing trail footprint, including historic trail impacts, and the “greater than” symbols are added where impacts to vegetation are expected to expand.

Table 4-19. Summary of Impacts to Vegetation on Nine ORV Trails and Black Mountain Trails under Alternative 2

Trail	Projected ORV Use (round trips per year)		Actions	Vegetation Acres Impacted ¹
	Recreational	Subsistence		
Black Mountain	Closed	55	No improvements	>3.7
Boomerang	4	4	No improvements	16.1
Caribou Creek	92	40	No improvements	>3.6
Copper Lake	35	110	No improvements	>234.7
Lost Creek	121	47	No improvements	2.0
Reeve Field	21	24	No improvements	29.3
Soda Lake	49	20	No improvements	>14.1
Suslota	85	62	No improvements	>190.0
Tanada Lake	105	73	No improvements	>261.2
Trail Creek	138	41	No improvements	3.7

¹ Impacted acres based on vegetation types overlaid with trail areas mapped by SMU (2008). These areas are expected to expand with increasing ORV use under Alternative 2 (650 recreational and 521 subsistence ORV round trips compared to 437 and 480, respectively, under current conditions).

As shown in Table 4-1, ORV use is expected to increase under Alternative 2 compared to current conditions. This increase in ORV use without trail improvements would likely result in increased impacts to vegetative communities, including an increase in the likelihood of trail braiding occurring, a decrease in vegetative cover and biodiversity, and a simplification of vegetative structure. Table 4-1 shows that at least six of the trails (Caribou Creek, Copper Lake, Lost Creek, Suslota, Tanada Lake, and Trail Creek) would be likely have more than 100 ORV round trips (200 passes) each year. However, Lost Creek and Trail Creek trails occur on gravel floodplains outside of the shrub-tussock community analyzed by Ahlstrand and Racine (1990). As indicated in Table 4-19, few acres of vegetation would be impacted along these trails. The remaining analysis area trails would have between 8 and 69 ORV round trips each year (with Boomerang trail having the lowest projected level of use). All but Boomerang and Reeve Field trails are likely to have more than 100 passes per year, which exceed the number of passes associated with moderate impacts to vegetation (Happe et al. 1998). Changes in the natural function and character of the plant communities would occur over many locations along these trails. Impacts along Boomerang and Reeve Field trails would be localized, and therefore minor, with 16 and 90 passes per year, respectively. Trail hardening has been

shown to reduce trail widening and braiding, by limiting the impact to soils and preventing the creation of large muck-holes (Allen et al. 2000); however, no trail hardening has been proposed under Alternative 2. In addition, no mitigations for trail impacts would occur under this alternative.

Ten exotic plant species have been documented within the analysis area along the Nabesna Road (Table 3-8; Figure 3-11). The exotic species found along this road could be dispersed throughout the trail network as all of the trails found within the analysis area are either accessed from the Nabesna Road, or by other trails that are accessed by the Nabesna Road. ORVs can serve as vectors for exotic plant dispersal by transporting seeds or other plant materials along the linear trail network (Loomis and Liebermann 2006); therefore, exotic plant species would likely spread into the trail network under this alternative.

Ninety-one rare plants identified by AKNHP in the Wrangell-St. Elias National Park and Preserve (Cook et al. 2007) are listed in Appendix D. Due to the wide diversity of habitat types, each of these species could potentially be present in the analysis area; however, species found in high alpine and mountainous areas less likely to occur in the analysis area where these habitat types are less common. If rare plants were located adjacent to existing trails currently experiencing expanding widths due to braiding, then those plants could be impacted.

The direct and indirect impacts to vegetation within the analysis area would be considered major under this alternative because of the large extent of the most severe impacts. Little or no vegetation recovery would occur under Alternative 2, as no re-route, reconstruction, or trail hardening would be conducted. The three most degraded trails (Suslota, Tanada Lake, and the portion of the Copper Lake located north of the Boomerang trail) would remain open year round to recreational and subsistence ORV users, which would result in continued trail braiding within these areas. Because of the continued expansion of trail widths within areas that are already heavily impacted and the resulting permanent adverse impacts to previously undisturbed areas, impacts to vegetation from ORV use along Suslota, Tanada Lake, and Copper Lake trails would be major. Moderate impacts would occur along Black Mountain, Caribou Creek, and Soda Lake trails because expected ORV use along these trails would occur at levels that would likely result in long-term impacts over many locations. Impacts on Boomerang and Reeve Field trails would likely be minor due to low ORV use. Impacts on Lost and Trail Creek would be minor because these trails are located on gravel floodplains with very little vegetation.

Cumulative

The impacts of other nearby past, present, and foreseeable future actions on vegetation are described under Alternative 1 and would result in minor, long-term, adverse impacts on vegetation. The net effect of these impacts, in combination with the direct and indirect impacts to vegetation likely under Alternative 2 would be long-term, major, adverse impacts to vegetation in the analysis area.

Conclusion

Continued ORV use with no closures to recreational use and the lack of trail improvements would allow trails to continue moving into previously undisturbed areas, resulting in major, long-term, adverse impacts to vegetation along the Copper Lake, Tanada Lake, and Suslota trails. Trail widening would continue to occur within low shrub and herbaceous communities (even on trails closed seasonally to recreational ORV use), resulting in long-term impacts to previously undisturbed vegetative communities. The lack of trail improvements and the lack of vegetative recovery associated with trail closures, combined with the continued ORV use on the Black Mountain, Caribou Creek, and Soda Lake trails, would result in moderate adverse impacts to vegetation. Impacts along

Boomerang and Reeve Field trails would be localized, and therefore minor, with few ORV round trips per year. Impacts on Lost and Trail Creek would be minor because these trails are located on gravel floodplains with very little vegetation. Because of the extent of major impacts on Copper Lake, Tanada Lake, and Suslota trails, this alternative would have a net major, long-term, adverse effect on vegetation.

This alternative would result in major impacts to vegetation. These impacts are not considered an impairment of park resources and values for the following reasons:

- Major impacts to vegetation are projected to occur on at least 715 acres. This represents 0.08 percent of the vegetation within the analysis area and would not result in a large scale change to the natural function and character of the vegetation community.
- While the impacts described above have an obvious effect on the natural state of the landscape, they do not occur at a scale that threatens intact native ecological communities.
- Impacts to vegetation at the scale described for this alternative are not key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park.

4.3.2.6 Alternative 3 Effects on Vegetation

Direct and Indirect

Alternative 3 would include a re-routing of the Soda Lake trail and the construction of a non-motorized trail (Rock Creek trail). Construction would result in approximately 12.8 acres of disturbance to vegetation. Ground-disturbing construction activities in previously undisturbed locations would result in minor impacts because the increase in the potential for invasion by exotic species would be short term, and any vegetation changes would be localized. In addition, as these new trails would impact previously undisturbed areas, the risk of impacting a rare plant species would be increased, a minor impact because of the extent of disturbance (12.8 acres).

Table 4-17 compares the estimated miles and acreage of impacts that would occur to the various vegetation types under each of the alternatives, as a result of past, present, and projected future ORV use. Table 4-20 summarizes the impacts to vegetation that would occur on each trail under Alternative 3 and was used to reach the conclusions for direct and indirect impacts under this alternative. The values reported for Alternative 3 are based on the existing trail footprint, including historic trail impacts. Where trail construction is proposed, the Acres Allowed to Recover column in Table 4-20 lists the estimated acreage of currently impacted vegetation that would be allowed to recover under this alternative.

Recreational ORV use would not be permitted under Alternative 3, which would reduce the use of trails by ORVs compared to current conditions. Table 4-1 shows annual ORV use is estimated at approximately 582 round trips under Alternative 3, compared to 917 round trips under current conditions. This reduction in ORV use would reduce impacts to vegetation, due to the reduced number of ORV passes that would occur along each trail. However, the majority of impacts to vegetation occur within the first 20 passes of an ORV, and with 6 projected ORV round trips, Boomerang is the only trail that would likely have less than 20 passes per year. Five of the trails (Copper Lake, Black Mountain, Lost Creek, Suslota, and Tanada Lake) would likely experience more than 100 ORV passes. However, Lost Creek and Trail Creek trails occur on gravel floodplains outside of the shrub-tussock community analyzed by Ahlstrand and Racine (1990). Few acres of vegetation would be impacted along these trails. On the other four trails, these ORV use levels

indicate that although trail impacts likely would be reduced under Alternative 3, the number of passes by ORVs that most trails would experience would likely exceed the number associated with the majority of impacts to vegetation. However, the reduced number of passes and impacts to soil condition would reduce the risk of invasion by exotic species along these trails, compared to existing conditions.

Table 4-20. Summary of Impacts to Vegetation on Nine ORV Trails and Black Mountain Trails under Alternative 3

Trail	Projected ORV Use (round trips per year)		Actions	Vegetation Acres Impacted ¹	Acres Allowed to Recover ²	
	Recreational	Subsistence			Due to Re-Routes	Due to Trail Improvements
Black Mountain	Closed	65	No improvements	3.7	0	0
Boomerang	Closed	6	No improvements	16.1	0	0
Caribou Creek	Closed	40	No improvements	3.6	0	0
Copper Lake	Closed	125	No improvements	234.7	0	0
Lost Creek	Closed	50	No improvements	2.0	0	0
Reeve Field	Closed	24	No improvements	29.3	0	0
Soda Lake	Closed	35	Constructed re-route with closure of old degraded trail	6.4	10.6	0
Suslota	Closed	70	No improvements	190.0	0	0
Tanada Lake	Closed	75	No improvements	261.2	0	0
Trail Creek	Closed	45	No improvements	3.7	0	0

¹ Impacted acres based on vegetation types overlaid with trail areas mapped by SMU (2008). These areas are not expected to increase substantially with similar or decreasing ORV use under Alternative 3 (0 recreational and 582 subsistence ORV round trips compared to 437 and 480, respectively, under current conditions).

² Under Alternative 3, only Soda Lake trail would be re-routed. These columns represent estimates of the acres of vegetation along the original trail that would recover after that original trail was closed, and the acres of vegetation that would recover near trail improvements. They are based on current impacts along trails that would be closed due to reroutes, as well as existing impacts located near proposed trail improvements.

The re-routing of the Soda Lake trail and closure of the original trail bed would allow the disturbed vegetation found along the original trail's route to recover. The acreages of currently disturbed vegetation that would be allowed to recover are listed in Table 4-21. Rates of vegetative recovery on closed/inactive trails would differ among the various vegetation types found within the analysis area. Studies conducted in the Wrangell-St. Elias National Park and Preserve have shown that dwarf shrub communities do not recover well after a trail becomes inactive (Happe et al. 1998). Recovery is also very poor in most low shrub communities, with the possible exception of open low shrub communities dominated by birch and willow (Happe et al. 1998). Recovery in herbaceous-dominated communities is likely high due to the expansion of graminoid species such as *Carex spp.*; however, lichen recovery within these communities is absent and moss recovery is slow (Happe et al. 1998). Recovery rates in tall shrub and broadleaf forests appear to be low, while recovery rates in needleleaf forests were highly variable across the areas sampled during previous studies (Happe et al. 1998). Closed trails do not typically recover to pre-trail conditions, and instead develop limited vegetative structure (1 to 2 layers), lower vegetative cover, and a different species composition compared to

adjacent undisturbed vegetation. These altered conditions are detectable for considerable lengths of time; for example, some trails that have been closed for 20 years within the park are still visible, displaying reduced cover, structure, and altered species composition (Loomis and Liebermann 2006). In addition, the level of ORV use prior to closure may not have a substantial impact on recovery rates. A study conducted in the park found that vegetative cover on inactive/closed trails did not statistically differ among trails with previously high (greater than 100 passes per year), medium (between 50 and 100 passes per year), and low use (less than 50 passes per year) (Happe et al. 1998). Additional factors affecting vegetative recovery include the slope, aspect, soil moisture levels and morphology, and hydrological regime of the area.

Table 4-21. Acres of Currently Impacted Vegetation that Would be Allowed to Recover under Alternative 3, Due to Re-routes

Vegetation Type	Sub-Type	Soda Lake Trail; Acres Recovered
Forest	Broadleaf Forest	0.0
	Needleleaf Forest	4.5
	Mixed Forest	0.0
Shrub	Tall Shrub	0.1
	Low Shrub	4.7
	Dwarf Shrub	0.4
	Mixed Shrub	0.3
Herbaceous	Bryoid	0.0
	Forb	0.0
	Graminoid	0.8
Total		10.6

Impacts to vegetative communities would likely be less than those experienced under current conditions, due to the monitoring/management actions that have been proposed for this alternative to prevent the expansion of impacts on unimproved trails (see Section 2.4.3), and the reduced ORV use expected under this alternative. Moderate adverse impacts would occur along Black Mountain, Copper Lake, Suslota, and Tanada Lake trails because of the lack of trail improvements and increases in subsistence ORV use to levels that could result in long-term impacts. Impacts would be minor along Boomerang, Caribou Creek, Lost Creek, Reeve Field, Soda Lake, and Trail Creek trails, due to the reduced ORV use and the implementation of the proposed monitoring/management program.

Because of the continued use of trails at levels that could result in long-term impacts (although reduced compared to current conditions) and the lack of trail improvements along the most degraded trails, the direct and indirect impacts to vegetative resources under this alternative would be moderate.

Cumulative

The impacts of other nearby past, present, and foreseeable future actions on vegetation are described under Alternative 1 and would result in minor, long-term, adverse impacts on vegetation. The net effect of these impacts, in combination with the direct and indirect impacts likely under Alternative 3, would be long-term, moderate, adverse impacts to vegetation in the analysis area.

Conclusion

Construction of the Soda Lake re-route would result in direct impacts to vegetation over a small area. Moderate impacts to vegetation would occur along Black Mountain, Copper Lake, Suslota, and Tanada Lake trails because of the lack of trail improvements and increases in subsistence ORV use to levels that could result in long-term impacts. Impacts to vegetation would be minor along Boomerang, Caribou Creek, Lost Creek, Reeve Field, Soda Lake, and Trail Creek trails, due to the reduced ORV use and the implementation of the proposed monitoring/management program. Because of the continued ORV use of some trails at levels that could result in long-term impacts, the direct and indirect impacts to vegetative resources under this alternative would be moderate.

The moderate impacts to vegetation anticipated from this alternative would not result in an impairment of park resources that fulfill specific purposes identified in the establishing legislation or that are essential to the integrity of the park.

4.3.2.7 Alternative 4 Effects on Vegetation

Direct and Indirect Effects

Under Alternative 4, eight of nine trails (all but Suslota) would be improved to at least a maintainable condition. Proposed activities include re-routing trails, trail reconstruction, installation of trail hardening, and creation of new non-motorized trails and routes. On improved and unimproved trails or trail segments, impact standards (as described in Section 2.4.4) would be applied to ensure that impacts do not expand beyond current conditions. Construction and trail improvement activities would result in approximately 119.5 acres of construction disturbance and complete removal of vegetation within the disturbed area. Where trail improvement activities result in vegetation removal greater than the designed trail tread width (such as cut/fill construction), disturbed areas outside the trail tread would re-vegetate. This could result in increased potential for invasion by exotic species over the short term. In addition, both gravel and GeoBlocks are being considered for trail hardening under Alternative 4. The use of gravels as a trail hardening material could increase the potential for invasion by exotic species, if these materials contain exotic plant parts or seeds. Also, as new/re-routed trails would impact previously undisturbed areas, the risk of impacting a rare plant species would increase.

Table 4-17 compares the estimated miles and acreage of impacts that would occur to the various vegetation types under each of the alternatives, as a result of past, present, and projected future ORV use. Table 4-22 summarizes the impacts to vegetation that would occur on each trail under Alternative 4 and was used to reach the conclusions for direct and indirect impacts under this alternative. The values reported for Alternative 4 are based on the existing trail footprint, including historic trail impacts, and the “less than” symbols are added where impacts to vegetation are expected to decrease. Where trail construction is proposed, the Acres Allowed to Recover column in Table 4-22 lists the estimated acreage of currently impacted vegetation that would be allowed to recover under this alternative.

Under Alternative 4, recreational use would not be allowed on Suslota, Tanada Lake, Copper Lake, and Boomerang trails; however, overall trail use by ORVs would increase under this alternative, compared to current conditions. Levels of ORV use are estimated at approximately 1,771 round trips under Alternative 4, compared to 917 round trips under current conditions. Despite this increase in trail use, disturbances from ORVs are not expected to be frequent, and the associated potential for invasion by exotic plant species is not expected to increase, because the trails would be improved, allowing ORV users to stay on one trail alignment. The expected number of ORV passes under this

alternative would exceed the number under which the majority of impacts occur to vegetation; however, impacts to vegetation would be minimized where trails were improved under this alternative. In addition, proposed management tools to respond to monitoring of improved trails would be proactive under Alternative 4 (see Section 2.4.4). As a result, trail braiding is unlikely to occur on any improved trails or re-routes.

Table 4-22. Summary of Impacts to Vegetation on Nine ORV Trails and Black Mountain Trails under Alternative 4

Trail	Projected ORV Use (round trips per year)		Actions	Vegetation Acres Impacted ¹	Acres Allowed to Recover ²	
	Recreational	Subsistence			Due to Re-Routes	Due to Trail Improvements
Black Mountain	Closed	144	Spot hardening and minor re-route construction using hand crews	<3.7	0	Unknown, but could be substantial
Boomerang	Closed	6	Improvement of river ramp	16.1	0	Minimal
Caribou Creek	180	25	Major trail hardening and some re-alignment	<3.6	0	Minimal
Copper Lake	Closed	274	Constructed re-route and hardening with old trail closure.	26.5	179.0	6.3
Lost Creek	153	50	Bladed trail to minimize crossings	<1.8	0	Minimal
Reeve Field	50	24	Re-route with closure of old degraded trail.	4.5	26.8	0
Soda Lake	126	25	Constructed re-route with closure of old degraded trail	6.4	10.6	0
Suslota	Closed	70	No improvements	190.0	0	0
Tanada Lake	Closed	265	Constructed re-route with closure of old trail.	17.3	257.7	0
Trail Creek	162	45	Bladed trail to minimize crossings	<3.7	0	Minimal

¹ Impacted acres based on vegetation overlaid with trail areas mapped by SMU (2008). Because of trail improvements, these areas are not expected to expand substantially with increasing ORV use under Alternative 4 (671 recreational and 1,100 subsistence ORV round trips compared to 437 and 480, respectively, under current conditions).

² Under Alternative 4, portions of Copper Lake, Reeve Field, Soda Lake, and Tanada Lake trails would be re-routed. This column represents the estimate of the acres of vegetation along the original trails that would recover after those trail segments were closed. They are based on current impacts along trails that would be closed due to reroutes, as well as existing impacts located near proposed trail improvements.

Use of the wilderness trails (Black Mountain trail system and the trails south of Tanada Lake) by subsistence ORV users is projected to at least double under this alternative. With no controls on off-trail use by subsistence ORV users, it is expected that there would be an increase in off-trail vegetation impacts such as vegetation stripping, plant mortality, and increase in bare ground, particularly along the Black Mountain trail system.

Trail improvements and re-routes would allow some disturbed vegetation located along the original trail segments to recover. The acreages of currently disturbed vegetation that would be allowed to recover following trail re-routes (of portions of the Copper Lake, Reeve Field, Soda Lake and Tanada Lake trails) are listed in Table 4-23. In addition to the opportunity for recovery of the 474 acres provided by re-routes, trail improvements would allow approximately 6.3 acres of vegetation to

recover along the Copper Lake trail. Although the exact breakdown of acreage by vegetation type allowed to recover is uncertain, the majority would likely consist of low shrub and needleleaf forest types. Trail improvements along the Caribou Creek, Trail Creek, and Lost Creek trails would not result in substantial recovery of existing impacts because these trails are in relatively good condition. Trail improvements that would allow ORV users to stay on one trail alignment could result in substantial recovery of vegetation along Black Mountain trail. As discussed under Alternative 3, vegetative communities would not all recover at the same rate or to the same level.

Table 4-23. Acres of Currently Impacted Vegetation that Would be Allowed to Recover under Alternative 4, Due to Re-routes¹

Vegetation Type	Sub-Type	Copper Lake Trail; Acres Recovered	Reeve Field Trail; Acres Recovered	Soda Lake Trail; Acres Recovered	Tanada Lake Trail; Acres Recovered
Forest	Broadleaf Forest	0.2	1.5	0.0	2.3
	Needleleaf Forest	19.1	17.7	4.5	42.8
	Mixed Forest	1.1	0.3	0.0	2.1
Shrub	Tall Shrub	0.7	0.0	0.1	4.1
	Low Shrub	118.4	7.2	4.7	131.0
	Dwarf Shrub	4.3	0.0	0.4	9.5
	Mixed Shrub	1.1	0.0	0.3	2.3
Herbaceous	Bryoid	0.0	0.0	0.0	0.0
	Forb	0.8	0.0	0.0	2.8
	Graminoid	33.2	0.0	0.8	60.7
Total		179.0	26.8	10.6	257.7

¹ This table reflects recovery along portions of trails that would be closed because of proposed re-routes. Additional recovery would occur during trail improvements including along Caribou Creek, Lost Creek, Trail Creek, Copper Lake, and Boomerang trails, and improvements in the Black Mountain trails and wilderness trails system south of Tanada Lake. Trail improvement data are not in a format that would allow overlay with wetlands in GIS.

The direct and indirect impacts to vegetation under this alternative would be considered minor. Adverse impacts to vegetation from ORV use would be minor along Black Mountain, Boomerang, Caribou Creek, Copper Lake, Lost Creek, Reeve Field, Soda Lake, Tanada Lake, and Trail Creek trails due to the implementation of the trail improvements, trail re-routes, as well as the implementation of the proposed monitoring/management program. Impacts to vegetation from ORV use would be minor along the Suslota trail, assuming that the proposed monitoring/management actions would prevent expansion of impacts.

Cumulative

The impacts of other nearby past, present, and foreseeable future actions on vegetation are described under Alternative 1 and would result in minor, long-term, adverse impacts on vegetation. The net effect of these impacts, in combination with the direct and indirect impacts likely under Alternative 4, would be long-term, minor, adverse impacts to vegetation in the analysis area. .

Conclusion

Trail improvement activities would directly impact 119.5 acres of vegetation in the short term but would allow ORV users to stay on one trail alignment and therefore minimize impacts to vegetation in the long term. Minor impacts to vegetation from ORV use would occur along Black Mountain, Boomerang, Caribou Creek, Copper Lake, Lost Creek, Reeve Field, Soda Lake, Tanada Lake, and Trail Creek trails because of trail improvements and the implementation of the proposed

monitoring/management program. Impacts to vegetation from ORV use would be minor along the Suslota trail due to the implementation of the proposed monitoring/management program, which would prevent the expansion of impacts. In addition, it is possible that the total net acreage of vegetation impacts would be less than current conditions due to a recovery of vegetation that is located along trails that would be closed (i.e., re-routed around) or improved. Based on these factors, Alternative 4 would have a net minor, long-term, adverse impact to vegetative resources.

The minor impacts to vegetation anticipated from this alternative would not result in an impairment of park resources that fulfill specific purposes identified in the establishing legislation or that are essential to the integrity of the park.

4.3.2.8 Alternative 5 Effects on Vegetation

Direct and Indirect

This alternative would improve most degraded segments of the trails to at least a maintainable condition. This would include re-routing trails, trail reconstruction, and installation of trail hardening. On improved and unimproved trails or trail segments, impact standards (as described in Section 2.4.5) would be applied to ensure that impacts do not expand beyond current conditions. In addition, new non-motorized trails and routes would be created. These construction and trail improvement activities would result in approximately 139.2 acres of construction disturbance and complete removal of vegetation within the disturbed area. Where trail improvement activities result in vegetation removal greater than the designed trail tread width (such as cut/fill construction), disturbed areas outside the trail tread would re-vegetate. Ground-disturbing construction activities in previously undisturbed locations would result in a short-term increase in the rate of invasion by exotic species. In addition, both gravel and GeoBlocks are being considered for trail hardening under Alternative 5. The use of gravels as a trail hardening material could increase the potential for invasion by exotic species, if these materials contain exotic plant parts or seeds. Also, as the improvements include new trails that would impact previously undisturbed areas, the risk of impacting a rare plant species would increase.

Table 4-17 compares the estimated miles and acreage of impacts that would occur to the various vegetation types under each of the alternatives, as a result of past, present, and projected future ORV use. Table 4-24 summarizes the impacts to vegetation that would occur on each trail under Alternative 5 and was used to reach the conclusions for direct and indirect impacts under this alternative. The values reported for Alternative 5 are based on the existing trail footprint, including historic trail impacts, and the “less than” symbols are added where impacts to vegetation are expected to decrease. Where trail construction is proposed, the Acres Allowed to Recover column in Table 4-24 lists the estimated acreage of currently impacted vegetation that would be allowed to recover under this alternative.

Trail use is expected to increase under this alternative compared to current conditions. Levels of ORV use are estimated at approximately 1,679 round trips under Alternative 5, compared to 917 round trips under current conditions. Despite this increase in trail use, disturbances are not expected to be frequent, and the associated potential for invasion by exotic plant species is not expected to increase, because these trails would be improved, allowing ORV users to stay on one trail alignment. The expected number of ORV passes under this alternative would exceed the number associated with the majority of impacts to vegetation; however, impacts to vegetation would be minimized where trails were improved under this alternative. In addition, proposed management tools to respond to monitoring of improved trails would be proactive under Alternative 5 (see Section 2.4.4). As a result, trail braiding is unlikely to occur on any improved trails or re-routes. Controls on off-trail use by

subsistence ORV users on the Black Mountain trail and the wilderness trails south of Tanada Lake would limit off-trail vegetation impacts, such as vegetation stripping, plant mortality, or increases in bare ground.

Table 4-24. Summary of Impacts to Vegetation on Nine ORV Trails and Black Mountain Trails under Alternative 5

Trail	Projected ORV Use (round trips per year)		Actions	Vegetation Acres Impacted ¹	Acres Allowed to Recover ²	
	Recreational	Subsistence			Due to Re-Routes	Due to Trail Improvements
Black Mountain	Closed	90	Spot hardening and minor re-route construction using hand crews	<3.7	0	Unknown, but could be substantial
Boomerang	7	6	Improvement of river ramp	16.1	0	Minimal
Caribou Creek	180	25	Major trail hardening and some re-alignment	<3.6	0	Minimal
Copper Lake	125	171	Constructed re-route and hardening with old trail closure.	26.5	179.0	6.3
Lost Creek	153	50	Bladed trail to minimize crossings	<1.8	0	Minimal
Reeve Field	50	24	Re-route with closure of old degraded trail.	4.5	26.8	0
Soda Lake	126	25	Constructed re-route with closure of old degraded trail	6.4	10.6	0
Suslota	Closed	80	Spot hardening of degraded meadows and stream crossings	<190.0	0	10.0
Tanada Lake	234	78	Constructed re-route with closure of old trail.	15.4	55.2	222.8
Trail Creek	162	45	Bladed trail to minimize crossings	<3.7	0	Minimal

¹ Impacted acres based on vegetation overlaid with trail areas mapped by SMU (2008). Because of trail improvements, these areas are not expected to expand substantially with increasing ORV use under Alternative 5 (1,037 recreational and 642 subsistence ORV round trips compared to 437 and 480, respectively, under current conditions).

² Under Alternative 5, portions of Copper Lake, Reeve Field, Soda Lake, and Tanada Lake trails would be re-routed. This column represents the estimate of the acres of vegetation along the original trails that would recover after those trail segments were closed. They are based on current impacts along trails that would be closed due to reroutes, as well as existing impacts located near proposed trail improvements.

Trail improvements and re-routes would allow some disturbed vegetation to recover. The acreages of currently disturbed vegetation that would be allowed to recover following trail re-routes (of portions of the Copper Lake, Reeve Field, Soda Lake, and Tanada Lake trails) are listed in Table 4-25. Under Alternative 5, approximately 271.6 acres of vegetation would be allowed to recover due to re-routes. In addition to the opportunity for recovery provided by the re-routes, trail improvements would allow approximately 222.8 acres of vegetation to recover along the Tanada Lake trail, 6.3 acres along the Copper Lake trail, and 10.0 acres along the Suslota trail. Although the exact breakdown of acreage by vegetation type that would be allowed to recover is uncertain, the majority would likely consist of low shrub and needleleaf forest types. Minimal recovery would occur along Boomerang trail, due to the trail hardening that would be done along the existing ramp. Trail improvements along the Caribou Creek, Trail Creek, and Lost Creek trails would not result in substantial recovery of existing impacts. Trail improvements could result in substantial recovery of vegetation along Black Mountain

trail because ORV users would be able to stay on one trail alignment, thus minimizing impacts from trail braiding and off-trail travel. As discussed for Alternative 3, vegetative communities would not all recover at the same rate or to the same level.

Table 4-25. Acres of Currently Impacted Vegetation that would be allowed to Recover under Alternative 5, Due to Re-routes¹

Vegetation Type	Sub-Type	Copper Lake Trail; Acres Recovered	Reeve Field Trail; Acres Recovered	Soda Lake Trail; Acres Recovered	Tanada Lake Trail; Acres Recovered
Forest	Broadleaf Forest	0.2	1.5	0.0	0.5
	Needleleaf Forest	19.1	17.7	4.5	10.5
	Mixed Forest	1.1	0.3	0.0	0.9
Shrub	Tall Shrub	0.7	0.0	0.1	1.4
	Low Shrub	118.4	7.2	4.7	31.3
	Dwarf Shrub	4.3	0.0	0.4	1.1
	Mixed Shrub	1.1	0.0	0.3	0.0
Herbaceous	Bryoid	0.0	0.0	0.0	0.0
	Forb	0.8	0.0	0.0	0.3
	Graminoid	33.2	0.0	0.8	9.3
Total		179.0	26.8	10.6	55.2

¹ This table reflects recovery along portions of trails that would be closed because of proposed re-routes. Additional recovery would occur during trail improvements including along Caribou Creek, Lost Creek, Suslota, Trail Creek, Tanada Lake, Copper Lake, and Boomerang trails, and improvements in the Black Mountain trails and wilderness trails system south of Tanada Lake. Trail improvement data are not in a format that would allow overlay with wetlands in GIS.

The direct and indirect impacts to vegetation under this alternative would be considered minor. Trail improvement and construction would directly impact 139.5 acres of vegetation in the short term but would result in long term benefits by allowing ORV users to stay on one trail alignment, thus preventing the expansion of impacts associated with trail braiding or off-trail use. Adverse impacts to vegetation from ORV use would be minor along Black Mountain, Boomerang, Caribou Creek, Copper Lake, Lost Creek, Reeve Field, Soda Lake, Suslota, Tanada Lake, and Trail Creek trails, due to the implementation of the trail improvements, re-routes, as well as the implementation of the proposed monitoring/management program.

Cumulative

The impacts of other nearby past, present, and foreseeable future actions on vegetation are described under Alternative 1 and would result in minor, long-term, adverse impacts on vegetation. The net effect of these impacts, in combination with the direct and indirect impacts likely under Alternative 5, would be long-term, minor, adverse impacts to vegetation in the analysis area.

Conclusion

Trail improvement and construction would directly impact 139.5 acres of vegetation in the short term but would result in long term benefits by allowing ORV users to stay on one trail alignment, thus preventing the expansion of impacts associated with trail braiding or off-trail use. Minor impacts to vegetation from ORV use would occur along Black Mountain, Boomerang, Caribou Creek, Copper Lake, Lost Creek, Reeve Field, Soda Lake, Suslota, Tanada Lake, and Trail Creek trails because of trail improvements and the implementation of the proposed monitoring/management program. In addition, it is possible that the total net acreage of vegetation impacts would be less than current conditions due to a recovery of areas that are located along trails that would be closed (i.e., re-routed

around) or improved. Based on these factors, Alternative 5 would have a net minor, long-term, adverse impact to vegetation.

The minor impacts to vegetation anticipated from this alternative would not result in an impairment of park resources that fulfill specific purposes identified in the establishing legislation or that are essential to the integrity of the park.

4.3.3 Water Quality and Fish Habitat

4.3.3.1 Methodology

The fish resources and habitat effects analysis was conducted by evaluating the specific actions associated with the proposed alternatives relative to fish resources and the habitats that could be affected. This analysis included first identifying which specific project actions could affect fish habitat and populations based on published literature and specific studies conducted within the Wrangell-St. Elias National Park and Preserve. Applicable references are summarized throughout Section 3.4.3. The level of effect of these project actions (e.g., based on the specific trail-stream crossing locations mapped by Buncic et al. [2009] or frequency of use based on projections in Table 4-1) was then determined. Additionally, trail-modifying actions (e.g., trail re-route, trail hardening, limitation on trail use) were also considered as mitigating actions. The relative importance of the resources likely to occur in the areas of effect (e.g., salmon spawning habitat) was also considered for both the adverse and mitigative actions. Then the combined effects were evaluated against the threshold criteria shown below to develop an overall assessment of the significance of the effect of the alternative's actions on the aquatic resources of Wrangell-St. Elias National Park and Preserve.

4.3.3.2 Impact Threshold Criteria

To determine the significance of effects on fish resources and habitat the impacts are compared against the following threshold criteria:

Negligible: Effects to fish habitat would be at or below the level of detection and would not be measurable or of any perceptible consequence to fish or other aquatic populations.

Minor: Effects to fish habitat would be measurable or perceptible, but localized within a small area. Viability of aquatic populations would not be affected.

Moderate: Effects to fish habitat would be measurable or perceptible. Viability of aquatic populations could be affected and mortality of individuals or disturbance of spawning gravels might occur.

Major: Effects to fish habitat would be readily apparent and would occur at multiple locations along a stream or river, substantially changing aquatic populations within a stream.

4.3.3.3 Assumptions

Where stream-specific fish inventories are not available, it is assumed that fish species are present if the stream is a tributary to a documented fish-bearing stream or river, unless the tributary is documented as intermittent or some obstruction to fish passage is noted.

Any future culvert installation would be passable to fish.

ORV trail users would generally follow the rules as designated by the NPS for each alternative.

Impact thresholds were selected assuming that local, site-specific effects are of lesser concern than effects that extend over a greater range of locations or that may affect aquatic populations. Local impacts would affect a small portion of the whole regional aquatic environment and would generally be of low ecological importance to the aquatic system.

4.3.3.4 Alternative 1 Effects on Fish Habitat

Direct and Indirect

The presence and use of ORV trails under Alternative 1 would continue to produce adverse impacts to aquatic habitat within the analysis area. Overall annual trail use would increase from an estimated 917 round trips under current conditions to 1,172 round trips (590 recreational and 582 subsistence) under Alternative 1. As noted in Section 3.4.3, 22 existing trail-stream crossing sites in the analysis area are currently considered to be functioning at reduced habitat capacity, due to existing or past trail use (Buncic et al. 2009). ADF&G recommends repairing or bypassing all but seven of those crossings to avoid impacts from current ORV use levels. The recommended corrective measures would not be implemented under Alternative 1 (Table 4-26).

Sediment has the potential to affect spawning habitat and benthic food resources near trail crossings. However, the distribution of these effects under Alternative 1 would be limited to regions very near the crossing, likely less than 100 meters downstream. EPA (Barbour et al. 1999) noted that a buffer distance of 18 meters between a stream and disturbance area was adequate to maintain stream habitat conditions and was effective at reducing most sediment-laden runoff to the adjacent stream (see Section 3.4.3). Because many ORV trails would not pass within 18 meters of streams, the impacts from trails that could contribute additional stream turbidity from runoff would be minor.

Of the 59 representative trail-stream crossings in the analysis area assessed by Buncic et al. (2009), one crossing, TC-1, where the Copper Lake trail crosses Tanada Creek, has habitat suitable for Chinook salmon spawning. If spawning nests were present, bottom disturbance from ORV crossing could cause direct fish egg mortality in this location under Alternative 1, a localized, moderate, adverse impact. While many other trail-stream crossings were mapped using GIS (184 total, Table 3-10), most additional crossings would be on smaller streams, or similar to those evaluated. The chance of fish spawning nests being directly encountered appears extremely low due to the small amount of total stream area directly affected. Therefore, adverse effects on spawning success of any fish species from direct contact at most sites would be negligible. About 38 miles, or 41 percent of all trails, would have summer ORV use restricted to subsistence use and private inholdings access only. The limitation on recreational ORV summer use would reduce ORV stream crossings at the majority of the trail-stream crossing sites considered to be of lower habitat functionality (17 of 22), particularly on the Copper Lake, Suslota, and Tanada Lake trails (Table 4-26). The streams at these crossings include some of the more important fish resources (Chinook and sockeye salmon, see Table 3-10). These closures to recreational ORV use would reduce direct sediment input from stream crossings and sediment runoff from trails. However, one major Copper Lake trail crossing (TC-1 on the Tanada Creek, Figure 2-11) with potential Chinook salmon spawning would remain open, and for the others, continued subsistence ORV use could lead to expanded trail braiding that could clear vegetation outside of the crossing areas (see Section 4.3.1), contributing additional sediment to streams.

Table 4-26. Summary of Corrective Measures Planned at Stream Crossings by Alternative

Trail	Crossing Number ¹	Alternative 1		Alternative 2		Alternative 3		Alternative 4		Alternative 5	
		Corrective Measures ²	Change in Total ORV Use	Corrective Measures	Change in Total ORV Use	Corrective Measures	Change in Total ORV Use	Corrective Measures	Change in Total ORV Use	Corrective Measures	Change in Total ORV Use
Black Mountain	CL-2, tributary to Copper River	None. Closed to recreational ORV use.	+18%	None. Closed to recreational ORV use.	No change.	None. Closed to recreational ORV use.	+18%	Approaches hardened. Closed to recreational ORV use.	+162%	Approaches hardened. Closed to recreational ORV use.	+64%
Copper Lake	CL-5, tributary to Copper River	None. Closed to recreational ORV use.	+24%	None.	+16%	None. Closed to recreational ORV use.	No change.	Replaced by re-route.	Trail segment closed.	Replaced by re-route.	Trail segment closed.
	CL-6, tributary to Copper River	None. Below Copper Lake trail closure.	+24%	None.	+16%	None. Closed to recreational ORV use.	No change.	Replaced by re-route.	Trail segment closed.	Replaced by re-route.	Trail segment closed.
	CL-7, tributary to Copper River	None. Below Copper Lake trail closure.	+24%	None.	+16%	None. Closed to recreational ORV use.	No change.	Approaches hardened. Closed to recreational ORV use.	+119%	Approaches hardened.	+137%
	TC-1, Tanada Creek crossing, possible Chinook spawning	None. Below Copper Lake trail closure.	+24%	None.	+16%	None. Closed to recreational ORV use.	No change.	Bridge construction. Closed to recreational ORV use.	+119%	Bridge construction.	+137%
Lost Creek	LC1-S	None.	+32%	None.	+9%	None. Closed to recreational ORV use.	-68%	None.	+32	None.	+32%
Soda Lake	SC-7	None.	+33%	None.	-22%	Replaced by re-route.	Trail segment closed.	Replaced by re-route.	Trail segment closed.	Replaced by re-route.	Trail segment closed.
Suslota	SLT-1, tributary to Natat Creek	None. Closed to recreational ORV use.	+17%	None.	+145%	None. Closed to recreational ORV use.	+17%	None. Closed to recreational ORV use.	+17%	Replaced by minor re-route.	Trail segment closed.
	SLT-2, tributary to Natat Creek	None. Closed to recreational ORV use.	+17%	None.	+145%	None. Closed to recreational ORV use.	+17%	None. Closed to recreational ORV use.	+17%	Existing replacement for SLT-1; approaches sloped back. Closed to recreational ORV use.	+33%
	SLT-3, tributary to Natat Creek	None. Closed to recreational ORV use.	+17%	None.	+145%	None. Closed to recreational ORV use.	+17%	None. Closed to recreational ORV use.	+17%	Bridge and puncheon installation. Closed to recreational ORV use.	+33%
Tanada Lake	TLT-1, flows to Tanada Lake	None. Closed to recreational ORV use.	+15%	None.	+174%	None. Closed to recreational ORV use.	+15%	Replaced by re-route.	Trail segment closed.	Replaced by re-route.	Trail segment closed.
	TLT-4, flows to Tanada Lake	None. Closed to recreational ORV use.	+15%	None.	+174%	None. Closed to recreational ORV use.	+15%	Replaced by re-route.	Trail segment closed.	Replaced by re-route.	Trail segment closed.
	TLT-5, flows to Tanada Lake	None. Closed to recreational ORV use.	+15%	None.	+174%	None. Closed to recreational ORV use.	+15%	Replaced by re-route.	Trail segment closed.	Replaced by re-route.	Trail segment closed.
	TLT-6, flows to Tanada Lake	None. Closed to recreational ORV use.	+15%	None.	+174%	None. Closed to recreational ORV use.	+15%	Replaced by re-route.	Trail segment closed.	Replaced by re-route.	Trail segment closed.
	TLT-8, flows to Tanada Creek	None. Closed to recreational ORV use.	+15%	None.	+174%	None. Closed to recreational ORV use.	+15%	Replaced by re-route.	Trail segment closed.	Culvert installed.	+380%
	TLT-9, flows to Tanada Creek	None. Closed to recreational ORV use.	+15%	None.	+174%	None. Closed to recreational ORV use.	+15%	Replaced by re-route.	Trail segment closed.	Culvert installed.	+380%
	TLT-10, flows to Tanada Creek	None. Closed to recreational ORV use.	+15%	None.	+174%	None. Closed to recreational ORV use.	+15%	Replaced by re-route.	Trail segment closed.	Culvert installed.	+380%
	TLT-11, flows to Tanada Creek	None. Closed to recreational ORV use.	+15%	None.	+174%	None. Closed to recreational ORV use.	+15%	Replaced by re-route.	Trail segment closed.	Culvert installed.	+380%
	TLT-12, flows to Tanada Creek	None. Closed to recreational ORV use.	+15%	None.	+174%	None. Closed to recreational ORV use.	+15%	Replaced by re-route.	Trail segment closed.	Culvert installed.	+380%
	TLT-13, flows to Tanada Creek	None. Closed to recreational ORV use.	+15%	None.	+174%	None. Closed to recreational ORV use.	+15%	Replaced by re-route.	Trail segment closed.	Culvert installed.	+380%
	TLT-14, flows to Tanada Creek	None. Closed to recreational ORV use.	+15%	None.	+174%	None. Closed to recreational ORV use.	+15%	Replaced by re-route.	Trail segment closed.	Culvert installed.	+380%
	TLT-16, flows to Tanada Lake	None. Closed to recreational ORV use.	+15%	None.	+174%	None. Closed to recreational ORV use.	+15%	Replaced by re-route.	Trail segment closed.	Culvert installed.	+380%

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Additionally, under Alternative 1 no trail hardening would be implemented, so summer use by ORVs may continue to degrade stream riparian areas and near-stream trail habitat and contribute turbidity and sediment to streams, including potential fish spawning habitat. Over time, ORV use in the analysis area is expected to increase from current levels (Table 4-1). However, particularly degraded trails (a portion of Copper Lake trail, and Suslota and Tanada Lake trails) would be closed to recreational ORV use except during frozen periods when stream bottoms, banks, and adjoining vegetation would not be directly disturbed. A limited number of trail-stream crossing sites with existing habitat problems would continue to be used heavily along parts of the Copper Lake trail, and along trails in the Nabesna Watershed. Many additional stream trail-crossings are reported in some of these areas (Table 3-10), but most are on small streams, and likely of less importance for fish production.

Chances of vegetation loss at riparian areas causing adverse levels of temperature increases are negligible due to the cool environment and limited magnitude of the areas affected. Also LWD displacement or loss may occur from active (people pulling LWD from stream crossing) and passive (loss of riparian vegetation) activities, but these would be fairly small in magnitude and distribution under this alternative. Oil products entering streams from fuel spills or exhaust emissions are a concern. However, the amount of fuel spilled from normal use that may enter streams under this alternative would be negligible based on the relatively low number of ORVs, likely small amount of overall spillage (a few gallons or less over the large analysis area), and low levels of oily, unburnt hydrocarbon emissions from the four-stroke ORV engines.

Continued ORV use would add sediment to the streams affecting local benthic production and potentially to spawning areas along all trails. These effects would be minor because they would be localized within small areas and would not affect the viability of aquatic populations. The main sources of impacts to streams (e.g., sediment increases, loss of riparian vegetation) are trail-stream crossing sites, and adverse effects would be most pronounced along the Copper River (with 4 impacted crossings), Tanada Creek (with 13 impacted crossings), and Natat Creek (with 3 impacted crossings). Possible ORV crossings of Chinook salmon redds in Tanada Creek could affect egg survival and disrupt active Chinook salmon spawning, a long-term, moderate, adverse effect. Because relatively few stream crossing locations among the hundreds of miles of analysis area streams would have direct or indirect impacts, most analysis area aquatic habitat would be unaffected. Based on the possible mortality of individuals or disturbance of spawning gravels that could occur at with ORV crossings at TC-1 and the continuing impacts from ORV use at other degraded crossings, Alternative 1 would result in moderate, adverse, direct and indirect impacts to water quality and fish habitat.

Cumulative

Throughout the analysis area, past mining activities, use of the Nabesna Road, multiple airplane landing sites (about 14 land and 8 water), and ongoing harvest of trees for firewood have all put pressure on aquatic systems, resulting in minor effects, some of which will continue into the future. Fish passage at some road culverts can limit access of fish to habitat and road runoff of sediment can affect habitat quality of streams adjacent to the road. These effects would be minor because of the limited amount of road runoff and few fish-passage blockages at road culverts in the analysis area. If the Nabesna Mine restoration occurs, and tailings are transported down the Nabesna Road, fugitive dust that is potentially high in metals could enter streams. Heavy metals, in high enough concentrations, can be toxic to fish and other aquatic organisms. Because of the low potential for metals to enter streams at levels that could impact the viability of aquatic populations, impacts from mine restoration activities would be minor. Firewood harvest in areas accessible to roads would likely continue to reduce LWD stream input and would limit formation of pools, an important aquatic

habitat component. Human access resulting in the harvest of fish populations in streams and lakes likely would continue to reduce some local fish populations. These impacts would be minor because they do not affect aquatic population viability.

As discussed in Section 3.3.2.1, there are approximately 94 miles of other motorized trails in the analysis area. These trails include stream crossings, some of which are noted as degraded in the 1986 trail inventory (Connery 1987). Because of the low level of use on most of the trails (less than 20 passes/year), impacts to fish habitat would be very localized and contained within any existing disturbance. However, there are anadromous stream crossings associated with these trails, including five mapped crossings of Tanada Creek. These crossings have not been surveyed, but Tanada Creek has habitat suitable for Chinook salmon spawning. If spawning gravels were present, bottom disturbance from ORV crossings could cause direct fish egg mortality, potentially a localized, moderate, adverse impact. Given the localized nature of these potential impacts within a large watershed, impacts associated with these crossings would not threaten viability of aquatic populations. Overall, impacts to fish habitat from these trails would be minor.

Climate change may also alter stream and fish production. Current climate models project increased temperature and precipitation in Alaska (Karl et al. 2009). Models project an average Alaska temperature increase of 3.5 to 7 °F by the middle of this century, although the modeled area is very broad and conditions may differ more locally (Karl et al. 2009). Little or no change is expected in the region of the analysis area over current conditions by mid-century, but models suggest by the end of the century temperature increases are likely to occur in the area. Increased temperature would affect glaciers, which could affect stream flow, flow timing, sediment load, and stream channel formation (GAO 2007). While it is not possible to determine what the outcome of these changes would be on fish resources, as they would have both beneficial and adverse effects, climate change is likely to place additional stress on existing fisheries resources that are adapted to the current conditions. Possible changes in flow (from changes in the amount of glacial melt water and from increased annual precipitation) and channel characteristics may be detrimental. Stream temperatures in the analysis area generally are below those considered detrimental to salmonids, so some increase could likely be tolerated with little adverse effects. However, increased water temperatures would be mostly detrimental for the major cold water species, including salmon, in the region. Because of the gradual nature of any changes, over the 20-year planning period, impacts to water quality and fish habitat from climate change are expected to be minor.

In summary the net effect of these actions, in combination with localized adverse direct and indirect effects under Alternative 1, is likely to be long-term, moderate, and adverse based primarily on localized affects areas, with most analysis area aquatic habitat unaffected. While some specific stream sites and individual aquatic organisms would be adversely affected, most of the water quality and aquatic habitat in the analysis area remains in pristine condition.

Conclusion

Overall, Alternative 1 would result in long-term, moderate, adverse effects on water quality and fish habitat because of localized effects on spawning gravels from sediment runoff and trail-stream crossings, particularly on potential crossing of Chinook salmon spawning areas on Tanada Creek. Multiple ORV stream crossings, particularly on the Tanada Lake, Copper Lake, and Suslota trails, would continue to cause adverse effects to sediment runoff and riparian vegetation along these trails with overall moderate impacts to the aquatic resources. Effects on viability of fish populations are unlikely. The percentage of analysis area aquatic habitats that could be affected would be low because most stream reaches in the analysis area are not directly crossed by ORV trails.

The moderate impacts to fish habitat/water quality anticipated from this alternative would not result in an impairment of park resources that fulfill specific purposes identified in the establishing legislation or that are essential to the integrity of the park. The described impacts are unlikely to affect the long-term viability of Copper River Chinook salmon, a species identified in the 1986 GMP and in subsequent planning documents as a fundamental resource for the park/preserve.

4.3.3.5 Alternative 2 Effects on Fish Habitat

Direct and Indirect

The presence and use of ORV trails under Alternative 2 would continue to produce adverse impacts to aquatic habitat within the analysis area. Overall annual trail use would increase from an estimated 917 round trips under current conditions to 1,171 trips (650 recreational and 521 subsistence), with period of use being similar to current conditions (Table 4-1). Use of two of the more degraded trails (Suslota and Tanada Lake) would more than double. Under this alternative, the corrective measures recommended by ADF&G would not be implemented (Table 4-26). Without trail closures, trail hardening, or trail-stream crossing improvements, trail-stream crossings with already reduced habitat capacity (especially on Copper Lake, Suslota and Tanada Lake trails) would increase. Effects at the 22 sites identified to have reduced habitat capacity (Buncic et al. 2009) would likely continue to worsen, and additional stream sections could develop reduced habitat quality. Under Alternative 2, ORV use and timing could increase degradation of stream banks and increase local stream turbidity and sedimentation, primarily when ORVs cross streams during the growing season.

One crossing, where the Copper Lake trail crosses Tanada Creek (TC-1), has habitat suitable for Chinook salmon spawning. If spawning nests were present, bottom disturbance from ORV crossings could cause direct fish egg mortality in this location under Alternative 2, a localized, moderate, adverse impact. While many other trail-stream crossings were mapped using GIS (184 total), most additional crossings would be on smaller streams, with negligible impacts because of the low chance of an ORV encountering a fish spawning nest directly. Increased ORV use, particularly on degraded trails (a portion of Copper Lake trail, as well as Suslota and Tanada Lake trails), would disturb stream banks, riparian vegetation, and stream bottoms, a minor effect because of the localized extent. Effects on stream temperature from vegetation loss, as well as reduction of LWD and toxicity from oil spill and other petroleum products, would be negligible for the same reasons noted in Alternative 1.

Continued ORV use under Alternative 2 would add sediment to the streams affecting local benthic production and potentially to spawning areas along all trails. These effects would be minor because they would be localized within small areas and would not affect the viability of aquatic populations. The main sources of impacts to streams (e.g., sediment increases, loss of riparian vegetation) are trail-stream crossing sites, and adverse effects would be most pronounced along the Copper River (with 4 impacted crossings), Tanada Creek (with 13 impacted crossings), and Natat Creek (with 3 impacted crossings). Possible ORV crossings of Chinook salmon redds in Tanada Creek could affect egg survival and disrupt active Chinook salmon spawning, a long-term, moderate, adverse effect. Because relatively few stream crossing locations among the hundreds of miles of analysis area streams would have direct or indirect impacts, most analysis area aquatic habitat would be unaffected. Based on the possible mortality of individuals or disturbance of spawning gravels that could occur at with ORV crossings at TC-1 and the continuing impacts from ORV use at other degraded crossings with increasing ORV use, Alternative 2 would result in moderate, adverse, direct and indirect impacts to water quality and fish habitat.

Cumulative

The impacts of other nearby past, present, and foreseeable future actions on water quality and fish habitat are similar to those described under Alternative 1 and would result in minor, long-term, adverse impacts on water quality and fish habitat. The net effect of these impacts, in combination with the direct and indirect impacts likely under Alternative 2, would be long-term, moderate, adverse impacts to water quality and fish habitat, primarily relating to localized effects on Chinook salmon spawning areas.

Conclusion

Overall, Alternative 2 would result in long-term, moderate, adverse effects on water quality and fish habitat because of localized effects on spawning habitat from sediment runoff and trail-stream crossings particularly on potential crossing of Chinook salmon spawning areas on Tanada Creek. Multiple and increasing ORV stream crossings, particularly on the Tanada Lake, Copper Lake, and Suslota trails, would continue to cause adverse effects to sediment runoff and riparian vegetation along these trails with overall moderate impacts to the aquatic resources. Effects on viability of fish populations are unlikely. The percentage of analysis area aquatic habitats that could be affected would be low because most stream reaches in the analysis area are not directly crossed by ORV trails.

The moderate impacts to fish habitat/water quality anticipated from this alternative would not result in an impairment of park resources that fulfill specific purposes identified in the establishing legislation or that are essential to the integrity of the park. The described impacts are unlikely to affect the long-term viability of Copper River Chinook salmon, a species identified in the 1986 GMP and in subsequent planning documents as a fundamental resource for the park/preserve.

4.3.3.6 Alternative 3 Effects on Fish Habitat

Direct and Indirect

Trail use under Alternative 3 would be reduced by 37 percent relative to current conditions, as recreational use would be eliminated on all nine trails. The proposed monitoring program would result in beneficial effects because new minor, short-term, adverse impacts on trail-stream crossings would not be allowed to progress into moderate or major, long-term, adverse impacts. Even with lower levels of ORV use, some continued impacts of sediment contributions from trail-stream crossings, vegetation degradation along trails adding to sediment runoff, and bank erosion at sites where it has occurred in the past, may continue, but at a slower rate under this alternative than under current conditions. Additionally, a 2.5-mile re-route along Soda Lake trail would bypass one of the 22 impacted trail-stream crossings known to have reduced habitat quality (Table 4-26). Although this re-route would eliminate two existing trail-stream crossings along the Soda Lake trail, it would add four new trail-stream crossings for a net gain of two more crossings. Crossings on the re-route would be hardened during construction utilizing GeoBlock panels or timber bridge or puncheon construction. This would minimize potential for any future degradation at these crossings. Additionally, these new crossings would be further upslope, likely on smaller, higher-gradient streams, which would reduce the potential for fish presence and their proximity to fish-bearing streams. The initial construction of this new trail route may add sediment from trail clearing, but this would likely occur only during the first year and the year following construction. Also, while several miles of new non-motorized trails and routes would be added under this alternative, added aquatic impact would not occur from this activity because of limited vegetation disturbance along trails or in stream riparian areas, or direct stream bottom disturbance from foot traffic.

Under Alternative 3, procedures would be included to monitor potential degradation of vegetation and stream habitat at known locations on all trails, including measuring eight separate parameters, three of which are related to streams. Should any two of the parameters (such as changes in stream width at crossings or added fine sediment 60 feet below a crossing) be documented, actions (e.g., trail maintenance, further restrictions on trail use, vehicle type restrictions, and trail closure) would be taken to reduce or eliminate future effects at these sites. This approach would reduce the overall effects of ORV impacts to streams.

The main sources of stream impacts (e.g., sediment increases, loss of riparian vegetation) are trail-stream crossing sites, and adverse effects would be most pronounced along the Copper River (with 4 impacted crossings), Tanada Creek (with 13 impacted crossings), and Natat Creek (with 3 impacted crossings). Despite overall analysis area reductions, ORV trail use on Suslota and Tanada Lake trails would increase by 15 and 17 percent, respectively, because of increased subsistence ORV use. These trails have 3 and 12 impacted crossings, respectively, and would be more susceptible to impacts with increased use. However, with the monitoring actions, adverse riparian and sedimentation effects from ORV use on these trails would be minor. Overall ORV use on Copper Lake trail would remain unchanged (Table 4-1). This trail has the crossing of Tanada Creek where Chinook salmon may spawn; continued ORV use with no corrective action at this crossing could impact spawning conditions, a moderate impact. ORV use would decrease on the remaining trails (Black Mountain, Boomerang, Caribou Creek, Lost Creek, Reeve Field, and Trail Creek). Combined with the monitoring actions, ORV use on these trails likely would result in minor impacts to aquatic resources. Because of the potential moderate effects on Chinook salmon spawning in Tanada Creek and minor impacts along other trails, direct and indirect adverse effects under Alternative 3 would be long term and moderate.

Cumulative

The impacts of other nearby past, present, and foreseeable future actions on water quality and fish habitat are similar to those described under Alternative 1 and would result in minor, long-term, adverse impacts on water quality and fish habitat. The net effect of these impacts, in combination with the direct and indirect effects likely under Alternative 3, would be long-term, moderate, adverse impacts to water quality and fish habitat, primarily relating to localized effects on Chinook salmon spawning areas. However, most of the aquatic habitat would be unaffected.

Conclusion

Overall, Alternative 3 would result in long-term, moderate, adverse effects to water quality and fish habitat because of continued (although reduced) ORV use and lack of corrective actions at impacted trail-stream crossings. Multiple ORV stream crossings, particularly on the Copper Lake, Tanada Lake, and Suslota trails, would continue to cause adverse effects to sediment runoff and riparian vegetation along these trails, but because of the monitoring program, these effects to aquatic resources would be minor. Because spawning gravels might be disturbed, impacts to Chinook salmon spawning areas from sediment and disturbance at the Tanada Creek crossing (TC-1) would be moderate. Adverse effects to a small number of other potential spawning areas would still occur but the number would be lessened because of reduced use and implementation of the monitoring and management program. While localized spawning habitat degradation may occur in other areas, it is unlikely to affect the viability of fish populations. The percentage of analysis area aquatic habitats that could be affected would be low because most stream reaches in the analysis area are not directly crossed by ORV trails.

The moderate impacts to fish habitat/water quality anticipated from this alternative would not result in an impairment of park resources that fulfill specific purposes identified in the establishing legislation or that are essential to the integrity of the park. The described impacts are unlikely to affect the long-term viability of Copper River Chinook salmon, a species identified in the 1986 GMP and in subsequent planning documents as a fundamental resource for the park/preserve.

4.3.3.7 Alternative 4 Effects on Fish Habitat

Direct and Indirect

Generally this alternative involves actions to improve vegetation and stream habitat conditions along all nine trails and the wilderness trail systems (Table 4-26), which would ultimately improve conditions at most of the problem trail-stream crossing areas and help prevent additional problem areas that could potentially adversely affect aquatic habitat in the future. This alternative would include re-routing segments of four of the trails (Copper Lake, Tanada Lake, Soda Lake, and Reeve Field trails) to avoid many problem areas. Trail hardening of Copper Lake and Caribou Creek trails to reduce runoff from soft areas would be implemented. Trail blading, or passing of small machines equipped with dozer blades to create a single trail tread, would occur on Trail Creek and Lost Creek trails to minimize the number of trail-stream crossings, and a ramp would be installed to prevent bank erosion on the Boomerang trail crossing of the Copper River. At one site, the Copper Lake trail crossing of Tanada Creek, where there was moderate concern for potential adverse effects on Chinook salmon spawning, a bridge would be installed. Ultimately 15 of the 22 sites (2 on the Copper Lake and Black Mountain trails, 12 on the Tanada Lake trail, and 1 on Soda Lake trail) indicated as potentially having adverse effects on aquatic resources would be bypassed with the new trail routes (Table 4-26). All of these actions would benefit aquatic resources over current conditions.

Adverse effects to streams would occur during trail improvement and construction activities. The initial trail hardening and trail and bridge construction may, in the short term, contribute sediment to streams in those areas, which likely would have the greatest effect during the year of construction. The effects of construction likely would be negligible to the fisheries system as a whole. Also, although recreational ORV use on Copper Lake, Suslota, and Tanada Lake trails would be eliminated, subsistence use would result in increased numbers of ORV passes, especially along the Tanada Lake trail (308 percent increase), one of the most heavily impacted trails relative to aquatic crossings (Table 4-26). Average ORV use for the analysis area trails is likely to double in the future (54 percent and 129 percent increase for recreation and subsistence use, respectively) even with the reduction in recreational use on Copper Lake and Boomerang trails; as a result, more pressure would be placed on trail-stream crossings and vegetated areas that could potentially increase surface runoff to streams. The re-routing of three of these trails may help reduce this more intensive use near streams. Also, the new re-routes, while eliminating some trail-stream crossings including many of those known to be problem crossings, would add new stream crossings resulting in a net gain in the number of trail-stream crossings at two trails. The estimated total number of crossings (based on GIS analysis, not ground surveys) would increase by 17 percent for Copper Lake trail, and 8 percent for Soda Lake trail. Crossings on proposed re-routes would be hardened during construction utilizing GeoBlock panels or timber bridge or puncheon construction. This would minimize potential for any future degradation at these crossings. The re-route of Tanada Lake trail would substantially reduce the total number of trail-stream crossings by 55 percent.

Indicator standards would be implemented for specific monitoring actions to help ensure that trails do not contribute significantly to aquatic habitat degradation. Procedures would be in place to modify trails or trail use if needed to reduce or eliminate adverse effects on habitat. Overall direct and

indirect adverse effects would be minor, primarily because of trail repair and construction of the bridge crossing at or near potential salmon spawning areas.

Cumulative

The impacts of other nearby past, present, and foreseeable future actions on water quality and fish habitat are similar to those described under Alternative 1 and would result in minor, long-term, adverse impacts on water quality and fish habitat. The net effect of these impacts, in combination with the direct and indirect effects likely under Alternative 4, would be long-term, minor, adverse impacts to water quality and fish habitat.

Conclusion

Overall, Alternative 4 would result in minor effects on water quality and fish habitat because of trail improvements, re-routes around impacted trail-stream crossings, and other corrective actions at impacted trail-stream crossings. Because of the re-routing of the Tanada Lake trail and the bridge crossing installation at TC-1, ORV use along that trail would result in minor impacts to aquatic habitat. Multiple impacted crossings would remain on Suslota trail (three) and on Copper and Black Mountain trails (three). Increased ORV use over these crossings could contribute sediment and reduce riparian vegetation, but impacts would be minor because of corrective actions on Copper Lake and Black Mountain trails and monitoring and corrective actions on all of these trails. Impacts on other analysis area trails would be minor because of trail improvements and corrective actions at impacted crossings. Substantial effects to spawning areas would not occur because of reduced use and implementation of the monitoring and management program. Effects on viability of fish populations or substantial spawning habitat degradation at multiple habitats would not occur. The percentage of analysis area aquatic habitats that could be affected would be low because most stream reaches in the analysis area are not directly crossed by ORV trails.

The minor impacts to fish habitat/water quality anticipated from this alternative would not result in an impairment of park resources that fulfill specific purposes identified in the establishing legislation or that are essential to the integrity of the park.

4.3.3.8 Alternative 5 Effects on Fish Habitat

Direct and Indirect

This alternative would take actions to improve all nine trails and the wilderness trail systems, which would ultimately improve crossing conditions at most of the problem trail-stream crossing areas and help prevent additional problem areas that would adversely affect future aquatic habitat conditions. Proposed actions would include re-routing four of the trails (Copper Lake, Tanada Lake, Soda Lake, and Reeve Field trails) to avoid many problem areas. However, only the southern portion of the Tanada Lake trail would be re-routed, still crossing 8 of the 12 problem trail-stream crossings identified from field surveys (Table 4-26). However, these crossings would be improved (e.g., culverts installed, additional trail hardening) to reduce or eliminate aquatic impacts at these sites. While several additional non-motorized trails and routes would be added (the Mentasta Traverse in addition to those described in Alternative 4), construction of non-motorized trails or their use would not adversely affect fish habitat for the same reasons noted for Alternative 3.

Actions taken (e.g., trail hardening, bridge construction, trail blading) at the Black Mountain, Copper Lake, and a portion of the Tanada Lake trails would be the same as those taken for Alternative 4 (Table 4-26). Additional actions under Alternative 5 would be installing culverts along the improved

segment of the Tanada Lake trail, specific hardening actions, bridge construction, and a short new trail route, avoiding the problem trail-stream crossing areas on the Suslota trail, which would likely eliminate the direct stream crossing impacts on this trail.

Ultimately 8 of the 22 sites (2 on the Copper Lake trail, 4 on the Tanada Lake trail, 1 on Soda Lake trail, and 1 on Suslota trail), indicated as potentially having adverse effects on aquatic resources, would be bypassed with the new trail routes (Table 4-26). Also, all of the crossings known to have aquatic habitat issues would still exist, but actions would be taken (e.g., culvert and bridge construction) at the sites to eliminate or reduce impacts (Table 4-26). All of these actions would benefit aquatic resources over current conditions.

Some adverse effects would occur from the construction of new trails and bridges, culvert installation, and trail hardening activities. The initial reconstruction hardening and bridge construction may, in the short term, contribute sediment to streams in those areas. This would likely have its greatest effect during the year of construction, although for some trails construction would occur over several years. The effects likely would be negligible to the fisheries system as a whole. Additionally, recreational and subsistence trail use would increase by 137 percent and 134 percent, respectively, over current ORV use across the trail system (Table 4-1), but recreational use would be eliminated on the Suslota trail.

The net result would be that overall ORV use, including subsistence use and recreational use, would be higher than current conditions on all nine trails with average use about double current levels, and nearly four times higher on Tanada Lake trail, a trail with past multiple ORV habitat-related problems. This increased ORV use would put more pressure on trail-stream crossings and vegetated areas that potentially could increase surface runoff to streams. However, re-routing, trail hardening, culvert installation, and bridge construction would allow vegetation recovery near trail-stream crossings, which would reduce the more intensive use effects. Also the new re-routes, while eliminating some trail-stream crossings, and many of those known to be problem crossings, would produce a net gain of number of trail-stream crossings on two trails. Because the new trail routing would cross different streams the estimated number of total stream crossings (mapped in GIS) would increase by 17 percent for Copper Lake trail and by 9 percent for Soda Lake trail. Crossings on proposed re-routes would be hardened during construction utilizing GeoBlock panels or timber bridge or puncheon construction. This would minimize potential for any future degradation at these crossings. The partial re-route of Tanada Lake trail would slightly reduce the number of trail-stream crossings by 5 percent. The number of total crossings on other trails would remain the same as under current conditions. Any effects from new crossings would be minor because indicator monitoring standards would be in place and specific corrective action would be taken to help ensure trails do not contribute significantly to aquatic habitat degradation.

Another monitoring action that would occur only in Alternative 5 would further help reduce potential adverse effects to streams. While off-trail ORV use is not specifically allowed by recreational users, it is allowed by subsistence users, if it does not cause “unacceptable resource impacts.” Under Alternative 5 any off-trail use would be monitored and actions would be taken to eliminate adverse effects in the same manner as for the designated trails noted above. In addition, under Alternative 5, subsistence ORV users would be required to stay on designated trails in designated wilderness on the Black Mountain trail system and the trails south of Tanada Lake. This would reduce further future potential problems at aquatic sites. Overall direct and indirect adverse effects would be reduced relative to current conditions, and would be minor, primarily because of trail repair or bridge crossing construction at or near potential salmon spawning areas.

Cumulative

The impacts of other nearby past, present, and foreseeable future actions on water quality and fish habitat are similar to those described under Alternative 1 and would result in minor, long-term, adverse impacts on water quality and fish habitat. The net effect of these impacts, in combination with the direct and indirect effects likely under Alternative 5, would be long-term, minor, adverse impacts to water quality and fish habitat.

Conclusion

Overall, Alternative 5 would result in minor, adverse effects to water quality and fish habitat because of trail improvements, re-routes around impacted trail-stream crossings, and other corrective actions at impacted trail-stream crossings. Because of the re-routing and improvement of the Tanada Lake trail and the bridge crossing installation at TC-1, ORV use along that trail would result in minor impacts to aquatic habitat. Multiple impacted crossings would remain on Suslota trail (two) and on Copper and Black Mountain trails (three). Increased ORV use over these crossings could contribute sediment and reduce riparian vegetation, but impacts would be minor because of corrective actions and monitoring on these trails. Impacts on other analysis area trails would be minor because of trail improvements and corrective actions at impacted crossings. Effects on viability of fish populations or substantial spawning habitat degradation at multiple habitats would not occur. The percentage of analysis area aquatic habitat that could be affected would be low because most stream reaches in the analysis area are not directly crossed by ORV trails.

The minor impacts to fish habitat/water quality anticipated from this alternative would not result in an impairment of park resources that fulfill specific purposes identified in the establishing legislation or that are essential to the integrity of the park.

4.3.4 Wildlife

4.3.4.1 Methodology

This section describes the impacts to wildlife that are likely to occur under each of the proposed alternatives for ORV trail management in the park. The effects analysis was conducted by comparing the description of actions that would be carried out under each of the five alternatives to available literature on wildlife, their habitat needs, and responses to ORV use. The level of direct, indirect, and cumulative effects under each alternative was analyzed, and their significance in terms of the wildlife resource determined.

4.3.4.2 Impact Threshold Criteria

To determine the significance of effects on wildlife and wildlife habitat the impacts were compared against the following threshold criteria:

Negligible: There would be no observable or measurable impacts to native species, their habitats, or the natural processes sustaining them. Habitat would retain ecological integrity to support wildlife species.

Minor: Impacts on native species, their habitats, or the natural processes sustaining them would be detectable. Small changes to population numbers, population structure, and other demographic factors not affecting population viability or stability might occur. Occasional responses to

disturbance by some individual wildlife could be expected. Habitat would retain adequate ecological integrity to support viability of all native species.

Moderate: Changes to population numbers, population structure, and other demographic factors would occur, but species would remain stable and viable. Frequent responses to disturbance by some individual wildlife could be expected, with some impacts to factors affecting population levels possible. Habitat would retain adequate ecological integrity to support viability of all native species.

Major: Population numbers, population structure, and other demographic factors might experience large-scale changes. Frequent responses to disturbance by some individual wildlife would be expected, with resulting decreases in population levels. Loss of habitat might affect the viability of at least some native species.

4.3.4.3 Assumptions

Wildlife populations in the analysis area will continue to fluctuate based on factors such as predation and weather.

Most of the analysis area is currently identified for limited fire suppression, meaning that wildfires are allowed to burn, subject to monitoring. It is assumed that this pattern will not change, allowing for potential habitat improvement through wildland fire.

The National Preserve lands will continue to be open to sport hunting, managed under state hunting regulations, as well as subsistence hunting by local rural residents under federal regulations. Aircraft may be used to access the Preserve for the purpose of hunting. The National Park lands will continue to be managed under federal subsistence hunting regulations, where only federally qualified residents can hunt and hunting access by aircraft is not allowed.

Projected ORV use and the factors influencing that use are described in Section 4.1.1, Overview and Methodology.

4.3.4.4 Alternative 1 Effects on Wildlife

Direct and Indirect

Use of the ORV trails in the analysis area is projected to increase (currently 917 ORV round trips per year) under Alternative 1 (No Action) to 1,172 ORV round trips per year (Table 4-1). Use would occur in the same general areas but would still be restricted during the summer on certain trails when not frozen. The trails that would remain closed to recreational ORV use during summer months are the Suslota and Tanada Lake trails and the Copper Lake trail south of the Boomerang cutoff. This would likely result in beneficial impacts to breeding wildlife by minimizing direct disturbance to adults and their young; examples include big game giving birth to offspring that are unable to escape from disturbance for a short period after birth, juvenile amphibians inhabiting pools that ORVs drive through, and bird nests containing eggs or chicks that could be crushed by a vehicle. Another benefit to wildlife from summer trail closures would result from decreased direct effects to habitat when the soil is thawed. Based on past trends of permit issuance, ORV use of trails is expected to increase 3 percent per year per trail for recreational users and 2 to 3 percent per year per trail for subsistence users; therefore, Alternative 1 would likely result in increased adverse direct and indirect effects on wildlife over current conditions.

The most pervasive adverse impact of ORVs on wildlife in the analysis area is their use by hunters in harvesting animals. With the increase in trail users projected under Alternative 1, hunting pressure on game animals present in the analysis area would increase. This could result in increased mortality to those wildlife species and displacement of these species to other, potentially less suitable areas. Hunters have reported that moose have been displaced by ORVs from former hunting grounds (ADF&G 1996). Altered movements of ungulate game species could also adversely affect predators by making their prey species more difficult to find. With the trail closures that would remain in effect under this alternative, access to certain areas would decrease for sport hunters, possibly easing hunting pressure on those areas; however, another effect of these closures could be to intensify hunting pressure in those areas left open. Overall, averaged over the analysis area, hunting pressure on wildlife would increase slightly under Alternative 1.

The second-most important impact of ORV trails to wildlife is loss of habitat. ORVs would have localized, moderate adverse effects on the habitat types that are present in the analysis area, causing melting of permafrost and soil instability (Allen et al. 2000). One mile of single-track trail directly affects 1 acre of habitat per mile of trail (see Table 3-7 for vegetation types disturbed by existing trails). This number quickly increases when trails become braided, with disturbed areas over 200 feet wide not uncommon in Alaska (Meyer 2002). Long-term, adverse effects related to habitat damage and loss are most pronounced in wet areas (Meyer 2002). Where trails cross riparian areas and wetlands, damage to habitat for moose, waterfowl, migratory birds, and other wildlife species could occur. The wetness of the soil at these locations makes damage more likely and longer lasting (Meyer 2002), which could cause ORV users to shift off established trails, creating further braiding and compounding habitat destruction in these important and vulnerable areas. A significant portion of the ORV trails in the analysis area (56.2 percent) cross wetlands, and several riparian areas are also crossed. Even one pass by an ORV can cause considerable vegetation loss in wetlands. Table 3-6 summarizes disturbance to wetlands from existing trails. For moose, a principal wildlife species hunted via these trails, the miles of trail, acres of wetlands present, and trail braiding would likely produce long-term, minor, adverse effects due to loss of habitat. Although disturbance often creates early seral habitat as vegetation recovers, which could benefit browsing ungulates such as moose, that is unlikely to happen in this particular case due to the unique ecosystem present within the analysis area. ORVs tear up soil and plants along trails which, due to low levels of organic matter, lack of drainage, and other factors, have a very low capacity to recover (see Section 3.3.1.3 for more details). Vegetation is likewise extremely slow to recover from disturbances such as ORV use, and regrowth typically takes much longer than it would in other ecoregions. Closed ORV trails do not typically recover to pre-use conditions and instead develop limited vegetative structure, lower vegetative cover, and a different species composition compared to adjacent undisturbed vegetation. These altered conditions are detectable for considerable lengths of time (see Section 4.3.2.6 for more details). The ORV trails in the analysis area have been spreading, through braiding, and becoming continually larger in part because of this slow vegetative recovery. Therefore, ORV disturbance of soils and vegetation in the analysis area is unlikely to appreciatively benefit moose or other wildlife through stimulation of new plant growth.

Another potential long-term, minor adverse effect on wildlife habitat occurs because ORVs can be a key vector in the spread of invasive plants (TWS 2006). Most of the exotic plants found within the analysis area, including the highly invasive white sweetclover, are located along the Nabesna Road (Figure 3-11). Invasive plant surveys along the ORV trails have not been conducted, but there is a great potential for these plants to be spread via ORVs into these areas, causing degradation of wildlife habitat.

Crossing of streams by ORVs can also cause increases in turbidity (Rinella and Bogan 2003), which would likely result in short- and long-term, minor, adverse effects to aquatic vegetation and

invertebrates, affecting waterfowl foraging and nesting habitat. ORV use at stream crossings with salmon would also have short-term, minor, adverse effects by disturbing and displacing mammalian carnivores that forage on spawned-out adults, as well as exposing wildlife to hunting and trapping.

Other localized adverse direct impacts to wildlife in the analysis area include increased use of stored metabolic resources from startling and fleeing; increased exposure to hunting, harassment, or poaching; and decreased reproductive success. The potential for ORVs to adversely impact wildlife would likely be increased over random use due to the fact that most ORV users are specifically seeking out wildlife (i.e., for hunting and viewing). Impacts could also be magnified for certain species due to their attraction to trails. Large mammals may use trails for travel, increasing their possibility of encountering an ORV and being disturbed, injured, or harvested. The open vegetation along trails could be used by some species of ground-nesting birds for breeding, possibly leading to a nest being crushed by a passing vehicle or abandonment of near-trail nests due to disturbance.

Impacts to wildlife habitat that would occur on each trail under this alternative are summarized below (Table 4-27). “Greater than” symbols are added where impacts to wetlands or vegetation are expected to expand. Projected ORV use is also shown for each trail as an indicator of hunting pressure. These data were used to reach the following conclusions for direct and indirect impacts.

Table 4-27. Summary of Impacts to Wildlife on Nine ORV Trails and Black Mountain Trails under Alternative 1

Trail	Projected ORV Use (round trips per year)			Action	Wildlife Habitat Impacted (acres)	
	Recreational	Subsistence	Change from Current		Wetlands	Vegetation
Black Mountain	Closed	65	18%	No improvements	>1.2	>3.7
Boomerang	7	6	30%	No improvements	9.4	16.1
Caribou Creek	121	40	34%	No improvements	0.2	>3.6
Copper Lake	30	125	24%	No improvements	>103.9	>234.7
Lost Creek	153	50	32%	No improvements	4.0	2.0
Reeve Field	35	24	31%	No improvements	>26.5	>29.3
Soda Lake	82	35	33%	No improvements	>5.2	>14.1
Suslota	Closed	70	17%	No improvements	>169.6	>190.0
Tanada Lake	Closed	75	15%	No improvements	>120.2	>261.2
Trail Creek	162	45	34%	No improvements	2.7	3.7

In summary, the direct and indirect effects of Alternative 1 on wildlife would be long-term, adverse, and minor. Although there would be some detectable impacts on wildlife and their habitat, there would likely be only small changes in demographics caused by this alternative due to there being no change in ORV use management. Native wildlife species would experience a small amount of habitat loss and occasional disturbance, but disturbance would be considered infrequent due to the low level of ORV access currently provided by the existing trails. Habitat would retain adequate ecological integrity to support viability of all native species.

Cumulative

Current conditions in the park are a result of past and present actions (see Chapter 3). The ORV trails in the analysis area have been used for traditional subsistence hunting and for sport hunting since well before the establishment of Wrangell-St. Elias in 1980. The Nabesna Road was originally built in 1933 to service the Nabesna Mine. The park is considering options for the clean-up of mine tailings at the mine. The current options considered for clean-up include capping materials on site or hauling

tailings out of the area via the Nabesna Road. If mine tailings are hauled out of the area via the Nabesna Road, then some dust, which would contain heavy metals, could escape from the transport trucks and settle along the road. This would produce long-term, minor, adverse effects on vegetation (Foy 1978, Auerbach 1997). Vegetation die-off would also have short-term negligible effects on wildlife by slightly decreasing available forage and habitat. If heavy metals are incorporated into plants and browsed by wildlife, this could lead to bioaccumulation and long-term, negligible, adverse immune, reproductive, and other effects. These impacts would be limited to areas immediately surrounding the Nabesna Road, and could cumulatively add to the impacts to wildlife from ORV use. ORVs traveling from the Nabesna Road down the trails could transport some of this dust further along trails via their wheels; however, the amount of mine dust transported in this manner would likely be minimal. Habitat loss and effects of heavy metal accumulation would likely be minor.

In recent decades, Alaska's climate has shown a more rapid warming trend than elsewhere in the United States (Parson 2001). Alaska has also grown substantially wetter over this time period. As described in Section 4.3.2.4, over the long term, climate change in Alaska may result in ecosystem-level shifts associated with the northward expansion of the boreal forest and landscape-level vegetation changes. Ultimately, these projected ecosystem shifts are likely to result in shifts in habitat composition or quality, which may displace wildlife populations or cause shifts in terrestrial mammal migration patterns. Because of the gradual nature of any changes, over the 20-year planning period, impacts to wildlife from climate change are expected to be minor.

As discussed in Section 3.3.2.1, there are approximately 94 miles of other motorized trails in the analysis area. Based on a 1986 inventory, these trails are generally in fair condition with some limited segments in degraded condition. Because of the very low level of use on these trails, impacts to vegetation and wildlife habitat are contained. In some cases, bare ground or past disturbances are described as re-vegetating (Connery 1987). Because of the low level of use associated with these trails, hunting pressure associated with them is limited. The trails may in fact serve to better distribute ORV-using hunters and therefore not concentrate hunting pressure, which could balance, in part, the negative effects on wildlife of the increased projected trail use. Overall, impacts to wildlife habitat from these trails would be considered minor.

Along the Nabesna Road there has been only minimal development, including a ranger station, a public-use cabin, picnic areas, private landing strips, and a few lodges/bed-and-breakfasts. The main attribute and attraction of the analysis area along the Nabesna Road is its wildness. The park receives relatively light visitor use, with 65,700 people in 2008 (compared to 3.07 million at Yellowstone National Park), less than one percent of whom use ORVs in the analysis area. Additional frontcountry development will be carried out on the park within the next 20 years, which would likely increase the number of visitors and possibly stimulate interest in accessing the backcountry via ORV.

The impacts of other nearby past, present, and foreseeable future actions would result in loss and alteration of wildlife habitat. There would be measureable impacts to wildlife habitat and populations; however, effects would be small and not affect the ecological integrity of the analysis area and would be considered minor. In combination with the minor, long-term, adverse direct and indirect impacts to wildlife, Alternative 1 would result in net long-term, minor, adverse cumulative impacts to wildlife in the analysis area.

Conclusion

The effects of Alternative 1 on wildlife and habitat would be minor. The trails that could be open for ORV use under this alternative are the same that are currently open, with only a relatively small increase in use projected. Some wildlife would experience short-term adverse impacts from ORVs,

but these are unlikely to cause population-level effects. Impacts to habitat would be noticeable, but habitat would retain adequate ecological integrity to support viability of all native species. Continued closure of the Suslota, Tanada Lake, and portions of the Copper Lake trails to recreational ORV use would benefit wildlife by eliminating disturbance during the sensitive breeding season and by not allowing ORVs on unfrozen soil.

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

4.3.4.5 Alternative 2 Effects on Wildlife

Direct and Indirect

Under Alternative 2, all nine trails would be open to recreational ORV use and no trail improvements would occur. Recreational and subsistence ORV use on existing trails under Alternative 2 is projected to increase slightly over current levels to 1,171 ORV round trips per year (Table 4-1). Those areas where soil and vegetation have been churned and damaged would not have the chance to recover under this alternative, as there would be no ORV closures. Wet areas that have become braided would likely become further widened by users attempting to circumvent boggy areas, compounding habitat impacts (see Section 4.3.1 for additional discussion). These conditions would produce potential long-term, minor adverse effects to wildlife because they would likely result in small changes to population numbers, population structure, and other demographic factors not affecting population viability or stability.

Hunting pressure on moose and Dall's sheep under Alternative 2 would increase slightly over current levels due to the higher projected ORV use. With recreational ORV use permitted on the Tanada Lake trail, sport hunters would be able to more easily access the wilderness area in the southern half of the analysis area, increasing hunting pressure of Dall's sheep in that area. This could result in increased mortality to those wildlife species and displacement of these species to other, potentially less suitable areas. Altered movements of ungulate game species could also adversely affect predators by making their prey species more difficult to find. A potential beneficial effect on wildlife of Alternative 2 is that the increased number of hunters could distribute themselves more evenly throughout the analysis area if trails remain open, possibly decreasing hunting pressure at any given spot from May 15 through October 15.

Alternative 2 would also have slightly increased short-term, disturbance impacts to breeding wildlife compared to current conditions. The increased use projected during the planning period could cause more disturbance to breeding adults or injury or death to young, although the effects would be minor, as wildlife have ample opportunities to escape to undisturbed areas.

Impacts to wildlife habitat that would occur on each trail under this alternative are shown below (Table 4-28). "Greater than" symbols are added where impacts to wetlands or vegetation are expected to expand. Projected ORV use is also shown for each trail as an indicator of hunting pressure. These data were used to reach the following conclusions for direct and indirect impacts.

Table 4-28. Summary of Impacts to Wildlife on Nine ORV Trails and Black Mountain Trails under Alternative 2

Trail	Projected ORV Use (round trips per year)			Action	Wildlife Habitat Impacted (acres)	
	Recreational	Subsistence	Change from Current		Wetlands	Vegetation
Black Mountain	0	65	15%	No improvements	>1.2	>3.7
Boomerang	4	4	174%	No improvements	9.4	16.1
Caribou Creek	92	40	-20%	No improvements	0.2	>3.6
Copper Lake	35	110	145%	No improvements	>103.9	>234.7
Lost Creek	121	47	16%	No improvements	4.0	2.0
Reeve Field	21	24	0%	No improvements	>26.5	29.3
Soda Lake	49	20	9%	No improvements	5.2	>14.1
Suslota	85	62	0%	No improvements	>169.6	>190.0
Tanada Lake	105	73	-22%	No improvements	>120.2	>261.2
Trail Creek	138	41	10%	No improvements	2.7	3.7

In summary the direct and indirect effects of Alternative 2 on wildlife would be long-term, adverse, and minor. Adverse impacts to habitat would increase along Suslota Lake, Tanada Lake, and Copper Lake (past the Boomerang Cutoff) trails due to increased projected use, but would be similar to current conditions along all other trails. Although there would be some detectable impacts on wildlife and their habitat, there would likely be only small changes in demographics caused by this alternative due to the similar use level compared to Alternative 1. Native wildlife species would experience at least 758 acres of habitat loss or disturbance, but habitat would retain adequate ecological integrity to support viability of all native species. There would be occasional disturbance to wildlife from ORVs, but disturbance would be considered infrequent due to the small number of ORV round trips and the likelihood of individual animals experiencing disturbance from them.

Cumulative

The impacts of other nearby past, present, and foreseeable future are described under Alternative 1 and would result in loss and alteration of wildlife habitat. There would be measureable impacts to wildlife habitat and populations; however, effects would be minor because they would be small and not affect the ecological integrity of the analysis area. In combination with the minor, long-term, adverse direct and indirect impacts to wildlife, Alternative 2 would result in net long-term, minor, adverse cumulative impacts to wildlife in the analysis area.

Conclusion

Increased ORV use on unimproved trails would result in an expansion of impacts to wildlife habitat, particularly in the vicinity of the Suslota, Tanada Lake, and Copper Lake trails. Because the habitat that these trails traverse is abundant within the analysis area, the impacts to habitat would not result in a loss of ecological integrity and would support viability of all native species. For this reason, the impact to wildlife habitat under this alternative is considered minor. Unimproved trails would continue to provide tough and limited access to sport and subsistence hunting. Consequently, impacts to wildlife from increased hunting pressure would be minor.

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

4.3.4.6 Alternative 3 Effects on Wildlife

Direct and Indirect

Under Alternative 3, ORV use would decrease on all nine trails, with a projected ORV use of 582 round trips per year averaged over the analysis period compared to the current ORV use of 917 round trips per year, a decrease of 37 percent (Table 4-1). This could reduce disturbance and hunting pressure on wildlife on average, potentially resulting in game species shifting use areas closer to and within the analysis area. Fewer projected users on the trail would likely result in a decreased probability of startling response effects and related increased utilization of metabolic resources. Development of the new Soda Lake Re-route and new non-motorized trails could cause disturbance to wildlife where it previously does not occur; however, total miles of motorized trails under this alternative (101.4 miles) would be slightly less than exist currently (103.5 miles). Though overall use would be less, the Soda Lake Re-route would change the distribution of hunters using the analysis area, placing them closer to the Mentastas and making harvest of Dall's sheep there more accessible. While this could increase hunting pressure on this species in the Mentastas, the re-route could also serve to disperse hunters away from current focal points of sheep hunting. That, combined with the decrease in ORV users in the analysis area, would likely decrease hunting pressure on Dall's sheep and moose overall.

Alternative 3 could also result in decreased impacts to wildlife habitat. The re-route could allow 1.7 miles of degraded trail to regenerate, and the new trail would be design-sustainable, which would allow ORV users to stay on one trail alignment. Construction of the trail re-route and the non-motorized trails could impact a total of 12.8 acres. The construction of 2.5 miles of new ORV trail would temporarily remove 10.0 acres of wildlife habitat, until vegetation is able to regenerate. The trail design would provide a high level of environmental protection, and designing the new trail sustainably would keep users from creating additional braids in the future, minimizing additional habitat impacts. The 2.8 acres impacted during construction of the non-motorized trails could also create additional disturbance to wildlife habitat. One degraded stream crossing would be removed by re-routing Soda Lake trail, allowing the crossing and its associated habitat to eventually regenerate. Preventing further degradation to these habitat areas could provide long-term beneficial effects to wildlife. The monitoring and management that would be in place under Alternative 3 (described in Chapter 2) would help prevent expansion of habitat degradation along the ORV trails.

Another potential impact to habitat is the spread of exotic plants on ORV tires. At this time, density of exotic species in the analysis is very low, with most occurring within the Nabesna road corridor. Because the potential for spread via ORV is low, the impact to wildlife habitat would be negligible.

Impacts to wildlife habitat that would occur on each trail under this alternative are shown below (Table 4-29). Projected ORV use is also shown for each trail as an indicator of hunting pressure. The Wildlife Habitat Impacted columns show acres of vegetation and wetland disturbance from construction (where trail construction is proposed), plus acres of currently impacted vegetation or wetlands. The Wildlife Habitat Recovery columns show acres of impacted vegetation and wetland disturbances that would be allowed to recover where trails were re-routed around impacts under this alternative. A positive number in the recovery columns indicates a beneficial impact to wildlife habitat. These data were used to reach the following conclusions for direct and indirect impacts.

Table 4-29. Summary of Impacts to Wildlife on Nine ORV Trails and Black Mountain Trails under Alternative 3

Trail	Projected ORV Use (round trips per year)			Action	Wildlife Habitat Impacted (acres)		Wildlife Habitat Recovery (acres)	
	Recreational	Subsistence	Change from Current		Wetlands	Vegetation	Wetlands	Vegetation
Black Mountain	Closed	65	18%	No improvements	1.2	3.7	0	0
Boomerang	Closed	6	-40%	No improvements	9.4	16.1	0	0
Caribou Creek	Closed	40	-67%	No improvements	0.2	3.6	0	0
Copper Lake	Closed	125	0%	No improvements	103.9	234.7	0	0
Lost Creek	Closed	50	-68%	No improvements	4.0	2.0	0	0
Reeve Field	Closed	24	-47%	No improvements	26.5	29.3	0	0
Soda Lake	Closed	35	-60%	Constructed re-route with closure of old trail	5.3	6.4	5.2	10.6
Suslota	Closed	70	17%	No improvements	169.6	190.0	0	0
Tanada Lake	Closed	75	15%	No improvements	120.2	261.2	0	0
Trail Creek	Closed	45	-71%	No improvements	2.7	3.7	0	0

In summary, the direct and indirect effects of Alternative 3 on wildlife would be long-term, adverse, and minor. Disturbance impacts on wildlife would decrease somewhat throughout the analysis area compared to current conditions. However, due to continued (albeit decreased) ORV use of the trails, habitat would not recover fully because plants regrow slowly in the analysis area. These impacts could cause small demographic changes to native wildlife populations, although the ecology of the analysis area would remain intact and would support the viability of all native species. Individuals would experience disturbance occasionally, but not frequently, due to the low number of ORV round trips and the likelihood of individual animals encountering ORVs.

Cumulative

The impacts of other nearby past, present, and foreseeable future are described under Alternative 1 and would result in loss and alteration of wildlife habitat. There would be measureable impacts to wildlife habitat and populations; however, effects would be minor because they would be small and not affect the ecological integrity of the analysis area. In combination with the minor, long-term, adverse direct and indirect impacts to wildlife, Alternative 3 would result in net long-term, minor, adverse cumulative impacts to wildlife in the analysis area.

Conclusion

Closing the area to recreational ORV use would have a beneficial effect on wildlife and wildlife habitat, compared to existing conditions. Reduced ORV access would reduce sport hunting in the area and decrease hunting pressure. Reduced ORV use would also reduce the level of habitat impacts, though continued subsistence ORV use on unimproved trails would continue to have a minor impact on wildlife habitat. Construction of the Soda Lake re-route and non-motorized trails would result in minor impacts to wildlife habitat and, because no sport hunting would occur, only a slight increase in subsistence hunting pressure. Overall, this alternative would result in minor impacts to wildlife and wildlife habitat.

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

4.3.4.7 Alternative 4 Effects on Wildlife

Direct and Indirect

Although the miles of motorized trail would increase slightly from the re-routes under this alternative compared to Alternative 1 (from 103.5 to 115.1, an 11 percent increase), impacts to habitat would likely decrease due to the maintainable and design-sustainable nature of the improved trails. Trails would be hardened, decreasing the tendency for users to create new braids, and the single trail alignment would be monitored and maintained. This would decrease the acres of habitat lost to churning and vegetation damage as well as decrease surface impacts to the trails themselves. The re-routes specified in this alternative would avoid much of the most severely degraded trail segments, allowing them to eventually recover.

Disturbance and other direct impacts to wildlife would increase, due to both increased use by the public and to increased construction, monitoring, and maintenance activities by park personnel. During construction, 119.5 acres of habitat would be impacted until vegetation recovered (Table 4-2). Use of the trails is projected to increase 93 percent over current levels (to approximately 1,771 round trips per year over the analysis period). The 93 percent increase in user projected with only an 11

percent increase in miles of trail would likely result in increased hunting pressure on wildlife in the analysis area, and the trail re-routes and improvements would change the distribution of hunters. The Tanada Lake and Soda Lake re-routes would allow motorized access into new areas previously accessible only by foot. The Tanada Lake re-route in particular would place motorized use into an area that has provided a very specific non-motorized sheep-hunting opportunity. Improving access to Tanada Lake would impact Dall's sheep; just south of this lake is the area with the highest harvest of this species in the analysis area (WSENPP and SMUM No date). Improvements to and maintenance of currently degraded trails would also improve access to areas that are currently difficult to approach by ORV. In particular, improvements and re-routes of the Copper Lake Trail would bypass and repair miles of trail that are currently classified as degraded to extremely degraded, improving subsistence ORV access to Dall's sheep hunting in areas accessed by this trail.

In addition to impacts from increased hunting pressure, there would be short- and long-term increases in disturbance to wildlife while trail repairs and re-routing occur. The more severe short-term disturbances could result from increased personnel on site and the use of loud construction equipment for the time it would take to construct the specified re-routes. The lesser long-term disturbance would be from personnel monitoring trail conditions every 3 years and performing periodic maintenance as necessary. There could also be a slight increase of human presence in the area used due to the construction and routing of several new non-motorized trails in the analysis area.

Another potential impact to habitat is the spread of exotic plants on ORV tires, the risk of which would increase under this alternative due to the increase in ORVs that would use the area. At this time, density of exotic species in the analysis is very low, with most occurring within the Nabesna road corridor. Because the potential for spread via ORV is low, the impact to wildlife habitat would be negligible.

Impacts to wildlife habitat that would occur on each trail under this alternative are shown below (Table 4-30). Projected ORV use is also shown for each trail as an indicator of hunting pressure. The Wildlife Habitat Impacted columns show acres of vegetation and wetland disturbance from construction (where trail construction is proposed), plus acres of currently impacted vegetation or wetlands. "Greater than" and "less than" symbols are added where impacts to wetlands or vegetation are expected to expand or decrease. The Wildlife Habitat Recovery columns show acres of impacted vegetation and wetland disturbances that would be allowed to recover where trails were improved or re-routed around impacts under this alternative. A positive number in the recovery columns indicates a beneficial impact to wildlife habitat. These data were used to reach the following conclusions for direct and indirect impacts.

This alternative estimates a potential doubling of subsistence ORV use on the wilderness trail systems. Without any proposed control over off-trail use, this could result in increased impacts to wildlife habitat. The direct and indirect effects of Alternative 4 on wildlife would be long-term, adverse, and moderate. Disturbance impacts to wildlife would nearly double, and individuals could be frequently disturbed. Disturbance under this alternative could cause some changes to the demography and distribution of wildlife populations. Disturbance would increase substantially on Copper Lake, Black Mountain, and Tanada Lake trails. ORV use on the other trails also would increase over current conditions. Populations are likely to remain stable and viable, and the ecological integrity of the analysis area would remain intact due to the relatively small amount of habitat directly impacted. Trail improvements would improve habitat quality for wildlife along trails by closing old degraded portions and allowing for some habitat recovery. Cumulative The impacts of other nearby past, present, and foreseeable future are described under Alternative 1 and would result in loss and alteration of wildlife habitat. There would be measureable impacts to wildlife habitat and

Table 4-30. Summary of Impacts to Wildlife on Nine ORV Trails and Black Mountain Trails under Alternative 4

Trail	Projected ORV Use (round trips per year)			Action	Wildlife Habitat Impacted (acres)		Wildlife Habitat Recovery (acres)	
	Recreational	Subsistence	Change from Current		Wetlands	Vegetation	Wetlands	Vegetation
Black Mountain	Closed	144	162%	Spot hardening and minor re-route construction using hand crews	<1.2	<3.7	Unknown, but could be substantial	Unknown, but could be substantial
Boomerang	Closed	6	30%	Improvement of river ramp	<9.4	16.1	Minimal	Minimal
Caribou Creek	180	25	71%	Major trail hardening and some re-alignment	<0.2	<3.6	Minimal	Minimal
Copper Lake	Closed	274	119%	Constructed re-route and hardening with old trail closure.	11.0	26.5	59.2	185.3
Lost Creek	153	50	32%	Bladed trail to minimize crossings	<4.0	<1.8	Minimal	Minimal
Reeve Field	50	24	64%	Re-route with closure of old degraded trail.	0.7	4.5	25.9	26.8
Soda Lake	126	25	72%	Constructed re-route with closure of old degraded trail	1.7	6.4	3.4	10.6
Suslota	Closed	70	17%	No improvements	169.6	190.0	0	0
Tanada Lake	Closed	265	308%	Constructed re-route with closure of old trail.	1.4	17.3	110.7	257.7
Trail Creek	162	45	34%	Bladed trail to minimize crossings	<2.7	<3.7	Minimal	Minimal

populations; however, effects would be minor because they would be small and not affect the ecological integrity of the analysis area. In combination with the moderate, long-term, and adverse direct and indirect impacts to wildlife, Alternative 4 would result in net long-term, moderate, adverse cumulative impacts to wildlife in the analysis area.

Conclusion

This alternative would result in increased hunting pressure, due to the near-doubling of predicted trail users. Trail improvements in currently degraded areas could serve to more evenly distribute hunting pressure throughout the analysis area, but the higher number of users and new access areas currently accessible through non-motorized means would increase hunting impacts on wildlife. This alternative would also result in increased short-term disturbances to wildlife over current levels due to trail construction and maintenance, but these activities would also improve habitat conditions over the long term. Overall, the substantial increase in projected ORV use and increased access to game species would result in long-term, adverse, and moderate impacts to wildlife under Alternative 4.

Protection of habitat for and populations of fish and wildlife is a stated purpose in the park's enabling legislation (ANILCA, Section 201(9)). Several wildlife species are mentioned specifically as significant resources in the 1986 GMP and in subsequent planning documents. These include caribou, moose, grizzly bears, Dall's sheep, trumpeter swans, and bald eagles. The moderate impacts to wildlife anticipated from this alternative would not affect the viability of the populations of any of those species and would not result in an impairment of park resources that fulfill specific purposes identified in the establishing legislation or that are essential to the integrity of the park.

4.3.4.8 Alternative 5 Effects on Wildlife

Direct and Indirect

The miles of trail in the analysis area would increase under this alternative from the re-routes and the addition of the Mentasta Traverse non-motorized trail (from 103.5 miles to 110.0 miles, a 6 percent increase); however, improved trails would be in at least a maintainable condition, and unimproved trails would be closed to recreational ORV use. Trails would be improved and hardened, decreasing the tendency for users to create new braids, and the single trail alignment would be monitored and maintained over time. This would decrease vegetation damage and the number of acres of habitat lost to churning. The improved and hardened trails would also be much more resistant to damage from ORVs. The re-routes and areas that would be improved under this alternative would avoid or improve many of the most severely degraded trail segments, allowing them to recover. This would benefit wildlife by allowing more habitat to recover and eliminating continued habitat destruction due to braiding. During construction of re-routes and later during ORV use of re-routed trails, wildlife could be disturbed in new areas not currently used, potentially causing wildlife to shift to other areas.

Designation of improved trails in the designated wilderness would minimize off-trail ORV impacts to wildlife habitat.

Under Alternative 5, ORV use of the trails is projected to increase 83 percent over current levels to approximately 1,679 round trips per year over the analysis period (Table 4-1). This substantial increase in users projected over only a 6 percent increase in miles of trail would result in increased hunting pressure on wildlife in the analysis area, and the trail re-routes and improvements would change the distribution of hunters. Improvements to and maintenance of currently degraded trails would also improve access to areas that are currently difficult to approach by ORV. Improvements and re-routes of the Copper Lake trail would bypass and repair miles of trail that are currently classified as degraded to extremely degraded, improving subsistence ORV access to Dall's sheep

hunting in the Black Mountain area. ORV use on the Copper Lake trail is projected to increase by 137 percent compared to current conditions, while ORV use on the Black Mountain trails is projected to increase by 64 percent. Improvements and re-routes of the Tanada Lake trail and those trails south of there (Pass Creek and Goat Creek) would likewise allow increased access into this part of the analysis area. The highest harvest of Dall's sheep in the analysis area occurs just south of Tanada Lake (WSENPP and SMUM No date). The 76.9 miles of new non-motorized trails and routes would also increase hunter access within the analysis area. The increase in the number of miles of trail, as well as the improvements of existing trails, would likely serve to redistribute hunters throughout the analysis area, potentially easing hunting pressure in areas that are currently more accessible. However, due to the large projected increase of use in the analysis area, overall hunting pressure would be increased, resulting in an increased harvest, particularly on Dall's sheep.

Construction and maintenance of trail repairs and re-routing would result in short- and long-term increases in disturbance to wildlife. The more severe short-term disturbance would consist of increased personnel on site and the use of loud construction equipment for the time it would take to construct the specified re-routes. During construction, 139.2 acres would be impacted (Table 4-2). The lesser long-term disturbance would be personnel monitoring trail conditions every 3 years and performing periodic maintenance as necessary.

Another potential impact to habitat is the spread of exotic plants on ORV tires, the risk of which would increase under this alternative due to the increase in ORVs that would use the area. At this time, density of exotic species in the analysis area is very low, with most occurring within the Nabesna road corridor. Because the potential for spread via ORV is low, the impact to wildlife habitat would be negligible.

Impacts to wildlife habitat that would occur on each trail under this alternative are shown below (Table 4-31). Projected ORV use is also shown for each trail as an indicator of hunting pressure. The Wildlife Habitat Impacted columns show acres of vegetation and wetland disturbance from construction (where trail construction is proposed), plus acres of currently impacted vegetation or wetlands. "Less than" symbols are added where impacts to wetlands or vegetation are expected to decrease. The Wildlife Habitat Recovery columns show acres of impacted vegetation and wetland disturbances that would be allowed to recover where trails were improved or re-routed. A positive number in the recovery columns indicates a beneficial impact to wildlife habitat. These data were used to reach the following conclusions for direct and indirect impacts.

The direct and indirect effects of Alternative 5 on wildlife would be long-term, adverse, and moderate. Disturbance impacts to wildlife from ORVs would increase, almost doubling, and individuals could be frequently disturbed, particularly during hunting season. Disturbance under this alternative could cause some changes to the demography and distribution of wildlife populations. ORV use, and thus disturbance to wildlife, is projected to increase substantially over current management on Copper Lake and Tanada Lake trails. ORV use also is projected to increase on the other trails. Populations are likely to remain viable, and the ecological integrity of wildlife habitat within the analysis area would remain intact due to the relatively small amount of habitat directly impacted. By closing old degraded portions of trails and allowing some habitat recovery, trail improvements would improve habitat quality for wildlife on all trails.

Table 4-31. Summary of Impacts to Wildlife on Nine ORV Trails and Black Mountain Trails under Alternative 5

Trail	Projected ORV Use (round trips per year)			Action	Wildlife Habitat Impacted (acres)		Wildlife Habitat Recovery (acres)	
	Recreational	Subsistence	Change from Current		Wetlands	Vegetation	Wetlands	Vegetation
Black Mountain	Closed	90	64%	Spot hardening and minor re-route construction using hand crews	<1.2	<3.7	Unknown, but could be substantial	Unknown, but could be substantial
Boomerang	7	6	30%	Improvement of river ramp	<9.4	16.1	Minimal	Minimal
Caribou Creek	180	25	71%	Major trail hardening and some re-alignment	<0.2	<3.6	Minimal	Minimal
Copper Lake	125	171	137%	Constructed re-route and hardening with old trail closure.	11.0	26.5	59.2	185.3
Lost Creek	153	50	32%	Bladed trail to minimize crossings	<4.0	<1.8	Minimal	Minimal
Reeve Field	50	24	64%	Re-route with closure of old degraded trail.	0.7	4.5	25.9	26.8
Soda Lake	126	25	72%	Constructed re-route with closure of old degraded trail	1.7	6.4	3.4	10.6
Suslota	Closed	80	33%	Spot hardening of degraded meadows and stream crossings	<158.6	<190.0	10	10
Tanada Lake	234	78	380%	Constructed re-route with closure of old trail.	4.8	15.4	260.8	278.0
Trail Creek	162	45	34%	Bladed trail to minimize crossings	<2.7	<3.7	Minimal	Minimal

Cumulative

The impacts of other nearby past, present, and foreseeable future are described under Alternative 1 and would result in loss and alteration of wildlife habitat. There would be measureable impacts to wildlife habitat and populations; however, effects would be minor because they would be small and not affect the ecological integrity of the analysis area. In combination with the moderate, long-term, adverse direct and indirect impacts to wildlife, Alternative 5 would result in net long-term, moderate, adverse cumulative impacts to wildlife in the analysis area.

Conclusion

Due to improved trails and the substantial increase in ORV users projected in the analysis area under this alternative, hunting pressure on wildlife would increase, particularly on Dall's sheep south of Tanada Lake and in the Black Mountain area and on Dall's sheep in some portions of the Mentastas. With the increased number of miles of trails available, this increased number of users would be somewhat diffused throughout the analysis area, possibly reducing hunting pressure in some areas. Wildlife would benefit from habitat improvements due to the improved condition of trails, maintenance of the single trail alignment, and continued monitoring and maintenance activities to ensure that impacts associated with unimproved trails do not expand. Once trails are constructed or improved, Alternative 5 would allow many degraded areas to recover. Disturbance caused by construction, monitoring, and maintenance activities would be infrequent and localized, so that wildlife could move away from affected areas. Overall, the substantial increase in projected ORV use and increased access to game species would result in long-term, adverse, and moderate impacts to wildlife under Alternative 5.

Protection of habitat for and populations of fish and wildlife is a stated purpose in the park's enabling legislation (ANILCA, Section 201(9)). Several wildlife species are mentioned specifically as significant resources in the 1986 GMP and in subsequent planning documents. These include caribou, moose, grizzly bears, Dall's sheep, trumpeter swans, and bald eagles. The moderate impacts to wildlife anticipated from this alternative would not affect the viability of any of these wildlife populations and would not result in an impairment of park resources that fulfill specific purposes identified in the establishing legislation or that are essential to the integrity of the park.

4.4 Human Environment

4.4.1 Scenic Quality

4.4.1.1 Methodology

A fundamental aspect of the method used for visual assessment was the evaluation of impacts to the scenic quality of key views relative to the proposed alternatives. The key steps in the process used to assess potential visual impacts included determining: 1) the visibility of selected trails throughout the analysis area, 2) the existing scenic quality at key viewpoints along Nabesna Road, and 3) the degree of change to the existing scenic quality at those viewpoints resulting from the visual presence of the trails. The techniques used to implement those steps are described in the following sections.

Visibility Analysis

NPS undertook an analysis of visibility to identify those locations within the analysis area where there is potential for the existing and proposed ORV trails to be seen from ground-level vantage points along Nabesna Road. The focus on visibility from the Nabesna Road accounts for the largest

proportion of potential viewers. The visual sensitivity and procedures employed for each component of the visibility analysis are described below. Views from the air, which are essentially unconstrained geographically, are not represented in the formal visibility analysis. However, changes to visual quality that would likely be apparent from the air were considered qualitatively in the effects analysis.

A topographic viewshed map for the analysis area was prepared using USGS 60-meter digital elevation model (DEM) data for the analysis area as the base. The result is a three-dimensional representation of the terrain within the analysis area.

The process of identifying the areas from which disturbance associated with the trails might be visible is termed a Zone of Visual Influence (ZVI) analysis. The ArcGIS program defined the Nabesna Road (initially using topography only) by reading every cell of the DEM data and assigning a value based upon straight, line-of-sight visibility from eye level at linear road locations throughout the analysis area. The resulting topographic viewshed map defines the areas that could be seen from the road, ignoring the screening effects of existing structures or vegetation. The ZVI data were overlaid on a base map indicating the locations of visual resources of interest (e.g., Nabesna Road, existing trails) identified within the analysis area.

The visibility pattern resulting from the ZVI analysis described above is a conservative representation of actual visibility. First, the basic ZVI model does not account for the screening effects of existing structures or vegetation. There are few structures present in the analysis area, but there are areas with extensive forest and/or shrub cover where the screening effects of tall vegetation can substantially reduce the area from which proposed trails would be visible. As discussed in Section 3.5.1, it is highly likely that the ZVI model indicates trail segments would be visible from the Nabesna Road in areas where the trail would be hardly noticeable or not visible because of intervening vegetation along the road or the trail. In addition, the basic ZVI model does not account for attenuating factors such as distance, haze, humidity, background landscape, or weather, any or all of which could make the proposed trail invisible or barely visible from certain locations under many atmospheric conditions. Consequently, the initial terrain-based ZVI analysis was supplemented with the addition of a vegetation layer in which average or typical heights were assigned to the respective vegetation community types. The viewshed results based on both terrain and vegetation are presented in Figure 3-14.

Scenic Quality Impact Evaluation

The key step in the visual resource assessment is to determine the visual impact of the proposed trail network on the aesthetic resources (the existing scenic quality) and viewers within the analysis area. This assessment included preparing computer-assisted visual simulations of the appearance of the long-term trails from representative viewpoints within the analysis area. These simulations were evaluated to determine the type and extent of visual impact expected to result from the proposed trails, based on the degree of change from existing conditions and the expected response of viewers.

Field Investigation

Field investigation within the analysis area provided input to the visibility analysis and the evaluation of impacts, and provided the basis for selecting key viewpoints and documenting the existing visual conditions for those viewpoints. Existing conditions in the analysis area were investigated in the field on August 15 and 16, 2009, following preparation of a preliminary viewshed map and key viewing areas. During the site visit, NPS personnel drove Nabesna Road and visited five representative key viewing areas along the road, which included Dead Dog Hill and the Twin Lakes campground area. Scenic areas with limited or no view of new trails proposed under the alternatives were not reviewed

during the field investigation. Photographs were taken at each key viewing area, and the directions toward the proposed trail routes and the GPS coordinates of the photograph locations were recorded. The location references were used to verify visibility of the trails, and photographs were used to document existing visual conditions and to develop visual simulations.

Viewpoint Selection

Because it is not feasible or necessary to evaluate all possible views, selected views were chosen that represent the range of visual resources in the analysis area. Representative views were chosen to reflect both views that would be seen by the largest numbers of people (i.e., high exposure, high sensitivity, and likely views for people who would be most impacted). Key views within the middleground and background viewing distances are of 0.5 to 3.5 miles and 3.5 miles or more, respectively. Views were considered from the Nabesna Road because it has the potential to be viewed by the largest number of people.

As discussed above, NPS personnel photo-documented existing visual conditions at five specific viewpoint locations in August 2009. From this set of locations, two viewpoint locations (Dead Dog Hill and Twin Lakes) were selected for use as key viewpoints for development of visual simulations. These viewpoints were selected based on objectives to: 1) provide clear, unobstructed views of the trails where available; 2) illustrate trail visibility from sensitive sites/resources (i.e., Nabesna Road) within the analysis area; and 3) illustrate typical views of the proposed trails that would be available to representative viewer/user groups within the analysis area. The location of each selected viewpoint is indicated in Figure 3-14.

Visual Simulations

Photographic simulations of the two selected viewpoints (Figure 3-14) were prepared to depict the anticipated visual changes associated with the proposed alternatives. High-resolution, computer-enhanced image processing was used to create realistic photographic simulations of the completed trails from each of the selected key viewpoint locations. This process ensures that trail elements are shown in proportion, perspective, and proper relation to the existing landscape elements in the view. Consequently, the alignment, elevations, dimensions, and locations of the proposed trails would be accurate and true in their relationship to other landscape elements in the photograph.

The simulations were evaluated to determine the type and extent of visual impact expected to result from the trail alternatives, based on the degree of change from existing conditions and the expected response of viewers. This evaluation compared the existing and simulated views from the representative viewpoint locations to determine whether there was a noticeable change to the existing scenic quality. The identified changes in scenic quality were evaluated in the context of viewer numbers and sensitivity to assess the significance of the visual impact, using the impact threshold criteria discussed below.

4.4.1.2 Impact Threshold Criteria

To determine the significance of effects on scenic quality the impacts will be compared against the following threshold criteria:

Negligible: Visitors likely would be unaware of any effects to scenic quality.

Minor: Alterations in views would be slight but detectable, would affect few visitors, and would not appreciably limit or enhance visual resources identified as fundamental to the park's purpose and significance.

Moderate: Many visitors likely would be aware of the effects; some changes to visual resources identified as fundamental to the park's purpose and significance would be apparent.

Major: Most visitors would be aware of the effects; changes to visual resources identified as fundamental to the park's purpose and significance would be readily apparent.

4.4.1.3 Assumptions

Because the largest number of visitors within the analysis area use the Nabesna Road corridor, the potential visibility of trail re-routes considered within the range of alternatives from the Nabesna Road is a key component of the analysis.

Segments of existing and/or constructed trails are and would be visible from the air. Inactive trails (such as braided portions allowed to recover) are visible from the air.

4.4.1.4 Alternative 1 Effects on Scenic Quality

Direct and Indirect

Under Alternative 1 (No Action), the NPS would continue the present management direction, guided by conditions of the 2007 lawsuit settlement. It is assumed that over the next 20 years, annual subsistence ORV use would increase by 102 round trips and recreational ORV use would increase by 153 round trips (Table 4-1). Recreational ORV use would be limited to winter months when the ground is frozen on several trails (i.e., Suslota trail, Tanada Lake trail, and the Copper Lake trail past the Boomerang turn-off) in the analysis area. The remaining six trails would be open to recreational ORV use year-round. Subsistence ORV use and access to inholdings would be allowed year-round. Under this alternative, portions of the analysis area would remain difficult to access because there would be no trail improvements; visitors would continue to use unimproved ORV trails.

As discussed in Chapter 3, the primary park user groups include visitors traveling along Nabesna Road to recreate in the analysis area or to reach their residences. Travelers along Nabesna Road are by far the largest group because most people access the analysis area via this road (some people access the analysis area by air).

Viewshed mapping and field verification indicate that features of the existing trail system are visible from limited locations on key travel routes in the analysis area, because of the influence of topography and vegetation. At many locations along the Nabesna Road trees and shrubs adjacent to the road block views of the terrain within the foreground, although views of features in the background are expansive. The viewshed results indicate that areas within which trails are located are visible intermittently along the Nabesna Road. Field review indicated that the trails themselves were not evident in these areas, however, because the extent of disturbance associated with the trails was not sufficient for them to be noticeable to people driving or stopped along the road. Consequently, visible evidence of the existing trails is limited to trailhead areas along the road, and the visual impacts created by the trails when viewed from the road are negligible.

Surface disturbance created by the nine trails and the wilderness trails in the analysis area would be visible in most areas from the air. By air, recreational and other users would see expanding trail

braids and rutted and muddy wetlands. Minor, adverse, visual impacts to the vegetation along the trails would result from broken vegetation and soil impacts. The most common visual impacts would be from a combination of trail braids and wheel ruts into saturated soil and vegetation damage.

Surface disturbance associated with the trails is also visible to trail users. Existing degradation along the trails can dominate the foreground views for trail users, particularly along portions Copper Lake, Reeve Field, Suslota, and Tanada Lake trails. Under Alternative 1, continued deterioration in the physical condition of the trail system would be expected. For trail users, this would translate primarily into an incremental increase in the duration of views of degraded trail conditions. Because this visual change would affect relatively few viewers and would not appreciably detract from the scenery evident in middleground and background views, this impact would meet the threshold criterion for a minor impact.

In summary, the visual disturbance created by the existing trail system represents a long-term, adverse effect that is limited in extent and magnitude and affects relatively few visitors. Visual impacts under Alternative 1 would be negligible for travelers along the Nabesna Road corridor and minor for both airborne visitors and trail users. Consequently, the combined direct and indirect effects of Alternative 1 on scenic quality would be minor, at most.

Cumulative

Several of the cumulative effects assumptions described in Section 4.1.2 that would be applicable to scenic quality are discussed in this section. Projections show a potential for somewhat increased visitor demand, access for subsistence users, and access to inholdings in the analysis area over the next 20 years. These increases would minimally increase the occurrence of visual degradation in the analysis area over an extended period of time. In addition, over the long term, construction of facilities along the Nabesna Road would have minor adverse and beneficial impacts on scenic quality. The facilities would provide or support additional opportunities for enjoying the scenery, while at the same time adding a minor element of modification to the landscape. On balance, these future changes would represent negligible new impacts. In combination with the minor, long-term, adverse direct and indirect impacts to scenic quality that have already occurred, they would result in net long-term, minor, adverse cumulative impacts to scenic quality in the analysis area.

As discussed in Section 3.3.2.1, there are approximately 94 miles of other motorized trails in the analysis area. Based on the 1986 inventory, these trails are generally in fair condition with some limited segments in degraded condition. Use levels on most of the trails are very low (less than 20 passes per year). Only two unmarked trailheads are visible from the Nabesna Road. Because of vegetation screening, the low level of impacts, and other factors, none of the other trails are visible from the Nabesna Road or from the Tok Cut-Off Highway. Portions of some trails are visible from the air if the pilot or passenger is familiar with the area. Overall, impacts to scenic quality from these trails would be considered negligible.

Alternative 1 would result in minor, long-term, adverse impacts to scenic quality within the analysis area. The impacts of other past, present and foreseeable future actions are also considered to be minor, although they would affect somewhat more visitors than would the changes resulting from Alternative 1. In combination, cumulative impacts under Alternative 1 would still be minor, because viewer exposure to visual change would not be widespread and the cumulative impacts would not involve apparent changes to visual resources identified as fundamental to the park's purpose and significance.

Conclusion

This alternative would result in minor direct and indirect impacts to scenic values in the park, primarily because of localized trail deterioration evident to some viewers. From the air, it is anticipated that visitors would experience a minor adverse effect because the trails would not be improved and trail braiding would continue. Trail users would experience similar effects, while changes to scenic quality experienced by visitors in the Nabesna Road corridor (the largest viewer group) would be negligible.

The minor impacts to scenic quality anticipated from this alternative would not result in an impairment of park resources that fulfill specific purposes identified in the establishing legislation or that are essential to the integrity of the park.

4.4.1.5 Alternative 2 Effects on Scenic Quality

Direct and Indirect

Under Alternative 2, it is assumed that over the next 20 years, subsistence use would increase by 41 round trips and recreational ORV use would increase by 213 round trips relative to current use levels (Table 4-1). Recreational ORV use would not be limited to winter months when the ground is frozen, but would be allowed on the nine trails throughout the analysis area but not in designated wilderness. Subsistence ORV use and access to inholdings would continue year-round. Under this alternative, the analysis area would remain difficult to access because there would be no trail improvements; visitors would continue to use unimproved ORV trails.

Because visible evidence of the existing trails is limited to trailhead areas along the road, the visual impacts created by the trails when viewed from the road would be negligible. By air, recreational and other users would see expanding trail braids and rutted and muddy wetlands, especially on the Copper Lake, Suslota, and Tanada Lake trails, which are most degraded. Minor, adverse, visual impacts to the vegetation along the trails would result from broken vegetation and soil impacts. The most common visual impacts would be from a combination of trail braids and wheel ruts into saturated soil and vegetation damage. Continuing degradation would dominate the foreground views for trail users along portions of the Copper Lake, Reeve Field, Suslota, and Tanada Lake trails. For trail users, this would translate primarily into an incremental increase in the duration of views of degraded trail conditions. Because this visual change would affect relatively few viewers and would not appreciably detract from the scenery evident in middleground and background views, this adverse impact would be minor.

Under this alternative, the magnitude of change from current effects would be minor because a relatively low increase in the amount of subsistence and recreational ORV use is anticipated over the next 20 years. Alternative 2 would result in continued, long-term visual disturbance from the existing trail system that would be limited in extent and magnitude. These effects would be visible to few park visitors, primarily those traveling by air and on the motorized trails, and would not appreciably detract from the scenery evident in the middleground and background views. Based on the composite level of scenic impacts among all viewer groups, expected changes in trail conditions under Alternative 2 would have minor overall direct and indirect effects on scenic quality.

Cumulative

The combined minor impacts of other nearby past, present, and foreseeable future actions on scenic quality are described under Alternative 1. The net effect of these impacts in combination with the

direct and indirect impacts likely under Alternative 2 would be long-term, minor, adverse impacts to scenic quality, primarily related to slightly increased visitor demand and subsistence and inholder access and construction of facilities along the Nabesna Road. The incremental contribution of the direct and indirect scenic quality effects from Alternative 2 would affect few visitors and is expected to be small relative to the other past, present and foreseeable future actions.

Conclusion

This alternative would result in minor direct and indirect impacts to scenic values in the park, primarily because of localized trail deterioration evident to some visitors, particularly along the Copper Lake, Reeve Field, Suslota, and Tanada Lake trails. Visitors traveling by air or on the trails open to motorized use would experience a minor adverse effect because the trails would not be improved and trail braiding would continue, with associated incremental effects on scenic quality. Visitors in the Nabesna Road corridor would experience negligible changes in scenic quality.

The minor impacts to scenic quality anticipated from this alternative would not result in an impairment of park resources that fulfill specific purposes identified in the establishing legislation or that are essential to the integrity of the park.

4.4.1.6 Alternative 3 Effects on Scenic Quality

Direct and Indirect

Under Alternative 3, the NPS would attempt to address resource impacts through trails administration with little investment in trail improvements. Recreational ORV use would not be allowed on any of the nine trails in the analysis area. It is assumed that over the next 20 years, subsistence use would increase by 102 round trips and recreational ORV use would decrease by 437 round trips (to 0) relative to current use levels (Table 4-1). Recreational ORV use would not be allowed in the analysis area year-round, while all nine trails and the wilderness trail systems would be open to subsistence ORV use year-round. However, a re-route would be constructed on the Soda Lake trail from Lost Creek to Platinum Creek to avoid private property. This trail re-route would also bypass most of the trail segments currently classified as degraded or very degraded. These improvements would result in a design-sustainable and maintainable trail. Once the re-route is completed, the old trail would be seasonally closed to all motorized users except those accessing the private property to allow for vegetation and soil recovery. Additionally, four non-motorized trails or routes would be considered as follows: Rock Creek, Platinum-Soda, Platinum-Reeve, and Sugarloaf. These actions would permanently impact approximately 4 acres within the analysis area, including 3.1 acres related to the permanent 6-foot tread on the Soda Lake Re-route and 0.9 acre related to 1.9 miles of constructed tread on the Rock Creek trail. During construction, approximately 12.8 acres would be affected (Table 4-2).

Trail braiding and degradation of trails would slow under this alternative because 3 percent of the trail segments classified as degraded would be improved. In addition, recreational ORV use would not be allowed year-round and total ORV use would be reduced by 42 percent compared to current use, which would presumably allow some level of recovery over time on degraded trail segments. Four new non-motorized trails or routes would be implemented but only 1.9 miles of new non-motorized trail would be constructed, resulting in limited new trail disturbance.

The ZVI analysis indicates that the Soda Lake Re-route segment should not be visible to viewers along the Nabesna Road, although a portion might be visible from the Lost Creek trail. The analysis indicates that portions of the proposed Rock Creek non-motorized trail would cross terrain that is

visible from the road, particularly in the upper section that loops to the west across elevated slopes to connect with the Caribou Creek trail. Given the viewing distance (over 1 mile from the road) and the limited disturbance from constructing tread for this trail (total construction disturbance with a potential width of 10 to 12 feet for a 4-foot tread width), however, it is unlikely that the Rock Creek trail would be visible from the Nabesna Road. Because the three new non-motorized routes would only be indicated by intermittent marking, such as cairns, these routes would not be visible from the Nabesna Road even within the foreground (0 to 0.5 miles) and would not create scenic quality impacts for users of the routes.

Visible evidence of the Soda Lake Re-route segment would likely be detectable in most areas from the air. Based on the limited extent of this disturbance (approximately 3 acres along a 4.3-mile route), this action would represent a minimal change to the degree of disturbance presently visible from the air. It is unlikely that the proposed non-motorized trail or routes would be visible from the air, other than possibly in the immediate vicinity of the Rock Creek trail, and no adverse impacts to scenic quality as seen from the air would be expected for these features.

Users of the Soda Lake trail would notice ground disturbance resulting from construction of the re-route segment on this trail. Because this effect would be temporary, quite limited in extent, and applicable to only a relatively small segment of the trail user viewer group, this would be a negligible scenic impact. Over the long term, Soda Lake trail users would benefit from avoidance of most of the degraded segments on this trail through the proposed re-route, thereby experiencing less trail degradation in their foreground views. To the extent that changes in trails administration under Alternative 3 might allow for gradual long-term recovery of some degraded trail segments, users of the motorized trails in general might experience a corresponding decrease in scenic quality impacts. Caribou Creek trail users may see portions of the Rock Creek non-motorized trail contouring adjacent slopes east of the trail, a minor effect given the small change in scenic quality and the few visitors that would be affected.

Alternative 3 would result in continued long-term visual disturbance from the existing trail system that would be limited in extent and magnitude and would affect relatively few visitors. Considering the range of impacts identified for the respective viewer groups, Alternative 3 would have minor overall direct and indirect effects on scenic quality.

Cumulative

The minor impacts of other nearby past, present, and foreseeable future actions on scenic quality are described under Alternative 1. The net effect of these impacts in combination with the direct and indirect impacts likely under Alternative 3 would be long-term, minor, adverse impacts to scenic quality, primarily related to slightly increased visitor demand and subsistence/inholder access and construction of facilities along the Nabesna Road. The incremental contribution of the direct and indirect scenic quality effects from Alternative 3 would affect few visitors and is expected to be small relative to the other past, present and foreseeable future actions.

Conclusion

This alternative would result in few new adverse impacts from trail development actions, and existing effects on scenic quality may diminish somewhat because of reduced overall ORV use. Lost Creek trail users potentially would be exposed to views of land disturbance during construction of the Soda Lake Re-route, and construction activity for the Rock Creek non-motorized trail might be evident from the Nabesna Road; these actions would only affect approximately 12.8 acres and the disturbance would be limited in duration. From the air, it is anticipated that visitors would experience negligible

to minor adverse effects because the existing trails would be maintained in their current condition and some new trail mileage would be developed. Under Alternative 3, users of the motorized trails in general would experience a corresponding decrease in scenic quality impacts if changed ORV use levels resulted in gradual long-term recovery of some existing degraded trail segments.

The minor impacts to scenic quality anticipated from this alternative would not result in an impairment of park resources that fulfill specific purposes identified in the establishing legislation or that are essential to the integrity of the park.

4.4.1.7 Alternative 4 Effects on Scenic Quality

Direct and Indirect

Under Alternative 4, the NPS would improve eight of the nine trails to a design-sustainable or maintainable condition to provide reasonable access while protecting park resources. It is assumed that over the next 20 years, subsistence use would increase by 620 round trips and recreational ORV use would increase by 234 round trips relative to current use levels (Table 4-1). Once improvements are in place, recreational ORV use would be allowed on trails in the National Preserve, but not in the National Park. Portions of the analysis area would be easier to access by trail because of the trail improvements; hence, the substantial increase in subsistence ORV use. Trail improvements would take place to the following trails: Lost Creek, Trail Creek, Caribou Creek, Soda Lake, Reeve Field, Tanada Lake, Copper Lake, Black Mountain trail system, wilderness trails south of Tanada Lake, and Boomerang. Additionally, seven non-motorized trails or routes would be constructed as follows: Caribou Creek trail to Rock Creek, Upper Platinum to Soda Lake, Platinum Creek to Reeve Field, route over Sugarloaf, Tanada Spur to Tanada Lake, a route from the wilderness boundary to Nabesna, and a constructed trail from 4-mile on Nabesna Road to the Copper River. Construction of trail re-routes and non-motorized trails would permanently impact approximately 31.7 acres within the analysis area, based on 6-foot motorized trail treads and 4-foot non-motorized trail treads. During construction, approximately 119.5 acres would be affected (Table 4-2).

A larger number of acres would be temporarily and permanently affected under this alternative than the previous alternatives. Additionally, a larger number of trail improvements would occur under this alternative, including improvements to eight motorized trails and seven non-motorized trails. Visual impacts created by the large number of trail improvements, as viewed from the Nabesna Road, would include temporary visual impacts from the construction activity and potential long-term visual impacts. Trail improvements could be intermittently visible within the foreground (0 to 0.5 miles) and middleground (0.5 to 3.5 miles) depending on site-specific conditions, while trail improvements would be barely noticeable, if at all, from the background (greater than 3.5 miles) viewing distance.

A simulation was prepared for this alternative to evaluate potential changes in the view from the Nabesna Road looking towards the Tanada Re-route. Figure 4-1 is a portrayal of the view from near the Twin Lakes campground area (shown on Figure 3-14) under current conditions. Figure 4-2 shows this same view after construction of the Tanada Re-Route. The simulation indicates that portions of this trail would be visible from the road. The visible portions of the trail are within the viewing middleground and background (right of center in Figure 4-2), however, and are barely noticeable in the simulation. The trail forms a discernable line in areas with no tree cover but, for the most part, the trail follows the topography and blends in with the natural landscape. Adverse impacts to scenic quality related to this re-route would be long-term but minor. Of the proposed re-routes under this alternative, the Tanada Re-route would be most viewable from the road. Visual impacts related to other trail construction would be negligible.

Figure 4-1 Existing Conditions

Tanada Re-route - Motorized Constructed Trail - View from Twin Lakes Campground



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Figure 4-2 Simulated Conditions

Tanada Re-route - Motorized Constructed Trail - View from Twin Lakes Campground



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Surface impacts created by the motorized trail improvements and trail re-routes and non-motorized trails in the analysis area would be visible in most areas from the air. New trail construction and improvements would create color contrast that would be noticeable from the air. However, trails for motorized use would be designed and monitored to ensure that braiding did not develop, and the long-term visible presence of the trail system would likely be less than at present. It is likely that the three non-motorized trails proposed for construction would be visible from the air, although these features would be relatively narrow (with approximately a 4-foot tread width) and would mostly be noticeable in the immediate vicinity of the respective trails, rather than from substantial distances. Because the non-motorized routes would involve trail markings only and not construction of trail tread, these features would not likely be noticeable from the air. Overall, adverse impacts to scenic quality for these trail features as seen from the air would be negligible to minor.

Under this alternative, an approximate doubling of subsistence ORV use is anticipated on trails within the designated wilderness. With no proposed monitoring of off-trail impacts or designated trails, off-trail impacts associated with this use would be expected to increase. While these impacts would not be visible from the Nabesna Road or Tok Cut-Off highway, they would be highly visible from the air and could also be visible to motorized trail users in the vicinity.

Users of the motorized trails would notice fresh disturbance associated with the trail improvements implemented under Alternative 4, which would decrease over time. Over the long term, these users would experience improved overall scenic quality from avoidance of many existing degraded trail segments and long-term recovery of other degraded trail segments as a result of the trail improvements. The Soda Lake re-route would be visible from the Soda Lake and Lost Creek trails, and the Rock Creek non-motorized trail would be visible from Caribou Creek. Seeing these other trails would be a minor effect on scenic quality given the small extent of impacts and the few visitors that would be affected.

In summary, Alternative 4 would result in a mix of short-term and long-term, adverse and beneficial effects on scenic quality. Trail improvements and re-routes would lessen the visual disturbance created by the existing trail system, representing a long-term beneficial effect that would be somewhat limited in extent and magnitude and would apply to users of the motorized trails and visitors traveling by air. Conversely, disturbance associated with trail construction activity would create some short-term visual effects that would be evident to some members of all of the key viewer groups. In addition, increased overall ORV use would result in long-term, adverse visual effects that would also be limited in extent and magnitude. On balance, considering the level of impacts among the respective viewer groups, the net, long-term direct and indirect effects of Alternative 4 on scenic quality would be minor.

Cumulative

The minor impacts of other nearby past, present, and foreseeable future actions on scenic quality are described under Alternative 1. The net effect of these impacts in combination with the direct and indirect impacts likely under Alternative 4 would be long-term, minor, adverse impacts to scenic quality, primarily related to slightly increased visitor demand and subsistence/inholder access. While construction of new trails, including the Tanada Re-route, would be intermittently visible from portions of the Nabesna Road, the incremental contribution attributable to Alternative 4 would affect few visitors and represent a small component of the overall cumulative effect on scenic quality.

Conclusion

Trail improvements and construction would result in short-term and long-term impacts to scenic values. Some of these impacts (less scarring because of trail improvements and relocations) would be beneficial and other impacts (visibility of construction disturbance and/or the permanent trail features) would be minor and adverse. Overall, these impacts would be minimal based on the extent of trail improvements and new trail construction or routing under this alternative. Additionally, as shown in the simulation, the trail improvement actions would result in minor, adverse impacts to the natural landscape. Visitors to the park potentially could be temporarily exposed to limited views of land disturbance (up to 119.5 acres, although visibility of that much acreage is not anticipated) during trail improvements and construction of the non-motorized trails. From the air, visitors would experience negligible to minor, short-term adverse effects. Overall, the long-term effects for both trail users and visitors traveling by air could be positive.

The minor impacts to scenic quality anticipated from this alternative would not result in an impairment of park resources that fulfill specific purposes identified in the establishing legislation or that are essential to the integrity of the park.

4.4.1.8 Alternative 5 Effects on Scenic Quality

Direct and Indirect

Under Alternative 5, the NPS would improve most degraded segments of the nine trails to a design-sustainable or maintainable condition to provide reasonable access while protecting park resources. Improvements are also proposed for the wilderness trail systems. On unimproved trails or trail segments, impact standards would be applied to ensure that resource impacts did not expand, that unimproved trail segments improved in condition over time, and that unmanaged proliferation of trails was minimized. It is assumed that over the next 20 years, subsistence use would increase by 162 round trips and recreational ORV use would increase by 600 round trips relative to current use levels (Table 4-1). Once trails are improved to at least a maintainable condition, this alternative would allow recreational ORV use on both National Park and Preserve trails. The analysis area would be easier to access by trail under this alternative due to the trail improvements. Trail improvements would take place on the following trails: Lost Creek, Trail Creek, Suslota, Caribou Creek, Soda Lake, Reeve Field, Tanada Lake, Copper Lake, Boomerang trail, and the trail systems in the designated wilderness. Additionally, eight non-motorized trails or routes would be constructed as follows: Mentasta Traverse, Nabesna Road to Rock Creek, trail from 4-mile point on the Nabesna Road to the Copper River, Tanada Lake trail to Tanada Lake, Upper Platinum to Soda Lake, Lower Platinum to Reeve Field, route over Sugarloaf, and a route from the wilderness boundary to the Nabesna Road. Re-routes and non-motorized trail construction would permanently impact approximately 30.4 acres within the analysis area, based on a 6-foot tread for new motorized trails and a 4-foot tread for new non-motorized constructed trails. During construction, approximately 139.2 acres would be affected (Table 4-2).

A number of acres would be temporarily and permanently disturbed under this alternative because a number of trails would be improved (temporary, construction impacts) and new trails would be built (permanent impacts). Additionally, a number of trail improvements and non-motorized trails or trail re-routes would occur under this alternative, including improvements to the nine analyzed trails, the two wilderness system trails, and the eight non-motorized trails. Visual impacts created by the large number of trail improvements would include temporary visual impacts from the construction activity and potential long-term visual impacts, although little of the affected trail mileage would be visible from the Nabesna Road. Where visible from the Nabesna Road, trail improvements would be

intermittently visible within the foreground (0 to 0.5 miles) and middleground (0.5 to 3.5 miles), with trail improvements barely noticeable, if at all, from the background (greater than 3.5 miles) viewing distance.

A simulation was prepared for this alternative to evaluate changes in the view from the Nabesna Road looking toward the non-motorized Mentasta Traverse. Figure 4-3 is a portrayal of the view from Dead Dog Hill (shown on Figure 3-14) under current conditions. Figure 4-4 shows this same view after construction of the Mentasta Traverse. A magnified view of the small outlined area in the center left of the Figure is provided. The simulation indicates that this non-motorized trail would be barely visible from the road. (The simulation was prepared using an assumed or typical disturbance width of 8 feet for a trail with a 4-foot wide tread; the actual disturbance width on steeper slopes could be 10 to 12 feet, or slightly more than indicated in the simulation.) To the extent that portions of the trail are visible, they are within the viewing middleground and background and are barely noticeable, and the trail appears to fit in with the existing landscape. Adverse impacts to scenic quality related to this non-motorized trail would be negligible. Of the proposed re-routes or new trail construction under this alternative, the Mentasta Traverse constructed non-motorized trail would be most viewable from the road. Visual impacts related to other trail construction would be negligible.

Visual impacts created by the trail improvements, trail re-routes, and non-motorized trails and routes in the analysis area would be visible in most areas from the air. New trail construction and improvements would create color contrast that would be noticeable from the air. Because trails would be improved as needed, it is anticipated that those trails would be less likely noticeable from the air on a long-term basis.

Users of the motorized trails would notice fresh disturbance associated with the trail improvements implemented under Alternative 5, which would decrease over time. Over the long term, these users would experience improved overall scenic quality from avoidance of many existing degraded trail segments and long-term recovery of other degraded trail segments as a result of the trail improvements. The Soda Lake re-route would be visible from the Soda Lake and Lost Creek trails, and the Mentasta non-motorized trail would be visible from Caribou Creek, Lost Creek, and Trail Creek trails. Seeing these other trails would be a minor effect on scenic quality given the small extent of impacts and the few visitors that would be affected.

Alternative 5 would result in a mix of short-term and long-term, adverse and beneficial effects on scenic quality. Trail improvements and re-routes would lessen the visual disturbance created by the existing trail system, representing a long-term beneficial effect that would be somewhat limited in extent and magnitude, and would apply primarily to users of the motorized trails and visitors traveling by air. Disturbance associated with trail construction activity would create some adverse visual effects that would be evident to some members of all of the key viewer groups, but would primarily be of short duration. On balance, considering the level of impacts among the respective user groups, the net, long-term direct and indirect effects of Alternative 5 on scenic quality would be minor.

Cumulative

The minor impacts of other nearby past, present, and foreseeable future actions on scenic quality are described under Alternative 1. The net effect of these impacts in combination with the direct and indirect impacts likely under Alternative 5 would be long-term, negligible to minor, adverse impacts to scenic quality, primarily related to slightly increased visitor demand and subsistence/inholder access. While construction of new trails and re-routes would have limited visibility for all viewer groups, including visitors along portions of the Nabesna Road, the incremental contribution

attributable to Alternative 5 would represent a small component of the overall cumulative effect on scenic quality.

Conclusion

Trail improvements and construction under Alternative 5 would result in some degree of long-term impacts to scenic values. Some of these impacts would be beneficial, such as reduction in scarring because of trail improvement and relocations. Other impacts would be adverse, including disturbance to viewsheds because of construction disturbance and/or the permanent trail features. As shown in the simulation for the proposed Mentasta Traverse, there would be negligible, adverse impacts to the natural landscape. Visitors to the park potentially would be exposed to temporary views of land disturbance during trail improvements and construction of the non-motorized trails which would affect up to 139.2 acres. From the air, it is anticipated that visitors also would experience a minor, short-term adverse effect. Overall, the long-term effects for both trail users and visitors traveling by air could be positive. This alternative would result in at most minor, adverse direct and indirect impacts to scenic values in the park primarily due to the addition of several non-motorized trails and a number of motorized trail improvements.

The minor impacts to scenic quality anticipated from this alternative would not result in an impairment of park resources that fulfill specific purposes identified in the establishing legislation or that are essential to the integrity of the park.

4.4.2 Cultural Resources

4.4.2.1 Methodology

The analysis of effects of alternatives on cultural resources involved a review of published and unpublished documents and other materials regarding the effects of management activities and ORV trail use. It is based on the site types and locations described in limited circulation reports that cover cultural resource inventories and summaries of cultural resources for the analysis area (McMahan 1994, NPS 1998, Proue et al. 2008, 2009). As discussed in Section 3.5.2, following initial reconnaissance intensive cultural resource inventories and shovel testing were conducted only along the Nabesna Road and portions of the nine ORV trails accessible to archaeologists on foot. Cultural resource inventories along construction corridors of proposed re-routes, new trails, and new routes would be undertaken to determine whether National Register-eligible cultural resource sites are present prior to any construction activities and sites would be avoided or subjected to mitigation measures, if unavoidable.

4.4.2.2 Impact Threshold Criteria

To determine the significance of effects on National Register-eligible cultural resources, the impacts were compared against the following threshold criteria:

Negligible: Cultural resource sites avoided or impacted at the lowest levels of detection; not measurable or barely measurable, with no perception of consequences. For purposes of Section 106 of the NHPA, the determination of effect would be no historic properties affected.

Minor: Disturbance of a site(s) results in little, if any, loss of integrity. The determination of effect for Section 106 would be no adverse effect.

Figure 4-3 Existing Conditions

Mentasta Traverse - Non-motorized Constructed Trail - View from Dead Dog Hill



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Figure 4-4 Simulated Conditions

Mentasta Traverse - Non-motorized Constructed Trail - View from Dead Dog Hill



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Moderate: Disturbance of a site(s) results in loss of integrity. Section 106-effect determination would be adverse effect. A Memorandum of Agreement (MOA) is executed between the NPS and the State Historic Preservation Officer (SHPO) and, if necessary, the Advisory Council on Historic Preservation (ACHP) in accordance with 36 CFR 800.6(b). Measures identified in the MOA to minimize or mitigate adverse impacts, potentially through data recovery, reduce the intensity of effects under NEPA from moderate to minor.

Major: Disturbance of a site(s) results in loss of integrity. The determination of effect for Section 106 would be adverse effect. Measures to minimize or mitigate adverse impacts cannot be agreed upon and the NPS and the SHPO and/or ACHP are unable to negotiate and execute an MOA in accordance with 36 CFR 800.6(b).

4.4.2.3 Assumptions

Cultural resource surveys will be conducted prior to any trail construction or reconstruction outside the inventoried areas of potential effect along the nine existing trail corridors (Suslota, Caribou Creek, Trail Creek, Lost Creek, Soda Lake, Reeve Field, Tanada Lake, Copper Lake, and Boomerang Lake) (Proue et al. 2008, 2009).

Known National Register-eligible cultural resources will be avoided during trail construction or reconstruction activities. If avoidance is not possible, as part of an MOA, NPS will develop data recovery plans as mitigative measures in consultation with appropriate state and federal agencies and interested parties.

NPS will consult with Upper Ahtna and Upper Tanana tribes to determine whether traditional cultural properties that are located along existing or proposed re-routes, trails, and routes might be disturbed.

For alternatives involving trail improvements or re-routes, on-going trail maintenance would include monitoring for impacts to documented cultural resources or exposure of previously undocumented cultural resources along or near the trails.

4.4.2.4 Alternative 1 Effects on Cultural Resources

Direct and Indirect

Cultural resources are known to occur within the Areas of Potential Effect (APEs) (defined as 15 meters on either side of a trail) of the Suslota and Copper Lake trails. According to NLUR (2008), these sites are situated off trail and the only noted disturbance was a modern fire ring near one site. No surface artifacts or features were observed at these sites. Based on the lack of existing impacts at these sites and their locations off of the ORV trails, continued maintenance and ORV use along these trails (at 17 and 24 percent over current ORV levels, respectively) would likely have negligible to minor effects on these resources. Cultural resource sites were recorded along the Trail and Lost Creek trails but were outside of their APEs. Continued maintenance and ORV use along these and the other five ORV trails under Alternative 1 (No Action) should have negligible effects because no known cultural resources occur within the APEs of those trails. Relocation of segments of existing trails due to safety-related trail problems or acute resource impacts as a result of ongoing maintenance activities are expected to have negligible effects on known cultural resources because of avoidance or mitigation. Uninventoried and unrecorded cultural resources that might be located in those areas, however, could be adversely affected. Materials recovered from the seven prehistoric sites recorded along existing trails are located 16 inches or less below the current ground surface (Proue et al. 2008, 2009). Relocation of trails or routes to address safety or acute resource problems could result in

minor to moderate impacts as surface vegetation is removed, as soil is eroded away, and as surface vegetation and soils are compacted. Impacts would be mitigated through cultural surveys prior to substantial trail maintenance activities outside of inventoried areas.

The probability of finding cultural resources would be higher at trail-stream crossings than along other trail segments because of the availability of fish and the concentration of game near water. Evidence of prehistoric and historic subsistence use likely would be more abundant along the ORV trails where they cross streams. Also, evidence of prehistoric and historic camp sites would be more likely near water. The lack of improvement to degraded crossings under Alternative 1 would avoid impacts to potential cultural resources at those high probability locations. However, allowing degradation to continue also could potentially impact cultural resources. Continued use of ORVs on degraded trails could have minor to moderate impacts to cultural resources by exposing previously unexposed sites (through loss of vegetation cover or soil erosion), by causing disturbance or breakage of individual artifacts, and through increased access to sites and potential vandalism. Trails bring in people, many of whom use the landscape in the same way that the people who created the archeological sites did (i.e., to spot and hunt game). Trail users are likely to dismount their ATVs, climb up the nearby knoll (often outside the APE), and could sit, camp, start fires, eat lunch, or engage in similar activities right on top of an archaeological site. ORV tracks are reported across Site NAB-396 outside the APE along the Copper Lake trail, and there is a modern, surface fire ring at Site NAB-428 inside the APE along the Suslota trail. Although impacts appear to be negligible to these two sites, as well as the three sites along the Trail Creek trail (NAB-392, NAB-393, and NAB-394, all outside the APE), two sites along the Lost Creek trail (NAB-103 and NAB-395, both outside the APE), and a second site along the Copper Lake trail (NAB-429, inside the APE), continued ORV use in degraded areas could lead to minor or moderate impacts.

Continuing ORV use on degraded trails could disturb known cultural resources along Suslota, Copper Lake, Lost Creek, or Trail Creek trails or currently unknown and unrecorded cultural resources along other analysis area trails. Off-trail use outside of surveyed trail corridors and other potential indirect impacts from ORV use could disturb currently unknown and unrecorded cultural resources. Based on the combination of these possible minor to moderate impacts, the overall direct and indirect impacts of Alternative 1 on cultural resources would be minor to moderate, adverse impacts.

Cumulative

While natural causes have resulted in minor to moderate impacts to sites such as NAB-103 (Lost Creek Village and Cemetery), past and present activities associated with trail use have apparently had no effect on the cultural resources. With increasing visitor usage through time (as predicted in the cumulative effects assumptions), increased traffic has more potential to impact unknown cultural sites throughout the analysis area. Given the low level of projected overall use, the impact to cultural resources from increased visitor use would be minor.

There have been no cultural resource inventories along either the non-motorized Skookum Volcano trail or the Trail-Lost route. However, cultural resources are recorded along both the Trail Creek trail and the Lost Creek trail in the vicinity of Trail-Lost foot trail and cultural resources are recorded along the Nabesna Road in the vicinity of the Skookum Volcano trail. Until the non-motorized trail and route are inventoried, the potential for direct effects is unknown, but use of these Trail-Lost and Skookum Volcano would increase the potential for negligible to minor indirect effects to the nearby known resources.

As discussed in Section 3.3.2.1, there are approximately 94 additional miles of motorized trail within the analysis area. These trails are used primarily by local subsistence hunters. The level of use on

most of the trails is light (less than 20 passes per year) and trail conditions vary. With the exception of the Batzulnetas trail, none of the trails has been surveyed for cultural resources. Continued use of ORVs on degraded trails could have minor to moderate impacts to cultural resources by exposing previously unexposed sites (through loss of vegetation cover or soil erosion); by causing disturbance or breakage of individual artifacts; and through increased access to sites and potential vandalism. However, given the low level of use on these trails and the localized nature of the degraded portions of trails, the overall impact to cultural resources from these trails is minor.

In combination with the minor to moderate, long-term, adverse direct and indirect impacts to cultural resources, Alternative 1 would result in net long-term, minor to moderate, adverse cumulative impacts to cultural resources in the analysis area.

Conclusion

Even though no new re-routes are developed and there are seasonal closures to recreational ORV use, the effects of Alternative 1 on cultural resources would be minor to moderate because of potential disturbance to currently unknown and unrecorded cultural resources associated with off-trail use outside of surveyed trail corridors and potential disturbance to known and unknown sites associated with continuing ORV use on degraded trails.

The minor to moderate impacts to cultural resources anticipated from this alternative would not result in an impairment of park resources that fulfill specific purposes identified in the establishing legislation or that are essential to the integrity of the park.

4.4.2.5 Alternative 2 Effects on Cultural Resources

Direct and Indirect

Cultural resources are known to occur within the APEs of the Suslota and Copper Lake trails. The increased ORV use on the Suslota trail (145 percent over current ORV use) and any increased trail maintenance have the potential to affect a known cultural site within the APE, as well as the village site of Old Suslota, which was investigated by the Bureau of Indian Affairs (BIA) as an Ahtna 14(h)(1) selection, but has not been evaluated for National Register eligibility. Although the village site is located outside both the APE and the park boundaries, actions within Wrangell-St. Elias have the potential to result in indirect effects. The increased ORV use along the Suslota trail segments containing cultural resources could have minor or moderate effects on these resources because of the potential for disturbing cultural sites. On the Copper Lake trail, the levels of continued maintenance and ORV use (16 percent over current ORV use) could have negligible to minor effects along trail segments that contain cultural resources. Cultural resource sites were recorded along the Trail and Lost Creek trails but were outside of their APEs. Continued maintenance and ORV use along these and the other five trails would have negligible effects because no known cultural resources occur within 15 meters of those trails.

Under Alternative 2 the increased ORV use along the analysis area trails, particularly Suslota trail (which would increase by 145 percent over current conditions) and Tanada Lake trail (which would increase by 174 percent over current conditions) could increased effects to unknown sites. Relocation of segments of existing trails due to safety-related trail problems or acute resource impacts as a result of ongoing maintenance activities are expected to have negligible effects on known cultural resources because of avoidance or mitigation, but could result in minor to moderate impacts on uninventoried sites as surface vegetation is removed, as soil is eroded away, and as surface vegetation and soils are

compacted. Impacts would be mitigated through cultural surveys prior to substantial trail maintenance activities outside of inventoried areas.

Continued use of ORVs on degraded trails could have minor to moderate impacts to cultural resources by exposing previously unexposed sites (through loss of vegetation cover or soil erosion), by causing disturbance or breakage of individual artifacts, and through increased access to sites and potential vandalism. As described under Alternative 1, negligible impacts from ORV tracks and other disturbance have been reported at known cultural sites in the analysis area; continued ORV use in degraded areas could lead to minor or moderate impacts.

Continuing increasing ORV use on degraded trails could disturb known cultural resources along Suslota and Copper Lake trails or currently unknown and unrecorded cultural resources along other analysis area trails. Off-trail use outside of surveyed trail corridors and other potential indirect impacts from ORV use could disturb currently unknown and unrecorded cultural resources. Based on the combination of these possible minor to moderate impacts, the overall direct and indirect impacts of Alternative 2 on cultural resources would be minor to moderate, adverse impacts.

Cumulative

The impacts of other nearby past, present, and foreseeable future actions on cultural resources are described under Alternative 1, and would result in minor to moderate, long term impacts to cultural resources. The net effect of these impacts in combination with the direct and indirect impacts likely under Alternative 2 would be long-term, minor to moderate, adverse impacts to known and uninventoried cultural resources.

Conclusion

Even though no new re-routes are developed, the effects of Alternative 2 on cultural resources would be minor to moderate. The potential disturbance to currently unknown and unrecorded cultural resources associated with off-trail use outside of surveyed trail corridors, and potential disturbance to known and unknown sites associated with continuing and increasing ORV use on degraded trails could result in minor to moderate adverse impacts to cultural resources.

The minor to moderate impacts to cultural resources anticipated from this alternative would not result in an impairment of park resources that fulfill specific purposes identified in the establishing legislation or that are essential to the integrity of the park.

4.4.2.6 Alternative 3 Effects on Cultural Resources

Direct and Indirect

With recreational ORV use eliminated under Alternative 3, there should be reduction of both direct and indirect effects to cultural resources. Cultural resources are known to occur within the APEs of the Suslota and Copper Lake trails. Continued maintenance and subsistence ORV use along these trail segments (at 17 percent over current total ORV use for Suslota and at current total ORV use for Copper Lake) could have negligible to minor effects on these resources. Cultural resource sites were recorded along the Trail and Lost Creek trails but were outside of their APEs. Continued maintenance and ORV use along these and the other five trails would have negligible effects because no known cultural resources occur within 15 meters of those trails.

The proposed Soda Lake Re-route would result in the elimination of one degraded crossing and may reduce the use of the other degraded crossings, high probability locations for potential cultural resources because opportunities for fishing, hunting, and camping increase near water. Closure of the Soda Lake trail (except to those accessing private land) should reduce the possibility of effects to undocumented sites. Creation of 26.2 miles of the non-motorized Rock Creek, Platinum-Soda, Platinum-Reeve, and Sugarloaf constructed trails and routes would be conducted in such a way as to avoid or mitigate any direct cultural resource impacts. Cultural resource inventories in the proposed activity areas would be undertaken to determine if National Register-eligible cultural resource sites are present. If significant cultural resources were found, agreements would be developed to either avoid them or implement data recovery plans. In addition, creation of non-motorized trails and routes would have the potential to increase access to areas that are currently relatively inaccessible.

Continuing ORV use on degraded trails could result in negligible or minor impacts to cultural resources along analysis area trails. Indirect impacts from ORV use would be reduced with reduced overall ORV use (37 percent less under Alternative 3 than current levels). Combined with the minor impacts possible from the Soda Lake re-route and non-motorized routes and trails, the overall direct and indirect impacts of Alternative 3 on cultural resources would be minor, adverse impacts.

Cumulative

The impacts of other nearby past, present, and foreseeable future actions on cultural resources are described under Alternative 1. With the recreational ORV closures proposed under this alternative, the predicted increase in visitor use over the planning period (Section 4.1.2) would be distributed to activities other than ORV use, which could result in minor (instead of minor to moderate impacts associated with ORV use) to cultural resources. The net effect of these impacts in combination with the direct and indirect impacts likely under Alternative 3 would be long-term, minor, adverse impacts to known and uninventoried cultural resources.

Conclusion

Because of mitigation and avoidance, the proposed motorized Soda Lake trail re-route and construction or development of non-motorized Rock Creek, Platinum-Soda, Platinum-Reeve, and Sugarloaf trails and routes under Alternative 3 could result in negligible to minor, adverse impacts on cultural resources. Continuing ORV use on degraded trails could result in negligible or minor impacts to cultural resources. Indirect impacts from ORV use would be reduced with reduced overall ORV use (37 percent less under Alternative 3 than current levels), resulting in overall minor impacts to cultural resources under Alternative 3.

The minor impacts to cultural resources anticipated from this alternative would not result in an impairment of park resources that fulfill specific purposes identified in the establishing legislation or that are essential to the integrity of the park.

4.4.2.7 Alternative 4 Effects on Cultural Resources

Direct and Indirect

Cultural resources are known to occur within the APEs of the Suslota trail, which is not proposed for improvements under Alternative 4, and the Copper Lake trail, which would be improved. Cultural resource sites were recorded along the Trail and Lost Creek trails but were outside of their APEs. The 17 percent increase in ORV use over current conditions and maintenance of the Suslota trail would have the potential to affect (directly and indirectly) the known cultural site and the village site

of Old Suslota, located outside the park. Because of similar ORV use levels on the Copper Lake trail and the lack of known cultural resources within their APEs along other analysis area trails, ORV use under Alternative 4 should have negligible to minor effects on cultural resources within the APEs along other trails.

The proposed improvements or re-routes of portions of eight motorized trails (Lost Creek trail, Trail Creek trail, Caribou Creek trail, Soda Lake trail, Reeve Field trail, Tanada Lake trail, Copper Lake trail, and Boomerang trail) and the wilderness trails south of Copper and Tanada lakes would eliminate impacted crossings except for LC1-S (a not yet degraded stream crossing on Lost Creek trail) and SLT-1, STL-2, and STL-3 (degraded crossings on Suslota trail). Under Alternative 4, continued ORV use could impact uninventoried sites at these locations, which have high probability for potential cultural resources because opportunities for fishing, hunting, and camping increase near water. Construction of improvements on the remaining impacted crossings would avoid or lead to mitigation of any direct impacts to cultural resources; however, they also would have the potential for indirect impacts through increased access to areas and cultural resources that are currently relatively inaccessible.

The closures of degraded trail segments to recreational ORV users on Suslota trail and in the National Park portion of the analysis area (Tanada Lake, Copper Lake, and Boomerang) would limit access and potential impacts to cultural resources. None of the proposed ORV re-routes would allow direct access to mapped cultural/historic sites in the analysis area, but they would likely provide access to currently unknown sites, particularly with the 93 percent increase in total ORV use under Alternative 4. Providing non-motorized trails and routes would allow access to one inventoried cultural/historical site mapped in the analysis area (based on Wrangell-St. Elias GIS data). Other, non-inventoried sites also may exist in the analysis area, which could be affected by access to the area. In addition, because Alternative 4 would not limit off-trail use for subsistence ORV users, the potential for continued off-trail use to affect cultural resources would be minor to moderate.

Trail improvements would keep ORV users on single-alignment trails (as opposed to expanding, braided trails), which would benefit cultural resources by preventing exposure of previously unexposed sites. Improvements would prevent continual soil erosion or loss of vegetation cover along trails that could disturb or break individual artifacts. Conversely, increasing ORV use on improved trails would increase access to known and unknown sites within and outside of APEs, which could increase the risk of potential vandalism. As described under Alternative 1, negligible impacts from ORV tracks and other disturbance have been reported at known cultural sites in the analysis area; increasing total ORV use in the analysis area could lead to minor impacts.

Increased ORV use and the lack of improvements to degraded crossings along the Suslota trail could affect cultural sites as soil erosion and vegetation impacts continued because cultural resources are more probable where the ORV trail crosses water. Improvements on other analysis area trails and crossings would benefit cultural resources by preventing exposure of previously unexposed sites and damage to known and unknown sites from soil erosion and vegetation losses. Increased overall ORV use could lead to minor impacts to cultural resources. Combined with the minor impacts possible from re-routes and non-motorized routes and trails, and the minor to moderate impacts from continued off-trail use by subsistence ORV users, the overall direct and indirect impacts of Alternative 4 on cultural resources would be minor.

Cumulative

The impacts of other nearby past, present, and foreseeable future actions on cultural resources are described under Alternative 1, and would result in minor to moderate, long term impacts to cultural

resources. Overall, the net effect of these impacts in combination with the direct and indirect impacts likely under Alternative 4 would be minor with the benefits of keeping ORV users on one alignment and the potential adverse impacts of increased level of ORV use and the lack of constraints on off-trail use for subsistence ORV users.

Conclusion

Mitigation measures would avoid direct impacts along the proposed re-routes of Copper Lake, Reeve Field, Soda Lake, and Tanada Lake trails and the development of non-motorized Rock Creek, Platinum-Soda, Platinum-Reeve, Sugarloaf, Wait-Nabesna, and 4-Mile trails and routes under Alternative 4. Cultural resources would benefit from the keeping ORV users on one alignment. Combined with the increased level of ORV use and no constraints on off-trail use for subsistence ORV users, adverse impacts to cultural resource sites would be minor.

The minor impacts to cultural resources anticipated from this alternative would not result in an impairment of park resources that fulfill specific purposes identified in the establishing legislation or that are essential to the integrity of the park.

4.4.2.8 Alternative 5 Effects on Cultural Resources

Direct and Indirect

Cultural resources are known to occur within the APEs of the Suslota and Copper Lake trails, both of which are proposed for improvements under Alternative 5. Cultural resource sites were recorded along the Trail and Lost Creek trails but were outside of their APEs. The 33 and 137 percent increases in total ORV use on the Suslota and Copper Lake trails, respectively, have the potential to affect (directly and indirectly) known cultural sites. Because of the lack of known cultural resources within their APEs along other analysis area trails, ORV use under Alternative 5 should have negligible to minor effects on cultural resources within the APEs along other trails.

The proposed motorized trail improvements or re-routes of all nine existing ORV trails (Lost Creek trail, Trail Creek trail, Suslota trail, Caribou Creek trail, Soda Lake trail, Reeve Field trail, Tanada Lake trail, Copper Lake trail, and Boomerang trail) and the wilderness trails south of Copper and Tanada lakes would result in the improvement of most degraded crossings, which have high probability for potential cultural resources because opportunities for fishing, hunting, and camping increase near water. Construction of these improvements would be conducted in such a way as to avoid or lead to mitigation of any direct impacts to cultural resources; however, they would have the potential for indirect impacts through increased access to areas that are currently relatively inaccessible.

The closures of degraded trail segments to recreational ORV use along the Suslota trail would limit access and potential impacts to cultural resources. None of the proposed ORV re-routes would allow access to mapped cultural/historic sites in the analysis area, but they would likely provide access to currently unknown sites, particularly with the 83 percent increase in total ORV use under Alternative 5. Providing non-motorized trails and routes would allow access to one inventoried cultural/historical site mapped in the analysis area (based on Wrangell-St. Elias GIS data). Other, non-inventoried sites also may exist in the analysis area. In addition, because Alternative 5 would limit off-trail use for subsistence ORV users, the potential for continued off-trail use to affect cultural resources would be negligible.

Trail improvements would keep ORV users on single-alignment trails (as opposed to expanding, braided trails), which would benefit cultural resources by preventing exposure of previously unexposed sites. Improvements would prevent continual soil erosion or loss of vegetation cover along trails that could disturb or break individual artifacts. Conversely, increasing ORV use on improved trails would increase access to known and unknown sites within and outside of APEs, which could increase the risk of potential vandalism. As described under Alternative 1, negligible impacts from ORV tracks and other disturbance have been reported at known cultural sites in the analysis area; increasing total ORV use in the analysis area could lead to minor impacts.

Improvements on analysis area trails and crossings would benefit cultural resources by preventing exposure of previously unexposed sites and damage to known and unknown sites from soil erosion and vegetation losses. Increased overall ORV use could lead to minor impacts to cultural resources. Combined with the minor impacts possible from re-routes and non-motorized routes and trails, the overall direct and indirect impacts of Alternative 5 on cultural resources would be minor.

Cumulative

The impacts of other nearby past, present, and foreseeable future actions on cultural resources are described under Alternative 1, and would result in minor to moderate, long-term impacts to cultural resources. Overall, the net effect of these impacts in combination with the direct and indirect impacts likely under Alternative 5 would be minor with the benefits of keeping ORV users on one alignment and the potential adverse impacts of increased levels of ORV use under Alternative 5.

Conclusion

Mitigation measures would avoid direct impacts along the proposed re-routes of Copper Lake, Reeve Field, Soda Lake, and Tanada Lake trails and the development of non-motorized Mentasta Traverse, Rock Creek, Platinum-Soda, Platinum-Reeve, Sugarloaf, Wait-Nabesna, and 4-Mile trails and routes under Alternative 5. Cultural resources would benefit from keeping ORV users on one alignment. Combined with the increased level of ORV use, impacts to cultural resources would be minor and adverse.

The minor impacts to cultural resources anticipated from this alternative would not result in an impairment of park resources that fulfill specific purposes identified in the establishing legislation or that are essential to the integrity of the park.

4.4.3 Subsistence

4.4.3.1 Methodology

Potential impacts to subsistence include reductions in the availability of subsistence resources, restrictions in subsistence access, and increased competition for subsistence resources. Changes in access can affect the level of effort required, time involved, and the effectiveness of the hunt, as well as potentially increase competition for subsistence resources. Increased competition can occur between different subsistence user groups and between subsistence hunters and sport hunters. Changes in the availability of resources, access, and competition can adversely affect the subsistence user by making subsistence activities more difficult and time-consuming, limiting the amount of food or supplies the subsistence user can obtain, and altering the subsistence user's quality of life.

The subsistence analysis considers the effects of the proposed alternatives in three areas: 1) the potential to reduce important subsistence fish or wildlife populations through reductions in numbers,

redistribution of subsistence resources, or habitat losses; 2) the potential for the action to affect subsistence access; and 3) the potential for the action to increase hunter or fisherman competition for subsistence resources. Potential effects are assessed qualitatively based on proposed trail improvements, changes in trail maintenance, and projected changes in ORV use levels.

The ANILCA Section 810(a) Summary Evaluation and Findings is included as Appendix F to this ORV Management Plan/EIS. In compliance with Title VIII, Section 810 of ANILCA, Appendix F evaluates whether the proposed alternatives would result in any potential restrictions to subsistence activities.

4.4.3.2 Impact Threshold Criteria

To determine the significance of effects on subsistence resources or opportunities the impacts were compared against the following threshold criteria.

Negligible: There would be no measurable effect on the population of any subsistence species as a result of direct, indirect, or cumulative impacts resulting from management alternatives. No restrictions to subsistence access or increase in competition for subsistence resources would occur.

Minor: There would be no long-term population decrease of any subsistence species as a result of direct, indirect, or cumulative impacts resulting from management alternatives. Restrictions to subsistence access would be trail-specific, with alternative means of access available. Increases in competition for subsistence resources would be very localized.

Moderate: There would be short-term population decreases in some subsistence species as a result of direct, indirect, or cumulative impacts resulting from management alternatives. Restrictions to subsistence access would result in area closures with the potential for limiting motorized access to large portions of the analysis area. Increases in competition for subsistence resources would affect large portions of the analysis area.

Major: There would be long-term population decreases in some subsistence species as a result of direct, indirect, or cumulative impacts resulting from management alternatives. Restrictions to subsistence access would close most existing trails in the area to subsistence ORV use and result in area closures with no reasonable alternatives for access. Increases in competition for subsistence resources would be very wide-spread across the analysis area.

4.4.3.3 Assumptions

The following analysis assumes that the NPS will continue to manage federal subsistence hunting and fishing within the National Park and Preserve, consistent with ANILCA and regulations established by the Federal Subsistence Board.

The assumptions used to project future subsistence and recreational ORV use by trail and alternative are discussed in Section 4.1.1, Overview of Methodology and Threshold Criteria, and noted below, as appropriate.

Other assumptions used in this analysis are identified in the following sections, when applicable.

4.4.3.4 Alternative 1 Effects on Subsistence

Direct and Indirect

Subsistence Resources. Under Alternative 1, there would be no trail improvements or changes to trail maintenance levels. Federally-qualified subsistence users would continue to employ ORVs for subsistence purposes on all nine trails and throughout the analysis area; recreational ORV use would continue along portions of seven of the nine trails. Under Alternative 1, increase in ORV use within the analysis area is projected to continue along current trends, with subsistence and recreational ORV use projected to increase over the next 20 years at an average annual increase of 2 to 3 percent (Table 4-1). It is anticipated that this would result in a minor increase in hunting pressure, and therefore a minor adverse impact on subsistence resources.

This alternative would have a minor effect on subsistence fish resources. None of the 22 stream crossings that are either degraded or have the potential for future degradation identified by ADF&G would be improved, although recreational ORV use at 17 of the crossings would be eliminated under Alternative 1 (Table 4-26). The continued ORV use of these degraded crossings could result in minor to moderate, long-term disturbance of fish or their habitat, but because of the localized nature of any disturbances, they are not expected to result in a significant impact to subsistence fish resources.

Access. With no trail improvements, continuation of current levels of trail maintenance, and continued ORV use on analysis area trails, trail conditions are not expected to improve under this alternative and could deteriorate somewhat. This could have a minor, adverse, long-term impact on subsistence access should trails become impassible; however, this is not expected to result in a significant restriction on subsistence uses because any reductions in access would be localized and alternate means of access would continue to be available.

Competition. The potential for an increase in competition for subsistence resources is based primarily on projected trends in the level of recreational ORV use of the nine trails, given that a high proportion of recreational ORV use in Wrangell-St. Elias is related to state-regulated hunting in the national preserve (see Table 4-1). Under Alternative 1, recreational ORV use is projected to increase at an annual average rate of 3 percent. This projected increase assumes that recreational ORV use on the seven trails where allowed will increase at a faster rate than subsistence use, consistent with existing trends in ORV use. Given that trends in ORV use would remain consistent, and that no new trails would be laid out or constructed, Alternative 1 is not expected to result in a significant increase in competition for subsistence resources over the 20-year planning period.

Cumulative

This section considers the incremental effects of the proposed alternatives when added to other past, present, and reasonably foreseeable future actions. Past and present actions affecting subsistence, including the impacts of past and present park management actions, are part of the baseline for this analysis. The reasonably foreseeable actions and assumptions included in this analysis are discussed in Section 4.1.2.

As discussed in Section 3.3.2.1, there are 94 additional miles of motorized trail within the analysis area. Trail condition varies, but generally use levels are light (less than 20 passes per year). Trail condition varies, but is generally fair with some degraded segments (Connery 1987). These trails are used by local federally qualified subsistence hunters, trappers, and firewood and berry gatherers. These additional trails provide access to the analysis area for subsistence purposes. Due to the low

level of use associated with these trails, which would continue over the planning period, impacts to subsistence wildlife resources associated with their use are negligible.

Overall visitation to the park could increase as a result of the development of recreational infrastructure along Nabesna Road, including the expansion of existing trailheads and improvements to or construction of multi-purpose trailheads. Improvements to trails that improve ORV access could improve access to and increase competition for subsistence resources. These potential effects are expected to have negligible to minor, adverse impacts on subsistence resources.

With respect to the future availability of and access to subsistence resources, global climate change is likely to play an important role. In recent decades, Alaska's climate has shown a more rapid warming trend than elsewhere in the United States (Parson 2001). Alaska has also grown substantially wetter over this time period. This warming trend has been corroborated by extensive melting of glaciers, warming and thawing of permafrost, retreat and thinning of sea ice, and reduction of the river and lake ice season (Parson 2001). Over the long term, climate change in Alaska is likely to result in ecosystem-level shifts associated with the northward expansion of the boreal forest (somewhat offset by increases in summer moisture stress, fire, and insect outbreaks) into the tundra zone, as well as landscape-level vegetation changes within these regions (e.g., shifts in plant dominance). Ultimately, these projected ecosystem shifts are likely to displace or change the resources available for subsistence, requiring communities to change their practices or move. For example, shifts in habitat composition or quality may result in the displacement of wildlife populations or shifts in terrestrial mammal migration patterns. Additionally, reduced snow cover, a shorter river ice season, and thawing of permafrost may obstruct travel to areas traditionally used for subsistence harvesting. Although there remain uncertainties related to the impacts of climate change on subsistence livelihoods, climate change will likely contribute to the future availability of and access to subsistence resources. Because of the gradual nature of any changes, over the 20-year planning period, impacts to subsistence from climate change are expected to be minor.

The reasonable foreseeable actions described in the preceding paragraphs, either individually or cumulatively, would not result in significant impacts to subsistence resources, access to subsistence, or increased competition for subsistence resources. Therefore, these other actions would result in minor adverse impacts to subsistence resources. Direct and indirect effects of alternative 1 would make a minor contribution to these effects, due to the negligible to minor effects to subsistence resource availability and minor adverse effects on access to and competition for subsistence resources. Therefore, in combination with the minor impacts to subsistence resources associated with past, present, and future projects, Alternative 1 would result in a minor adverse cumulative effect on subsistence resources.

Conclusion

Minor increases in hunting pressure that would occur due to continuing trends in ORV use would not result in long-term decreases in any subsistence population in the analysis area under Alternative 1. Continued ORV use in the analysis area would result in minor, localized reductions in access due to trail degradation. A minor increase in competition for subsistence resources would also occur due to the anticipated increases in recreational ORV users over the planning period. Overall, Alternative 1 would have minor direct, indirect, and cumulative effects on subsistence resources.

The minor impacts to subsistence resources and opportunities anticipated from this alternative would not result in an impairment of park resources that fulfill specific purposes identified in the establishing legislation or that are essential to the integrity of the park.

4.4.3.5 Alternative 2 Effects on Subsistence

Direct and Indirect

Subsistence Resources. Alternative 2 would have at most a minor, long-term effect on subsistence wildlife resources based on projected annual increases in ORV use. There would be no trail improvements or changes to trail maintenance levels under this alternative. Federally-qualified subsistence users would continue to use ORVs for subsistence purposes on all nine trails and throughout the analysis area; recreational ORV use would also be allowed on all nine trails. Under Alternative 2, growth in ORV use in the analysis area is projected to continue along current trends, with subsistence ORV use projected to increase over the next 20 years at an average annual increase of 2 percent (Table 4-1). The overall increase in ORV use would result in a minor increase in hunting pressure but comparable to the current rates, and therefore would result in a minor, adverse impact to subsistence wildlife resources.

This alternative would have a minor, adverse effect on subsistence fish resources. None of the 22 stream crossings currently degraded or with the potential for future degradation would be improved (Table 4-26). The continued ORV use of these crossings could result in minor to moderate disturbance of fish or their habitat, but because of the localized nature of any disturbances, they are not expected to result in a significant impact to subsistence fish resources.

Access. With no trail improvements, continuation of current levels of trail maintenance, and continued subsistence and recreational ORV use allowed on all nine trails, trail conditions are not expected to improve under this alternative and would deteriorate. This could have a minor, long-term, adverse impact on subsistence access, should trails become impassable; however this is not anticipated to result in a significant restriction on subsistence uses because any reductions in access would be localized and alternate means of access would continue to be available.

Competition. The potential for an increase in competition for subsistence resources is based primarily on projected trends in the level of recreational ORV use of the nine trails, given that a high proportion of recreational ORV use in Wrangell-St. Elias is related to state-regulated hunting in the national preserve (see Table 4-1). Under Alternative 2, recreational ORV use is projected to increase at an annual average rate of 3 percent. This projected increase assumes that recreational ORV use on all nine trails will increase at a faster rate than subsistence use, consistent with existing trends in ORV use. Given that trends in ORV use would remain consistent, and that no new trails would be laid out or constructed, Alternative 2 is not expected to result in a significant increase in competition for subsistence resources over the 20-year planning period.

Cumulative

The impacts of other nearby past, present, and foreseeable future actions on subsistence resources are described under Alternative 1, and would result in minor impacts to subsistence resources. Alternative 2 would make a minor contribution to these effects due to the negligible to minor effects to subsistence resource availability, and minor adverse effects on access to and competition for subsistence resources. Therefore, in combination with the minor impacts to subsistence resources associated with past, present, and future projects, Alternative 2 would result in a minor adverse cumulative effect on subsistence resources.

Conclusion

Minor increases in hunting pressure that would occur due to continuing trends in ORV use would not result in long-term decreases in any subsistence population in the analysis area under Alternative 2. Continued subsistence and recreational ORV use in the analysis area would result in minor, localized reductions in access due to trail degradation. A minor increase in competition for subsistence resources would also occur due to the anticipated increases in recreational ORV users over the planning period. Overall, Alternative 2 would have minor direct, indirect, and cumulative effects on subsistence resources.

The minor impacts to subsistence resources and opportunities anticipated from this alternative would not result in an impairment of park resources that fulfill specific purposes identified in the establishing legislation or that are essential to the integrity of the park.

4.4.3.6 Alternative 3 Effects on Subsistence

Direct and Indirect

Subsistence Resources. Alternative 3 would have a minor effect at most on subsistence wildlife resources based on projected annual increases in subsistence ORV use. Construction of the Soda Lake trail re-route and creation of non-motorized trails and routes would result in minor, temporary disturbance to wildlife during the construction period. No other trail improvements would occur and trail maintenance would continue at current levels. Recreational use would not be allowed on any of the trails under this alternative. Subsistence ORV use is projected to increase over the next 20 years with an average annual increase of 2 to 3 percent (Table 4-1). The Soda Lake trail improvements and the slightly higher projected annual subsistence ORV growth rate for the Caribou Creek, Lost Creek, Soda Lake, and Trail Creek trails under this alternative (3 percent versus 2 percent under current levels) may result in minor increases in subsistence hunting activity, but this would be offset by the reduction in recreational hunting that would result from closure of all nine trails to recreational ORV use.

This alternative would have a minor, adverse effect at most on subsistence fish resources. Only 1 of the 22 impacted stream crossings would be improved, although ORV use would be reduced at some crossings in the short term as a result of closure of all nine trails to recreational ORV use (Table 4-26). The continued ORV use of these degraded crossings could result in minor to moderate disturbance of fish or their habitat, but because of the localized nature of any disturbances, they are not expected to result in a significant impact to subsistence fish resources.

Access. The Soda Lake Re-route and the closure of all nine trails to recreational ORV use under this alternative would result in minor improvements in trail conditions on the other eight trails and thus on subsistence access.

Alternative 3 includes monitoring of trail conditions and could result in closure of trails or areas to subsistence ORV use if more extensive resource impacts are documented, particularly on highly degraded trails (e.g., Tanada Lake) where no improvements would be made. However, the proposed monitoring/management system allows for other actions to be taken before consideration of trail closure (such as spot maintenance or vehicle class restrictions). Any potential trail closure would occur over an extended period of time, based on monitoring, so that ORV users of that trail would have time to figure out reasonable alternatives for access.

Competition. The potential for an increase in competition for subsistence resources is based primarily on projected trends in the level of recreational ORV use of the nine trails, given that a high proportion of recreational ORV use in Wrangell-St. Elias is related to state-regulated hunting in the national preserve (see Table 4-1). All nine trails would be closed to recreational ORV use under this alternative, which would therefore result in a decrease in competition for subsistence resources.

Cumulative

The impacts of other nearby past, present, and foreseeable future actions on subsistence resources are described under Alternative 1, and would result in minor impacts to subsistence resources.

Alternative 3 would make a minor contribution to these effects due to the negligible to minor effects to subsistence resource availability, and minor improvements in access to and reductions in competition for subsistence resources resulting from its implementation. Therefore, in combination with the minor impacts to subsistence resources associated with past, present, and future projects, Alternative 3 would result in a minor, adverse cumulative effect on subsistence resources.

Conclusion

Trail rerouting and closure of trails to recreational ORV use would result in minor improvements in access due to improvements in trail condition. Closure of trails to recreational ORV users would result in decreased competition for subsistence resources over the planning period. Overall, Alternative 3 would have minor direct, indirect, and cumulative effects on subsistence resources.

The minor impacts to subsistence resources and opportunities anticipated from this alternative would not result in an impairment of park resources that fulfill specific purposes identified in the establishing legislation or that are essential to the integrity of the park.

4.4.3.7 Alternative 4 Effects on Subsistence

Direct and Indirect

Subsistence Resources. Under Alternative 4 improvements would be made to eight of the nine trails and the wilderness trail systems, with trails improved to at least a maintainable condition to provide reasonable access while protecting park resources. Once trail improvements are in place, trail maintenance would increase to a level that would correct unsafe situations, correct natural resource damage, and restore the trail to the planned design standard. Recreational ORV use trails within the National Preserve would be subject to a user fee; recreational ORV use would not be permitted on unimproved or improved trails in the park (Boomerang, Copper Lake, and Tanada), along Suslota trail, or along wilderness trails.

These improvements are expected to result in substantial increases in subsistence ORV use on the Copper Lake, Black Mountain, and Tanada Lake trails where subsistence ORV use is projected to increase at an annual rate of 10 percent, 10 percent, and 15 percent, respectively. Recreational ORV use on the Soda Lake, Caribou Creek, and Reeve Field trails is expected to double by the midpoint of the 20-year planning period (Table 4-1). These projected increases in use are likely to be accompanied by a significant increase in hunting pressure, with some non-motorized routes and trails improving access to areas that have thus far only seen limited hunting activity. For example, the Tanada Re-route would establish a motorized trail over Sugarloaf where no trail currently exists. This would provide additional access to Dall's sheep in this area and would increase hunting pressure in this area. Because of increased hunting pressure, subsistence users likely would have to travel farther to harvest animals, which would limit opportunities for non-motorized subsistence hunters

unable to access these areas. Additionally, by resurfacing other trails, Alternative 4 also would likely disperse hunting pressure within the analysis area. If an unsustainable increase in harvest levels were to occur, the Federal Subsistence Board and the Alaska Board of Game could modify seasons, harvest limits, or both. Therefore, this alternative is not expected to significantly reduce populations of important subsistence wildlife resources.

Additional ORV use along trails has the potential to alter wildlife movements through temporary, localized disturbance and displacement from the immediate vicinity of trails during trail improvement, re-route, construction, and use; however, this is not expected to result in wildlife population declines, substantial habitat losses, or any long-term population movements as ORV use would continue to be dispersed throughout the analysis area. Thus, impacts to wildlife under Alternative 4 would be moderate (see Section 4.3.4, Wildlife for additional discussion), and Alternative 4 would have a moderate, adverse impact on the numbers and distribution of important subsistence wildlife resources in the analysis area.

The degraded stream crossings identified by ADF&G would largely be repaired or replaced under this alternative, with recreational ORV use being reduced on the few crossings that are not replaced or improved (Table 4-26). These actions would result in minor improvements in fish habitat.

Access. The trail improvements proposed under Alternative 4 would result in a substantial improvement in the condition of the degraded trails and would, therefore, result in improved access for subsistence users. Alternative 4 includes monitoring of both improved and unimproved trail conditions and could result in closure of trails or areas to subsistence ORV use if resource damage is documented. However, the proposed monitoring/management system allows for other actions to be taken before consideration of trail closure (such as spot maintenance or vehicle class restrictions). Any potential trail closure would occur over an extended period of time, based on monitoring, so that ORV users of that trail would have time to figure out reasonable alternatives for access.

Competition. The potential for an increase in competition for subsistence resources is based primarily on projected trends in the level of recreational ORV use of the nine trails, given that a high proportion of recreational ORV use in Wrangell-St. Elias is related to state-regulated hunting in the national preserve (see Table 4-1). Alternative 4 would result in significant improvements in the condition of most of the ORV trails in the analysis area, improving ease of access for recreational ORV use. Four of the nine trails would be closed to recreational ORV use under this alternative (Boomerang, Copper Lake, Suslota, and Tanada Lake trails). Large increases in recreational ORV use are projected for the other trails (Caribou Creek, Lost Creek, Reeve Field, and Soda Lake, and Trail Creek trails; see Table 4-1). This projected increase in use would include general (sport) hunters and would increase competition for the area's wildlife resources in the north and west portions of the analysis area. It is difficult to predict the potential level of increased competition, but it is not anticipated to significantly restrict subsistence activities.

Cumulative

The impacts of other nearby past, present, and foreseeable future actions on subsistence resources are described under Alternative 1, and would result in minor impacts to subsistence resources. Alternative 4 would contribute to these effects due to the minor, localized reductions in subsistence resource availability, substantial improvements in access to subsistence resources, and increased competition for subsistence resources resulting from its implementation. If an unsustainable increase in harvest levels were to occur, the Federal Subsistence Board and the Alaska Board of Game could modify seasons, harvest limits, or both. The Alaska Department of Fish and Game also has the ability to close or modify seasons outside of the state board process through emergency order authorities.

Therefore, in combination with the minor impacts to subsistence resources associated with past, present, and future projects, Alternative 4 would result in a moderate, adverse cumulative effect on subsistence resources.

Conclusion

Alternative 4 could cause short-term decreases in subsistence resources in the analysis area due to trail improvements, which would result in substantial increases in subsistence and recreational ORV use accompanied by increased hunting activity. Trail improvements would increase access to and thus competition for subsistence resources over the planning period. Therefore, Alternative 4 would have moderate direct, indirect, and cumulative effects on subsistence resources.

The moderate impacts to subsistence resources and opportunities anticipated from this alternative would not result in an impairment of park resources that fulfill specific purposes identified in the establishing legislation or that are essential to the integrity of the park.

4.4.3.8 Alternative 5 Effects on Subsistence

Direct and Indirect

Subsistence Resources. Under Alternative 5, improvements would be made to the most degraded segments of all nine of the trails, with trails improved to a design-sustainable or maintainable condition. Improvements would also be made to the wilderness trails (Black Mountain and trails south of Tanada Lake) that are used for subsistence access. NPS-qualified subsistence users would continue to employ ORVs for subsistence purposes on all nine trails, subject to monitoring and management actions. Subsistence ORV use off existing trails would be allowed as long as the use does not result in creation of new trails or unacceptable resource impacts. If standards for any impact indicator are exceeded, newly created trails would be closed. Within the designated wilderness, subsistence ORV users would be required to stay on designated trails. Once trails are improved to at least maintainable condition, recreational ORV use would be allowed on both National Park and Preserve trails, subject to payment of a user fee. Several non-motorized trails and routes would also be laid out or constructed under Alternative 5.

Trail improvements, re-routes, and construction proposed under Alternative 5 would result in significantly increased ORV use in analysis area trails (Table 4-1). For example, on the Copper Lake and Black Mountain trails recreational ORV use is projected to increase at an annual rate of 20 percent and 5 percent, respectively. Recreational ORV use on the Reeve Field and Tanada Lake trails is expected to double and triple, respectively, by the midpoint of the 20-year planning. Minor annual increases in subsistence ORV use are projected for most trails under this alternative. These projected increases in use are likely to be accompanied by an increase in hunting activity, which would increase harvest pressure in some areas that have thus far seen only limited hunting activity as described under Alternative 4 above. If an unsustainable increase in harvest levels were to occur, the Federal Subsistence Board and the Alaska Board of Game could modify seasons, harvest limits, or both. Therefore, this alternative is not expected to significantly reduce populations of important subsistence wildlife resources.

As described under Alternative 4, additional ORV use along trails has the potential to alter wildlife movements through temporary, localized disturbance and displacement from the immediate vicinity of trails during trail improvements, re-route, construction, and use; however, this is not expected to result in wildlife population declines, substantial habitat losses, or any long-term population movements as ORV use would continue to be dispersed throughout the analysis area. Thus, impacts

to wildlife under Alternative 5 would be moderate (see Section 4.3.4, Wildlife for additional discussion), and Alternative 5 would have a moderate, adverse impact on the numbers and distribution of important subsistence wildlife resources analysis area.

The degraded stream crossings identified by ADF&G would largely be repaired or replaced under this alternative with use being reduced on the few crossings that are not replaced or improved (Table 4-26). These actions would result in minor improvements in fish habitat.

Access. The trail improvements proposed under Alternative 5 would result in a substantial improvement in the condition of the degraded trails and as well as along certain trails within designated wilderness south of Tanada Lake and in the Black Mountain area. Therefore, Alternative 5 would result in improved access along these trails for subsistence users. Alternative 5 includes monitoring of both improved and unimproved trail conditions, as well as monitoring of off-trail impacts, and could result in closure of trails or areas (i.e., areas used for off-trail use) to subsistence ORV use if resource damage is documented. Any reductions in access would be localized and alternate means of access would continue to be available. The designation of trails within the designated wilderness for subsistence ORV users would prohibit off-trail ORV use in these areas. This would affect subsistence access, primarily for sheep hunting. Given the extent of the trail systems that would be designated (35.1 miles), and the improvement in trail conditions elsewhere, Alternative 5 would result in overall improved access for subsistence users.

Competition. The potential for an increase in competition for subsistence resources is based primarily on projected trends in the level of recreational ORV use of the nine trails, given that a high proportion of recreational ORV use in Wrangell-St. Elias is related to state-regulated hunting in the national preserve (see Table 4-1). Alternative 5 would result in significant improvements in the condition of most of the ORV trails in the analysis area, improving ease of access for recreational ORV use. Eight of the nine trails (all except Suslota) would be open to recreational ORV use under this alternative. Large increases in recreational ORV use are projected for these trails (see text above under Subsistence Resources and Table 4-1). This projected increase in use would include general (sport) hunters and would likely increase competition for the area's wildlife resources. This competition would be limited by the different seasons and harvest limits applied to each group. For example, as noted above, in GMU 12 the subsistence season for moose is August 15–28 and September 1–17, whereas sport hunters can only hunt from August 24–28 and September 8–17. Additionally, sport hunters are more likely to pursue trophy-class animals, represented by older and larger males. In contrast, subsistence hunters can take females and younger animals when allowed by regulation. For example, in GMU 11, subsistence hunters may harvest any sheep, while sport hunters are restricted to at least a 3/4-curl ram. In GMU 12, however, the harvest limit for subsistence and sport hunters is the same—a full-curl ram. Some subsistence hunters could be displaced by increased ORV use, particularly those hunting on foot or horseback. Local subsistence hunters have indicated that this has already happened in some portions of the park. Although it is difficult to predict the potential level of increased competition, it is not anticipated to significantly restrict subsistence activities.

Cumulative

The impacts of other nearby past, present, and foreseeable future actions on subsistence resources are described under Alternative 1, and would result in minor impacts to subsistence resources. Alternative 5 would contribute to these effects due to the minor, localized reductions in subsistence resource availability, substantial improvements in access to subsistence resources, and increased competition for subsistence resources. If an unsustainable increase in harvest levels were to occur, the Federal Subsistence Board and the Alaska Board of Game could modify seasons, harvest limits, or

both. The Alaska Department of Fish and Game also has the ability to close or modify seasons outside of the state board process through emergency order authorities. Therefore, in combination with the minor impacts to subsistence resources associated with past, present, and future projects, Alternative 5 would result in a moderate, adverse cumulative effect on subsistence resources.

Conclusion

Alternative 5 could cause short-term decreases in subsistence resources in the analysis area due to trail improvements, which would result in substantial increases in recreational ORV use accompanied by increased hunting activity. Trail improvements would increase access to and thus competition for subsistence resources over the planning period. Therefore, Alternative 5 would have moderate direct, indirect, and cumulative effects on subsistence resources.

The moderate impacts to subsistence resources and opportunities anticipated from this alternative would not result in an impairment of park resources that fulfill specific purposes identified in the establishing legislation or that are essential to the integrity of the park.

4.4.4 Wilderness

4.4.4.1 Methodology

ANILCA provides some exceptions to standard National Park and wilderness management practices, including allowing the appropriate use of certain motorized means of surface transportation traditionally employed for subsistence purposes. The analysis in this section acknowledges that ORV use for subsistence purposes is allowed in wilderness just like many other activities. However, all allowed activities, including those related to subsistence, are subject to evaluation and management. For example, while hiking is also an allowed activity in wilderness, hiking is regulated to limit or mitigate impacts that are commonly found to be damaging to wilderness values, such as the damage sometimes created by the development of networks of social trails. Even in the special context of ANILCA, an allowed activity or use may cause major impacts or even impairment and can therefore become inappropriate or incompatible with wilderness or other resource values.

Wilderness quality measures the extent of disturbance to the wilderness from non-natural activities. Chapter 3.5.4 describes the baseline wilderness qualities of the Wrangell-St. Elias Wilderness in the analysis area. This section compares the baseline wilderness qualities to those expected under the proposed alternatives to evaluate potential affects. The analysis qualitatively compares the existing wilderness character to the proposed wilderness character based on the potential effects of trail construction, trail reconstruction, and trail re-routes. Most effects are indirect (i.e., construction in wilderness) changes resulting from anticipated increases in use due to better access under some alternatives.

This section also discusses the effects of each alternative on the portions of the analysis area classified in the 1986 GMP as eligible for wilderness designation. The existing Caribou, Lost Creek, Trail Creek, Soda Lake, Reeve Field, and Boomerang trails all lie within areas classified as eligible for wilderness designation.

4.4.4.2 Impact Threshold Criteria

To determine the significance of effects on wilderness the impacts will be compared against the following threshold criteria:

Negligible: Effects to the wilderness character would be so small and short term that it would not be of any measurable or perceptible consequence. Wilderness character includes an untrammelled, natural, and undeveloped setting with opportunities for solitude or an unconfined and primitive experience.

Minor: Actions may result in effects to the wilderness or wilderness character, but would not be noticeable by the majority of visitors and would not reduce the integrity of wilderness.

Moderate: Actions may result in localized long-term effects that alter the wilderness character so that it is readily noticeable to visitors and/or reduces the integrity of wilderness.

Major: Actions may result in widespread long-term effects to the wilderness character and associated values and reduces the integrity of wilderness.

4.4.4.3 Assumptions

For the action alternatives (2, 3, 4, and 5), impacts to eligible wilderness are presented for both the 1986 eligibility mapping and the revised eligibility map proposed in Chapter 2 of this document (Figure 2-2). This dual set of effects is presented so that the reviewer can compare the effects to eligible wilderness. For the action alternatives, the cumulative impacts and conclusions are based on the effects described for the proposed revision of the 1986 eligibility map. For the No Action alternative, impacts to eligible wilderness are described based on the 1986 eligibility mapping (Figure 2-1).

Improved motorized access to the designated wilderness boundary (such as is proposed under Alternatives 4 and 5 for the Copper Lake and Tanada Lake trails) would increase the level of non-motorized use in the designated wilderness past those access points. This increase in use is reflected in the projected trail use.

Backcountry planning will occur within the next 20 years. Within designated wilderness, Wrangell-St. Elias will continue to attempt to balance reasonable access to backcountry/wilderness opportunities with providing outstanding opportunities for solitude and a primitive experience in an undeveloped setting. It is assumed that most access to designated wilderness in the park will continue to occur via small plane.

4.4.4.4 Alternative 1 Effects on Wilderness

Direct and Indirect

Designated Wilderness

Under Alternative 1 (No Action), the NPS would continue the present management direction, guided by the conditions of the 2007 lawsuit settlement. Conditions associated with three trails (Copper Lake, Black Mountain, and Tanada Lake trails) would continue to have negligible, direct and/or indirect impacts on wilderness quality within the analysis area. The Copper Lake and Tanada Lake trails lead directly to the wilderness boundary, where the Tanada Lake trail splits into two trails (Goat Creek and Pass Creek), each continuing several miles into the designated wilderness. Beyond the wilderness boundary the Copper Lake trail is known as the Black Mountain trail; this trail continues into the wilderness area for some distance and also splits into three separate trails. Under this alternative, the trails would not be improved, in or outside of the wilderness area, and would be closed to recreational ORV use. Subsistence ORV use still would be allowed during all seasons along

the Black Mountain trails and the trails south of Tanada Lake and access to private inholdings by ORV would be allowed on the Copper Lake and Tanada Lake trails.

The remaining seven trails in the analysis area do not enter or closely approach the designated wilderness area and are assumed to have little to no indirect effect, either beneficial or adverse, on wilderness quality. Recreational ORV use on these trails would continue to occur seasonally throughout the analysis area.

Untrammeled Quality. Changes to the untrammeled quality of wilderness could occur if the wilderness resource would be manipulated as a result of a management action. Under this alternative, there would be no effect, either beneficial or adverse, on the current untrammeled quality of the wilderness resource because this alternative would not intentionally manipulate wilderness.

Natural Quality. Wilderness quality is not only affected by what happens in the wilderness, but also what happens outside of the wilderness. Changes to the natural quality of wilderness could occur if wilderness and the surrounding area would be affected by plant and animal communities, physical resources, and biophysical processes. Under this alternative, trails and ORV use would continue to be potential pathways and sources of plant community change, but would continue to have negligible effects on the natural quality.

Undeveloped Quality. Alternative 1 would not change conditions related to trails that could influence the undeveloped quality of the wilderness. Under this alternative, motorized use would continue in the wilderness area, including the use of ORVs for subsistence purposes and the use of fixed wing aircraft. As discussed in Section 3.5.4.4, ORV use has resulted in degraded conditions in some locations within the wilderness, particularly along portions of the Black Mountain trail system south of Copper Lake. Within this trail system, 10 miles are classified as degraded, very degraded, and extremely degraded, with impacts that include bare ground, rutting, mud/muck holes, vegetation and soil damage, and trail braiding. Based on average trail width estimates (Meyer and Anderson, 2007), approximately 70 acres of actual disturbance are associated with the Black Mountain trail system; 13 acres of disturbance are associated with the trails south of Tanada Lake. To non-motorized users, these impacts are obvious reminders of long-term and continued motorized use that has reduced the undeveloped quality of the wilderness in those locations. Because these are long-term, localized effects that would be readily noticeable to most visitors, these continuing impacts meet the moderate impact threshold.

Solitude or Primitive and Unconfined Quality. Changes to the solitude or primitive and unconfined quality of wilderness could occur if wilderness were no longer remote from sights and sounds of people inside of the wilderness or remote from occupied and modified areas outside of the wilderness, and if facilities were present and management restricted visitor behavior. Under this alternative, subsistence ORV use on the Black Mountain trail system is anticipated to slightly increase, from 55 to 65 users per year from current use levels, over a 20-year period. Similarly, subsistence ORV use on the wilderness trails south of Tanada Lake is projected to increase from 40 to 47 users per year (Table 4-1). Access and travel activity originating in and outside of the wilderness and the presence of user-created facilities that support fly-in use of the wilderness can also influence opportunities for solitude. Because the existing activities that can diminish the opportunities for solitude are highly transitory and are rather widely distributed in time and area, they meet the threshold criteria for negligible impacts. With a slight increase in user numbers over time, Alternative 1 would not change or would minimally change conditions for this wilderness quality. Therefore, this alternative would continue to have negligible, adverse effects on the solitude or primitive and unconfined quality of the wilderness.

In summary, Alternative 1 would result in long-term, moderate, adverse effects on wilderness character resulting from continued subsistence ORV use on unimproved trails and the impacts associated with those trails.

Eligible Wilderness (Effects based on the 1986 wilderness eligibility mapping)

Under this No Action alternative, the 1986 wilderness eligibility assessment classified the Caribou, Lost Creek, Trail Creek, Soda Lake, Reeve Field, and Boomerang trails as being in eligible wilderness (see Figure 2-1). Section 3.5.4.4 describes the existing condition of areas classified as eligible wilderness; natural and undeveloped qualities and opportunities for solitude and a primitive experience have been moderately impacted by ORV use. Under this alternative, ORV use (including recreational, subsistence, and access to inholdings) would continue on the Caribou, Lost Creek, Trail Creek, Soda Lake, Reeve Field, and Boomerang trails. No trail improvements or trail construction is proposed.

Untrammeled Quality. Changes to the untrammeled quality of wilderness could occur if the wilderness resource were manipulated as a result of a management action, such as fire suppression, dam construction, trail improvement using man-made materials, or manipulation of wildlife populations. Under this alternative, there would be no effect, either beneficial or adverse, on the current untrammeled quality of the wilderness resource because this alternative does not propose trail improvements or other management actions that would intentionally manipulate wilderness.

Natural Quality. Wilderness quality is not only affected by what happens in the wilderness, but also by what happens outside of the wilderness. Changes to the natural quality of wilderness could occur if wilderness and the surrounding area were affected by plant and animal communities, physical resources, and biophysical processes. Under this alternative, 43.7 miles of trails with recreational and subsistence ORV use would continue to be potential pathways and sources of plant community change. Plant community change and soil damage occurs in some degraded segments of trails, particularly where braiding occurs. Twenty percent of the 43.7 miles of ORV trails in eligible wilderness are classified as degraded, very degraded, or severely degraded. These deteriorated conditions would continue to result in a moderate impact on the natural quality of wilderness.

Undeveloped Quality. Under this alternative, motorized use would continue in eligible wilderness, including the use of ORVs for recreational and subsistence purposes. As discussed in Section 3.5.4.4, ORV use has resulted in degraded trail conditions on some trail segments within the eligible wilderness, particularly along portions of the Soda Lake, Reeve Field, and Boomerang trails. Twenty percent of the 43.7 miles of ORV trails in eligible wilderness are classified as degraded, very degraded, or severely degraded, with impacts that include bare ground, rutting, mud/muck holes, vegetation and soil damage, and trail braiding. To non-motorized users, these impacts are obvious reminders of long term and continued motorized use that has reduced the undeveloped quality of the wilderness in those locations. With no trail improvements and continued permitting of ORV use, these impacts would be expected to gradually expand and have a moderate effect to the undeveloped character of the area.

Solitude or Primitive and Unconfined Quality. Changes to the solitude or primitive and unconfined quality of wilderness could occur if wilderness were no longer remote from sights and sounds of people inside of the wilderness or remote from occupied and modified areas outside of the wilderness, and if facilities were present and management restricted visitor behavior. Under this alternative, recreational and subsistence ORV use on the trails in eligible wilderness is anticipated to slightly increase over a 20-year period. Because 85 percent of the ORV use in the area is related to hunting, motorized use is seasonal and opportunities for solitude or a primitive experience are

minimally impacted for much of the summer season. Therefore, ORV use at anticipated levels (as presented in Table 4-1) would have a moderate but reversible effect on opportunities for solitude or an unconfined experience.

In summary, the continued permitting of a slightly increased level of ORV use and the expansion of long term impacts associated with degraded ORV trails would result in localized long-term effects and a moderate impact to the wilderness character. This impact would preclude the motorized trail corridors from future wilderness designation. Assuming a 0.25-mile corridor around each of the motorized trails (Caribou Creek, Trail Creek, Lost Creek, Soda Lake, Reeve Field, and Boomerang), 7,530 acres would be affected. This acreage figure does not represent actual disturbance on the ground, but accounts for impacts caused by motorized noise and dispersed non-motorized use.

Cumulative

Several of the cumulative effects assumptions described in Section 4.1.2 that would be applicable to wilderness are discussed in this section. Projections show that there is potential for increased visitor demand and subsistence access in the analysis area over the next 20 years. Increased visitor use and subsistence/access to inholdings use is anticipated, but is not likely to significantly affect the wilderness quality. Additionally, construction of facilities along the Nabesna Road would have a negligible impact on wilderness quality, assuming increased numbers of visitors do not access the wilderness area.

As discussed in Section 3.3.2.1, there are 94 additional miles of motorized trail within the analysis area, 93 percent of which occur within areas classified as eligible wilderness. Generally, use levels are light (less than 20 passes per year). Trail conditions vary, but most are in fair condition, with some degraded segments (Connery, 1987). These trails are used by local federally qualified subsistence hunters, trappers, and firewood and berry gatherers. There are no trailheads associated with these trails, and most park visitors are never aware that they exist. Impacts associated with these trails may result in effects to the wilderness or wilderness character, but would not be noticeable by the majority of visitors, would not reduce the integrity of wilderness, and would therefore be considered minor.

These impacts, in combination with the moderate, long-term, adverse direct and indirect impacts to wilderness quality that have already occurred, would result in moderate net long-term, adverse cumulative impacts to wilderness in the analysis area.

Conclusion

This alternative would not produce a significant change in existing adverse impacts to wilderness resources. Alternative 1 would continue to allow conditions that result in moderate diminishment of one of the wilderness qualities (undeveloped quality) and negligible effects on a second quality (solitude or primitive and unconfined quality). The alternative would have no effect on the other two wilderness qualities (untrammeled quality and natural quality). Overall, including the moderate effect on wilderness character in areas eligible for wilderness designation, Alternative 1 would result in continued conditions that represent a moderate adverse change from natural conditions.

Because they are localized effects (for example, 83 acres of impact within the designated wilderness represents 0.03 percent of all designated wilderness within the analysis area) the moderate impacts to wilderness character anticipated from this alternative would not result in an impairment of park resources.

4.4.4.5 Alternative 2 Effects on Wilderness

Direct and Indirect

Designated Wilderness

Under this alternative, subsistence use would continue to occur on all trails within the designated wilderness. No trail improvements are proposed. For the Black Mountain trail system, 55 ORV round trips are projected; 45 round trips are projected for the trails south of Tanada Lake.

The remaining seven trails in the analysis area do not enter or closely approach the designated wilderness area and are assumed to have little to no indirect effect, either beneficial or adverse, on designated wilderness quality. Recreational ORV use on these trails would continue to occur.

Untrammeled Quality. Changes to the untrammeled quality of wilderness could occur if wilderness would be manipulated as a result of a management action. Similar to Alternative 1, under this alternative there would be no effect, either beneficial or adverse, on the current untrammeled quality of the wilderness resource because this alternative would not intentionally manipulate wilderness.

Natural Quality. Wilderness quality is not only affected by what happens in the wilderness, but also what happens outside of the wilderness. Changes to the natural quality of wilderness could occur if wilderness and the surrounding area would be affected by plant and animal communities, physical resources, and biophysical processes. Similar to Alternative 1, under this alternative trails and ORV use would continue to be potential pathways and sources of plant community change, but would continue to have negligible effects on the natural quality.

Undeveloped Quality. Alternative 2 would not change conditions related to trails that could influence the undeveloped quality of the wilderness. Similar to Alternative 1, under this alternative motorized use would continue in the wilderness area. As discussed for Alternative 1, motorized use has resulted in degraded conditions in some locations within the wilderness, which has reduced the undeveloped quality of the wilderness in those locations. Because these are long-term, localized effects that would be readily noticeable to most visitors, these continuing impacts meet the moderate impact threshold.

Solitude or Primitive and Unconfined Quality. Changes to the solitude or primitive and unconfined quality of wilderness could occur if wilderness were no longer remote from sights and sounds of people inside of the wilderness or remote from occupied and modified areas outside of the wilderness, and if facilities were present and management restricted visitor behavior. Under this alternative, subsistence ORV use on the Black Mountain trail is anticipated to remain the same as current use levels over a 20-year period, while subsistence ORV use on the wilderness trails south of Tanada Lake is expected to increase slightly. Subsistence use is anticipated to slightly increase from 105 to 110 and 65 to 73 users, respectively, on the Copper Lake and Tanada Lake trails. Additionally, recreational ORV use would increase by 15 additional users on the Copper Lake trail and 105 additional users on the Tanada Lake trail (Table 4-1). The year-round recreational ORV use (and subsistence and inholding use) outside of the wilderness area would disturb the remoteness of the wilderness area intermittently throughout the year. Access and travel activity originating in and outside of the wilderness and the presence of user-created facilities that support fly-in use of the wilderness can also influence opportunities for solitude. Because the existing activities that can diminish the opportunities for solitude are highly transitory and are rather widely distributed in time and area, they meet the threshold criteria for negligible impacts. Alternative 2 would not change or would minimally change conditions for this wilderness quality. There also would be minimal change

based on a slight increase in user numbers within the wilderness. Therefore, this alternative would continue to have negligible, adverse effects on the solitude or primitive and unconfined quality of the wilderness.

In summary, for designated wilderness, there would be little change to ORV use levels or impacts associated with trails as a result of actions proposed in this alternative. The moderate level of impact to wilderness character that already exists would not change.

Eligible Wilderness (Effects based on the 1986 wilderness eligibility mapping)

The 1986 wilderness eligibility assessment classified the Caribou, Lost Creek, Trail Creek, Soda Lake, Reeve Field, and Boomerang trails as being in eligible wilderness (see Figure 2-1). Section 3.5.4.4 describes the existing condition of areas classified as eligible wilderness; natural and undeveloped qualities and opportunities for solitude and a primitive experience have been moderately impacted by ORV use. Under this alternative, ORV use (including recreational, subsistence, and access to inholdings) would continue on the Caribou, Lost Creek, Trail Creek, Soda Lake, Reeve Field, and Boomerang trails. No trail improvements or trail construction is proposed.

The continued permitting of an increased level of ORV use and the expansion of long term impacts associated with degraded ORV trails would result in localized long-term effects and moderate impacts to undeveloped quality and opportunities for solitude. These impacts would preclude the motorized trail corridors from future wilderness designation. Assuming a 0.25-mile corridor around each of the motorized trails (Caribou Creek, Trail Creek, Lost Creek, Soda Lake, Reeve Field, and Boomerang), 7,530 acres would be affected. This acreage figure does not represent actual disturbance on the ground, but accounts for impacts caused by motorized noise and dispersed non-motorized use.

Eligible Wilderness (Effects based on the proposed revision of the 1986 wilderness eligibility mapping)

This analysis is based on the revised wilderness eligibility assessment discussed in Section 2.3 of this Plan/EIS and shown on Figure 2-2. Under the revised eligibility, existing motorized trails are within ineligible corridors. These include Suslota, Caribou Creek, Lost Creek, Trail Creek, Soda Lake, Reeve Field, Tanada Lake, Copper Lake, and Boomerang trails. Corridors are wide enough (0.25 mile for Caribou Creek, Lost Creek, Trail Creek, Soda Lake, Reeve Field, and Boomerang; 0.5 mile for Suslota, Tanada Lake, and Copper Lake) that impacts associated with degraded trail segments would not extend to areas considered eligible.

Untrammeled Quality. Changes to the untrammeled quality of wilderness could occur if the wilderness resource were manipulated as a result of a management action, such as fire suppression, dam construction, trail improvement using man-made materials, or manipulation of wildlife populations. This alternative proposes no such activities within eligible wilderness. Consequently, there would be a negligible effect on the untrammeled quality of the eligible wilderness.

Natural Quality. Wilderness quality is not only affected by what happens in the wilderness, but also by what happens outside of the wilderness. Changes to the natural quality of wilderness could occur if wilderness and the surrounding area were affected by plant and animal communities, physical resources, and biophysical processes. Under this alternative, limited subsistence ORV use will occur off existing trail corridors classed as ineligible and into eligible wilderness. This off-trail ORV use could be a potential pathway for plant community change through introduction of invasive plant species, but to date none have been documented. Vegetation and soil damage associated with off-trail

subsistence ORV use is limited. Within eligible wilderness, this would result in a negligible impact on the natural quality of wilderness.

Undeveloped Quality. All impacts associated with degraded portions of ORV trails, such as bare ground, rutting, mud/muck holes, vegetation damage, and trail braiding, would be contained within the trail corridors classified as ineligible. Some subsistence ORV use would occur off existing trails and in eligible wilderness. Impacts associated with off-trail use are highly localized, of minor severity, and are not observable to the average backcountry visitor. For these reasons, impacts to the undeveloped quality of eligible wilderness would be minor.

Solitude or Primitive and Unconfined Quality. Changes to the solitude or primitive and unconfined quality of wilderness could occur if wilderness were no longer remote from sights and sounds of people inside of the wilderness or remote from occupied and modified areas outside of the wilderness, and if facilities were present and management restricted visitor behavior. Under this alternative, recreational and subsistence ORV use in the ineligible trail corridors is anticipated to slightly increase over a 20-year period. This increased use would result in a slight increase in non-motorized use in eligible wilderness, mostly associated with the motorized trail corridors and related to sport and subsistence hunting. Impacts associated with motorized trails within ineligible corridors would be noticeable to and might detract from the experience of those accessing eligible areas via these corridors. Additionally, those using eligible areas adjacent to ineligible trail corridors might experience some motorized noise, particularly during August and early September (hunting season). Taken together, these impacts would have a minor effect on solitude or primitive and unconfined quality of eligible wilderness.

In summary, actions proposed under this alternative may result in effects to the eligible wilderness character, but would not reduce the integrity of wilderness and would not preclude eligible areas from future consideration for wilderness suitability.

Cumulative

The impacts of other nearby past, present, and foreseeable future actions on wilderness quality are described under Alternative 1. The net effect of these impacts in combination with the direct and indirect impacts likely under Alternative 2 would be long-term, moderate, adverse impacts to wilderness quality.

Conclusion

Under this alternative, continued ORV use on unimproved trails would cause moderate adverse impacts to wilderness resources. Alternative 2 would continue to allow conditions that result in moderate diminishment of undeveloped quality and negligible effects on solitude or primitive and unconfined quality within the designated wilderness, and would have no effect on the other two wilderness qualities (untrammeled quality and natural quality). Overall, including the minor effect on wilderness character in areas suitable for wilderness designation, Alternative 2 would result in continued conditions that represent a moderate adverse change from natural conditions.

For designated wilderness, a moderate determination is made because subsistence ORV use would continue to result in localized long-term effects that alter the wilderness character so that it is readily noticeable to visitors and/or reduces the integrity of wilderness. Because of the localized nature of these impacts, the moderate impacts to wilderness anticipated from this alternative would not result in impairment of park resources.

4.4.4.6 Alternative 3 Effects on Wilderness

Direct and Indirect

Under this alternative, recreational ORV use would not be permitted within the analysis area. Within designated wilderness, subsistence ORV use would continue, both on and off existing trails. A slight increase in subsistence ORV use on wilderness trails is anticipated over the 20-year planning period. No trail improvements are proposed. Within eligible wilderness, the Soda Lake re-route is proposed. Additionally, one non-motorized trail (Rock Creek) would be constructed and three non-motorized routes would be laid out in eligible wilderness (Platinum-Soda, Platinum-Reeve, and Sugarloaf).

Under this alternative, unimproved trails would be monitored. If monitoring over time shows an increase in resource impacts associated with degraded trails segments, management actions would be taken, up to and including trail closure.

Designated Wilderness

Untrammelled Quality. Changes to the untrammelled quality of wilderness could occur if wilderness would be manipulated as a result of a management action. Similar to alternatives 1 and 2, under this alternative there would be no effect, either beneficial or adverse, on the current untrammelled quality of the wilderness resource because this alternative would not intentionally manipulate wilderness.

Natural Quality. Similar to alternatives 1 and 2, under this alternative trails and ORV use would continue to be potential pathways and sources of plant community change, but would have negligible effects on the natural quality. Natural conditions would be restored outside of the wilderness area by allowing a substantial portion of the existing ORV impacts to recover after trails are closed to recreational ORV use.

Undeveloped Quality. Alternative 3 would not substantially change conditions related to trails that could influence the undeveloped quality of the wilderness. Similar to Alternatives 1 and 2, under this alternative subsistence ORV use would continue in the designated wilderness. As discussed for Alternatives 1 and 2, motorized use has resulted in degraded conditions on some segments of the Black Mountain trail system. This has reduced the undeveloped quality of the wilderness in those locations. Because these are long-term, localized effects that would be readily noticeable to most visitors, these continuing impacts meet the moderate impact threshold.

Solitude or Primitive and Unconfined Quality. Changes to the solitude or primitive and unconfined quality of wilderness could occur if wilderness were no longer remote from sights and sounds of people inside of the wilderness or remote from occupied and modified areas outside of the wilderness, and if facilities were present and management restricted visitor behavior. Under this alternative, subsistence ORV use is anticipated to increase from 55 to 65 users over the next 20 years on the Black Mountain trail, and from 40 to 47 users on the wilderness trails south of Tanada Lake. Subsistence ORV use would also increase from 105 to 125 and 65 to 75 users, respectively, on the Copper Lake and Tanada Lake trails (Table 4-1). Recreational ORV use would cease on the latter two trails, although current recreational ORV use on these trails is low (20 users per year on the Copper Lake trail and none on the Tanada Lake trail). As a result, total ORV use on these four trails at the end of the 20-year planning period would be 312 users, an overall increase of 10 percent during the period. The slight increase in the level of ORV use in and adjacent to the wilderness area would result in slightly more opportunity for non-motorized wilderness users to encounter sights and/or sounds of motorized traffic, and a slight decrease in their opportunities for solitude. The result would be a

negligible, adverse change from current conditions, and negligible overall impacts, for this wilderness quality.

In summary, for designated wilderness, there would be little change to ORV use levels or impacts associated with trails as a result of actions proposed in this alternative. The moderate level of impact to wilderness character that already exists would not change.

Eligible Wilderness (Effects based on the 1986 wilderness eligibility mapping)

The 1986 wilderness eligibility assessment classified the Caribou, Lost Creek, Trail Creek, Soda Lake, Reeve Field, and Boomerang trails as being in eligible wilderness (see Figure 2-1).

Actions proposed under this alternative would result in continued moderate effects to the undeveloped quality of eligible wilderness and would result in 6,624 acres being precluded from future consideration for wilderness suitability, primarily because of long-term impacts associated with degraded portions of existing trails. The Soda Lake re-route would have a moderate impact on wilderness character and could preclude 916 acres within 0.25 mile of the re-route from consideration for future wilderness designation. This effect would be off-set by the closure of the existing, degraded portion of the Soda Lake trail. The closed portion includes 946 acres, if calculated using a 0.25-mile corridor. This area, allowed to recover, would meet the criteria for eligible wilderness.

Eligible Wilderness (Effects based on the proposed revision of the 1986 wilderness eligibility mapping)

This analysis of impacts to eligible wilderness under Alternative 3 is based on the proposed revised eligibility map presented in Chapter 2 and shown in Figure 2-2.

Untrammelled Quality. Changes to the untrammelled quality of wilderness could occur if the wilderness resource were manipulated as a result of a management action, such as fire suppression, dam construction, trail improvement using man-made materials, or manipulation of wildlife populations. Under this alternative, the Soda Lake trail would be re-routed. The re-route would be located within eligible wilderness and designed and constructed to accommodate subsistence ORV use. The design for this re-route includes short segments of GeoBlock, a man-made material, to harden creek crossings and wet areas. Consequently, in the vicinity of the constructed re-route, there would be a moderate impact to the untrammelled quality of eligible wilderness, and long-term motorized use on one trail alignment. The existing, degraded portion of the Soda Lake trail would be closed and allowed to recover. In other portions of the analysis area, there would be negligible impacts on the untrammelled quality of eligible wilderness.

Natural Quality. Wilderness quality is not only affected by what happens in the wilderness, but also what happens outside of the wilderness. Changes to the natural quality of wilderness could occur if wilderness and the surrounding area would be affected by plant and animal communities, physical resources, and biophysical processes. Under this alternative, limited subsistence ORV use would occur off existing trail corridors classed as ineligible and into eligible wilderness. Subsistence ORV use would also occur on the constructed Soda Lake re-route. This ORV use could be a potential pathway for plant community change through introduction of invasive plant species, but to date none have been documented. Vegetation and soil damage associated with current low levels of off-trail subsistence ORV use is limited. Within eligible wilderness, this would result in a negligible impact on the natural quality of wilderness.

Undeveloped Quality. All impacts associated with degraded portions of ORV trails, such as bare ground, rutting, mud/muck holes, vegetation damage, and trail braiding, would be contained within the trail corridors classified as ineligible. Some subsistence ORV use would occur off existing trails and in eligible wilderness. Impacts associated with off-trail use would be highly localized, of minor severity, and not observable to the average backcountry visitor.

Under this alternative, the Soda Lake trail would be re-routed. The re-route would be located within eligible wilderness and designed and constructed to accommodate subsistence ORV use. The design for this re-route includes mechanized construction resulting in a 48-inch tread. Construction would include sideslope cut and fill and would result in long term alteration of soils and vegetation within approximately 10 acres of disturbed area. Consequently, in the vicinity of the constructed re-route, there would be a moderate impact to the undeveloped quality of eligible wilderness, and long-term motorized use on one trail alignment. The existing, degraded portion of the Soda Lake trail would be closed and allowed to recover. Over time, the closed segment would meet the criteria for eligible wilderness.

An estimated 2.8 acres of vegetation and soil impacts would occur in association with the construction of the non-motorized Rock Creek trail. The identification and layout of three non-motorized routes would result in very minimal ground disturbance, but could eventually result in some impacts to soils and vegetation such as trampling, vegetation breakage, and soil compaction. These impacts would be detectable and noticeable to all visitors using the trails/routes, and so would result in a moderate impact to the undeveloped character of the eligible wilderness in the vicinity of the trails.

Solitude or Primitive and Unconfined Quality. Under this alternative, ORV use in the ineligible trail corridors would decrease over a 20-year period because no recreational ORV use would be permitted. This decreased use would result in a decrease in non-motorized use in eligible wilderness, associated with the motorized trail corridors. Impacts associated with motorized trails within ineligible corridors would still be noticeable and might detract from the experience of those accessing eligible areas via these corridors. Additionally, those using eligible areas adjacent to ineligible trail corridors might experience some motorized noise, particularly during August and early September (hunting season). Taken together, these impacts would have a negligible effect on solitude or primitive and unconfined quality of eligible wilderness.

The construction of the Soda Lake re-route would introduce approximately 35 subsistence ORV users into areas previously inaccessible to motorized use. This use would occur during hunting season and, within the re-route corridor, would have a moderate impact on solitude or primitive and unconfined quality of the eligible wilderness.

The construction of the non-motorized Rock Creek trail and layout of three non-motorized routes has the potential to increase non-motorized use in the vicinity of these trails/routes. Increased use of these areas could result in an increase in number of people or parties encountered and could result in a minor impact to the solitude or primitive and unconfined quality of the eligible wilderness.

In summary, outside of the Soda Lake re-route, actions proposed under this alternative would result in minor effects to the eligible wilderness character, would not reduce the integrity of eligible wilderness, and would not preclude eligible areas from future consideration for wilderness suitability. The Soda Lake re-route would have a moderate impact on wilderness character and could preclude 916 acres within 0.25 mile of the re-route from consideration for future wilderness designation. This effect would be off-set by the closure of the existing, degraded portion of the Soda Lake trail. The

closed portion includes 946 acres, if calculated using a 0.25-mile corridor. This area, allowed to recover, would meet the criteria for eligible wilderness.

Cumulative

The impacts of other nearby past, present, and foreseeable future actions on wilderness quality are described under Alternative 1. The net effect of these impacts, in combination with the direct and indirect impacts ranging from negligible to moderate under Alternative 3, would be minor to moderate long-term, adverse impacts to wilderness quality.

Conclusion

This alternative would not cause significant changes to existing adverse impacts to wilderness resources. With continued subsistence ORV use on unimproved trails, Alternative 3 would continue to allow conditions that result in moderate diminishment of undeveloped quality and negligible effects on solitude or primitive and unconfined quality within the designated wilderness, and would have no effect on the other two wilderness qualities (untrammelled quality and natural quality). Overall, including the moderate effect on eligible wilderness character resulting from the Soda Lake re-route, Alternative 3 would result in continued conditions that represent a moderate adverse change from natural conditions.

For designated wilderness, a moderate determination is made because subsistence ORV use would continue to result in localized long-term effects that alter the wilderness character so that it is readily noticeable to visitors and/or reduces the integrity of wilderness. Because they are localized, the moderate level of impacts to wilderness anticipated from this alternative would not result in impairment of park resources.

4.4.4.7 Alternative 4 Effects on Wilderness

Direct and Indirect

Designated Wilderness

Within designated wilderness, the Black Mountain trail system and trails south of Tanada Lake would be improved through a combination of trail brushing, installing water control features, hardening with native materials, and re-routing trail segments. On re-routes, no tread construction would occur, only brushing and marking. Where re-routes are constructed, old degraded segments of trail would be closed to ORV use. Trails leading to the designated wilderness (Copper Lake and Tanada Lake) would be improved; therefore, a significant increase in subsistence ORV use is anticipated on trails within the designated wilderness. Subsistence ORV users within the designated wilderness would still be permitted to travel off existing trails.

Untrammelled Quality. Changes to the untrammelled quality of wilderness could occur if wilderness resource were manipulated as a result of a management action, such as fire suppression, dam construction, trail improvement using man-made materials, or manipulation of wildlife populations. Under this alternative, trail improvements are proposed but do not involve man-made materials. Additionally, subsistence hunting occurs, but there are no specific actions taken to manage animal populations. Under this alternative there would be no effect, either beneficial or adverse, on the current untrammelled quality of the wilderness resource because this alternative would not intentionally manipulate wilderness.

Natural Quality. Indicators relative to the natural quality include plant and animal communities, physical resources, and biophysical processes. Under this alternative trails and ORV use would continue to be potential pathways and sources of plant community change. Assuming that proposed trail improvements would allow subsistence ORV users to stay on one trail alignment, there would be a beneficial impact associated with closure and recovery of adjacent degraded areas. This would be at least partially off-set by an increase in off-trail use that would occur with increased subsistence ORV use anticipated with this alternative. Because these actions would result in detectable changes, this would result in a minor impact to natural quality.

Undeveloped Quality. Under Alternative 4 a variety of both adverse and beneficial changes in trail conditions could influence the undeveloped quality of the wilderness. With a large increase in subsistence ORV use and no monitoring in place to control off-trail use, motorized off-trail use would result in expansion of unmanaged trails and noticeable surface disturbance. Because increased off-trail ORV use would result in widespread long-term effects that alter the undeveloped quality so that it is readily noticeable to visitors and/or reduces the integrity of wilderness, this would result in a major adverse impact.

There would be a minor, adverse effect on the undeveloped quality of wilderness resource values because trail improvements (using hand tools) would be added under this alternative. Additionally, the Wait-Nabesna non-motorized route would be marked through the wilderness area to connect Nabesna Road and the Tanada Lake trail that could result in negligible, adverse impacts to the undeveloped quality. These impacts could diminish the undeveloped quality on a site-specific basis. Conversely, some existing adverse effects to undeveloped quality would diminish because old trail segments that are severely degraded would be closed and would recover over time.

Solitude or Primitive and Unconfined Quality. Changes to the solitude or primitive and unconfined quality of wilderness could occur if wilderness were no longer remote from sights and sounds of people inside of the wilderness or remote from occupied and modified areas outside of the wilderness, and if facilities were present and management restricted visitor behavior. Under this alternative, subsistence ORV use on the Black Mountain trails is anticipated to increase over current conditions by 89 users, or 162 percent (from 55 to 144 users), and subsistence ORV use on the wilderness trails south of Tanada Lake is anticipated to increase by 132 users (from 40 to 172 users), or over 300 percent, over a 20 year period. Similarly, subsistence use is anticipated to increase by 169 and 200 users, respectively, on the Copper Lake and Tanada Lake trails (Table 4-1). Recreational ORV use would cease on the latter two trails, although current recreational ORV use on these trails is low (20 users per year on the Copper Lake trail and none on the Tanada Lake trail). Overall, total ORV use on these four trails would triple, from 285 users currently to 855 users per year at the end of the 20-year planning period. The increase in the level of ORV use in and adjacent to the wilderness area would result in considerably more opportunity for non-motorized wilderness users to encounter sights and/or sounds of motorized traffic, and a decrease in their opportunities for solitude. The result would be a moderate, adverse effect on conditions for this wilderness quality.

In summary, for designated wilderness, the benefits associated with improved trails would be off-set by the increase in ORV use, and particularly off-trail use. The increased use and associated impacts to the undeveloped character and opportunities for solitude and unconfined quality over a large area would result in a major adverse impact to the character of the designated wilderness.

Eligible Wilderness (Effects based on the 1986 wilderness eligibility mapping)

Under this alternative, the existing Suslota, Caribou Creek, Trail Creek, Lost Creek, Soda Lake, Reeve Field, and Boomerang trails are within corridors classified as eligible. Proposed improvements that would occur in areas classified as eligible wilderness are as follows:

- Most of the constructed motorized re-route for the Tanada Lake trail (45 acres impacted in eligible wilderness).
- The constructed motorized re-route for the Soda Lake trail (10 acres impacted).
- The constructed motorized re-route for the Reeve Field trail (3.0 acres impacted).
- Improvements on the Trail Creek, Lost Creek, Caribou Creek, and Boomerang trails (4.4, 2.9, 3.1, and 0.1 acres impacted, respectively).
- The constructed non-motorized Rock Creek, Tanada Spur, and 4-mile trails (2.8, 4.2, and 1.6 acres impacted, respectively).
- The non-motorized Platinum-Soda, Platinum-Reeve, Wait-Nabesna, and Sugarloaf routes (no layout impacts).

These proposed improvements in eligible wilderness would reduce or eliminate the expansion of impacts related to degraded trail segments. Old degraded portions of trails would be closed to ORV use and allowed to recover.

Trail construction impacts (particularly when designed for long-term motorized use) would result in a moderate impact to the undeveloped character of eligible wilderness. Additionally, the anticipated increase in ORV use associated with improved trails would result in moderate impacts to opportunities for solitude and a primitive experience. Assuming a 0.25-mile corridor around improved motorized trails, this would result in 8,592 acres of eligible wilderness being precluded from future consideration as suitable wilderness.

Eligible Wilderness (Effects based on the proposed revision of the 1986 wilderness eligibility mapping)

This analysis of impacts to eligible wilderness is based on the proposed revision of eligibility described in Chapter 2 and shown on Figure 2-2.

Under this alternative, the existing Suslota, Caribou Creek, Trail Creek, Lost Creek, Soda Lake, Reeve Field, Tanada Lake, Copper Lake, and Boomerang trails are within corridors classified as ineligible. Improvements proposed under this alternative for the Caribou Creek, Trail Creek, Lost Creek, Reeve Field, Copper Lake, and Boomerang trails all fall within the ineligible corridors. Proposed improvements that would occur in areas classified as eligible wilderness are as follows:

- Most of the constructed motorized re-route for the Tanada Lake trail (45 acres impacted in eligible wilderness).
- The constructed motorized re-route for the Soda Lake trail (10 acres impacted).

- The constructed non-motorized Rock Creek, Tanada Spur, and 4-mile trails (2.8, 4.2, and 1.6 acres impacted, respectively).
- The non-motorized Platinum-Soda, Platinum-Reeve, Wait-Nabesna, and Sugarloaf routes (no layout impacts).

After improvements, recreational ORV use would be permitted on the Caribou Creek, Trail Creek, Lost Creek, Soda Lake, Reeve Field, and Boomerang trails, with 0 to 50 percent increases in use projected, depending on the trail. Subsistence ORV use would continue on all trails but would increase significantly on the improved Tanada and Copper Lake trails.

Untrammelled Quality. Changes to the untrammelled quality of wilderness could occur if the wilderness resource were manipulated as a result of a management action, such as fire suppression, dam construction, trail improvement using man-made materials, or manipulation of wildlife populations. Under this alternative, the Soda Lake and Tanada Lake trails would be re-routed. The re-routes would be located within eligible wilderness and designed and constructed to accommodate multiple uses, including ORVs. The design for these re-routes includes short segments of GeoBlock, a man-made material, to harden creek crossings and wet areas. Consequently, in the vicinity of these constructed re-routes, there would be a moderate impact to the untrammelled quality of eligible wilderness, and long-term motorized use on one trail alignment. The existing, degraded portion of the Soda Lake and Tanada Lake trails would be closed and allowed to recover.

In other portions of the analysis area, there would be negligible impacts on the untrammelled quality of eligible wilderness.

Natural Quality. Changes to the natural quality of wilderness could occur if wilderness and the surrounding area were affected by plant and animal communities, physical resources, and biophysical processes. Under this alternative, construction activities for motorized and non-motorized trail improvements would disturb 63.6 acres and result in plant community and soil changes within the area affected by construction. These improved trails could serve as potential pathways for plant community change through introduction of invasive plant species, but to date none have been documented. Impacts are limited but noticeable to all visitors using the trails and would result in moderate impacts to the natural quality of eligible wilderness in the vicinity of the new or improved trails.

Limited subsistence ORV use would continue to occur off existing trail corridors classed as ineligible and into eligible wilderness. This ORV use could be a potential pathway for plant community change through introduction of invasive plant species, but to date none have been documented. Vegetation and soil damage associated with current and anticipated low levels of off-trail subsistence ORV use is limited. Within eligible wilderness, this would result in a negligible impact on the natural quality of wilderness.

Undeveloped Quality. All impacts associated with degraded portions of ORV trails, such as bare ground, rutting, mud/muck holes, vegetation damage, and trail braiding, would be contained within the trail corridors classified as ineligible. Some subsistence ORV use would occur off existing trails and in eligible wilderness. Impacts associated with off-trail use are highly localized, of minor severity, and are not observable to the average backcountry visitor.

Under this alternative, the Soda Lake trail would be re-routed. The re-route would be located within eligible wilderness and designed and constructed to accommodate subsistence and recreational ORV

use. The design for this re-route includes mechanized construction resulting in a 48-inch tread. Construction would include sideslope cut and fill and would result in long term alteration of soils and vegetation within approximately 10 acres of disturbed area. Consequently, in the vicinity of the constructed re-route, there would be a moderate impact to the undeveloped quality of eligible wilderness, and long-term motorized use on one trail alignment. The existing, degraded portion of the Soda Lake trail would be closed and allowed to recover.

Alternative 4 proposes a constructed re-route for the Tanada Lake trail that would lie almost entirely within area classified as eligible for wilderness designation. This area has no existing trails. The design for this re-route includes mechanized construction resulting in a 48-inch tread. Construction would include sideslope cut and fill and would result in long term alteration of soils and vegetation within the disturbed area (approximately 45 acres). No recreational ORV use would be permitted on the re-route, but it would be open for subsistence and access to inholdings. Construction of this re-route would result in a moderate and long-term impact to the undeveloped character of the area.

An estimated 8.6 acres of vegetation and soil impacts would occur in association with the construction of the non-motorized Rock Creek, Tanada spur, and 4-mile trails. These impacts would be detectable and noticeable to all visitors using the trails, so would result in a moderate impact to the undeveloped character of eligible wilderness in the vicinity of the constructed trails.

The identification and layout of non-motorized routes would result in very minimal ground disturbance, but could eventually result in some impacts to soils and vegetation such as trampling, vegetation breakage, and soil compaction and would result in negligible impacts to the undeveloped character of the eligible wilderness.

Solitude or Primitive and Unconfined Quality. Under this alternative, ORV use in the ineligible trail corridors would increase 42 percent over the 20-year period because of trail improvements. This increased use would result in an increase in non-motorized use in eligible wilderness, associated with the motorized trail corridors. Additionally, those visitors using eligible areas adjacent to ineligible trail corridors might experience some motorized noise, particularly during August and early September (hunting season). Taken together, these impacts would have a minor effect on solitude or primitive and unconfined quality of eligible wilderness.

The construction of the Soda Lake re-route would introduce approximately 150 recreational and subsistence ORV users into areas previously inaccessible to motorized use. Most of this use would occur during hunting season and, within the re-route corridor, would have a moderate impact on solitude or primitive and unconfined quality of the eligible wilderness. The construction of the Tanada Lake re-route would introduce approximately 265 subsistence ORV users into areas previously inaccessible to motorized use. This would impact non-motorized users, particularly during hunting season, and would have a moderate impact on the solitude or primitive and unconfined quality within at least a mile of the constructed re-route.

The construction of the non-motorized Rock Creek, Tanada spur, and 4-mile non-motorized trails and layout of four non-motorized routes has the potential to increase non-motorized use in the vicinity of these trails/routes. Increased use of these areas could result in an increase in number of people or parties encountered and could result in a minor impact to the solitude or primitive and unconfined quality of the eligible wilderness.

In summary, constructed re-routes for the Soda Lake and Tanada Lake trails that accommodate motorized uses would result in moderate impacts to wilderness character that could preclude those trail corridors (2,376 acres) from future wilderness consideration. These effects would be mitigated

somewhat by the closure to ORV use and recovery of the existing degraded trail corridors (4,717 acres). Constructed non-motorized trails would have moderate impacts on the undeveloped character of eligible wilderness but these improvements would not preclude the trail corridors from future consideration for wilderness designation.

Cumulative

The impacts of other nearby past, present, and foreseeable future actions on wilderness quality are described under Alternative 1. The net effect of these impacts in combination with the moderate direct and indirect impacts likely under Alternative 4 would be long-term, major, adverse impacts to designated wilderness quality related to a variety of trail management activities and substantially increased ORV use in and near the designated wilderness.

Conclusion

Under Alternative 4, negligible, adverse impacts to the untrammeled quality and minor adverse impacts to the natural quality would occur related to the proposed trail activities in the designated wilderness. There would be major, adverse effects on the undeveloped quality of wilderness resource values because of the impacts associated with a significant increase in subsistence ORV use and proliferation of unmanaged motorized trails. Total ORV use on trails in and leading to the wilderness would nearly triple. The increase in the level of ORV use in and adjacent to the wilderness area would result in more opportunity for non-motorized wilderness users to encounter sights and/or sounds of motorized traffic, and a decrease in their opportunities for solitude. The result would be a moderate, adverse change from current conditions for this wilderness quality. Overall, including the moderate effect on wilderness character in areas eligible for wilderness designation, Alternative 4 would be expected to result in major impacts to wilderness character. Combined with the moderate level of impact that already exists, this would result in widespread long-term effects to the wilderness character and associated values and reduced integrity of wilderness and a major impact within designated wilderness.

For designated wilderness, a major impact determination is made because of the anticipated increase in subsistence ORV with no proposed control over off-trail motorized use. Other alternatives anticipate subsistence ORV use levels or management controls that would contain or improve existing impacts. Under Alternative 4, off-trail impacts associated with motorized use are expected to expand within designated wilderness. This level of impact is considered unacceptable for the following reasons:

- It impedes the attainment of the park's desired future conditions for natural and cultural resources as identified in the park's 1986 GMP. GMP goals related to wilderness are to "preserve the wilderness character". This alternative would result in an expansion of motorized impacts in designated wilderness over and above what already exists.
- Expansion of motorized impacts in the designated wilderness would diminish opportunities for current or future generations to enjoy, learn about, or be inspired by park resources or values.
- Expansion of motorized impacts and a significant increase in subsistence ORV use could unreasonably interfere with the atmosphere of peace and tranquility maintained in wilderness (see discussion of opportunities for solitude and a primitive experience).

By establishing “eight million seven hundred thousand acres” of wilderness and stating that the park would be managed “to maintain unimpaired the scenic beauty and quality of high mountain peaks, foothills, glacial systems, lakes, and streams, valleys, and coastal landscapes in their natural state”, ANILCA clearly established wilderness as a fundamental value of Wrangell-St. Elias National Park and Preserve. Therefore, the major level of impacts to wilderness anticipated from this alternative would result in impairment of park resources that fulfill specific purposes identified in the establishing legislation or that are essential to the integrity of the park.

4.4.4.8 Alternative 5 Effects on Wilderness

Direct and Indirect

Designated Wilderness

Within designated wilderness, the Black Mountain trail system and trails south of Tanada Lake would be improved through a combination of trail brushing, installing water control features, hardening with native materials, and re-routing trail segments. On re-routes, no tread construction would occur, only brushing and marking. Where re-routes are constructed, old degraded segments of trail would be closed to ORV use. Trails leading to the designated wilderness (Copper Lake and Tanada Lake) would be improved and recreational ORV use would be permitted on improved trails to the designated wilderness boundary. Because of competition with recreational ORV users on improved trails leading to the wilderness boundary, this alternative projects only a moderate increase in subsistence ORV use on trails in designated wilderness over current use levels (64 percent increase on the Black Mountain trail system, 20 percent increase on the trails south of Tanada lake).

Within designated wilderness, subsistence ORV users would be required to stay on designated and improved trails; no off-trail ORV use would be allowed.

Untrammeled Quality. Changes to the untrammeled quality of wilderness could occur if the wilderness resource were manipulated as a result of a management action, such as fire suppression, dam construction, trail improvement using man-made materials, or manipulation of wildlife populations. Under this alternative, trail improvements are proposed but do not involve man-made materials. Additionally, subsistence hunting occurs, but there are no specific actions taken to manage animal populations. Under this alternative there would be no effect, either beneficial or adverse, on the current untrammeled quality of the wilderness resource because this alternative would not intentionally manipulate wilderness.

Natural Quality. Indicators relative to the natural quality include plant and animal communities, physical resources, and biophysical processes. Under this alternative trails and ORV use in designated wilderness would continue to be potential pathways and sources of plant community change. Proposed trail improvements would not cause changes in plant communities and would allow subsistence ORV users to stay on one designated trail alignment. There would be a beneficial impact associated with closure and recovery of adjacent degraded areas. Overall, there would be negligible impact to the natural quality of designated wilderness as a result of this alternative.

Undeveloped Quality. Trail improvements proposed for wilderness trails would be low impact. Re-routes would be brushed and marked, but no tread construction would occur. Hand tools would be utilized for constructing water control features and only native materials would be used for spot-hardening. Improvements would be focused on the 10 miles of trail currently classed as degraded or worse. Impacts to the undeveloped quality from trail improvement would be partially mitigated

through closure of old degraded segments of trail. Overall, this would result in a minor, adverse effect on the undeveloped quality of wilderness.

Once trails are improved, subsistence ORV users would be required to stay on improved, designated trails. This would minimize proliferation of motorized trails and impacts associated with them and result in a beneficial impact to the undeveloped quality of designated wilderness.

Additionally, the Wait-Nabesna non-motorized route would be marked, partially through designated wilderness, to connect the Nabesna Road and the Tanada Lake trail. Routes would only be marked; no tread construction would occur, and brushing would only occur if needed to avoid unsafe situations. This would result in negligible, adverse impacts to the undeveloped quality.

Solitude or Primitive and Unconfined Quality. Changes to the solitude or primitive and unconfined quality of wilderness could occur if wilderness were no longer remote from sights and sounds of people inside of the wilderness or remote from occupied and modified areas outside of the wilderness, and if facilities were present and management restricted visitor behavior. Under this alternative, subsistence ORV use on the Black Mountain trails is anticipated to increase over current conditions by 35 round trips, or 64 percent (from 55 to 90 round trips), and subsistence ORV use on the wilderness trails south of Tanada Lake is anticipated to increase over current conditions by 8 round trips, or 20 percent (from 40 to 48 round trips) over a 20 year period. This moderate increase in motorized use would result in more opportunity for non-motorized users to encounter sight and/or sounds of motorized traffic and reduce their opportunities for solitude in the wilderness.

With improvement of the Tanada Lake and Copper Lake trails, significantly more recreational ORV users would be accessing the wilderness boundary. Some of these users would then be proceeding, on foot, into the designated wilderness for sport hunting or recreational activities. This increase in non-motorized use would result in more opportunity for non-motorized users to encounter other users and reduce their opportunities for solitude in the wilderness.

Taken together, this would have a moderate impact on the solitude or primitive and unconfined quality of designated wilderness.

In summary, for designated wilderness, there would be beneficial impacts resulting from trail improvement and requiring subsistence ORV users to stay on improved, designated trails. This action would help to contain impacts to the natural and undeveloped qualities of wilderness. Combined with the moderate impact to opportunities for solitude and primitive experience, this would result in a moderate impact to wilderness character resulting from actions proposed under this alternative.

Eligible Wilderness (Effects based on the 1986 wilderness eligibility mapping)

Under this alternative, the existing Caribou Creek, Trail Creek, Lost Creek, Soda Lake, Reeve Field, and Boomerang trails are within corridors classified as eligible. Proposed improvements that would occur in areas classified as eligible wilderness are as follows:

- The constructed motorized re-route for the Soda Lake trail (10 acres impacted).
- The constructed motorized re-route for the Reeve Field trail (3.0 acres impacted).
- Improvements on the Trail Creek, Lost Creek, Caribou Creek, and Boomerang trails (4.4, 2.9, 3.1, and 0.1 acres impacted, respectively).

- The constructed non-motorized Mentasta traverse, Rock Creek, Tanada Spur, and 4-mile trails (41.9, 2.8, 4.2, and 1.6 acres impacted, respectively).
- The non-motorized Platinum-Soda, Platinum-Reeve, Wait-Nabesna, and Sugarloaf routes (no layout impacts).

These proposed improvements in eligible wilderness would reduce or eliminate the expansion of impacts related to degraded trail segments. Old degraded portions of trails would be closed to ORV use and allowed to recover.

Trail construction impacts (particularly when designed for long-term motorized use) would result in a moderate impact to the undeveloped character of eligible wilderness. Additionally, the anticipated increase in ORV use associated with improved trails would result in moderate impacts to opportunities for solitude and a primitive experience. Assuming a 0.5-mile corridor around improved motorized trails, this would result in 5,216 acres of eligible wilderness being precluded from future consideration as suitable wilderness.

Eligible Wilderness (Effects based on the proposed revision of the 1986 wilderness eligibility mapping)

This analysis of impacts to eligible wilderness is based on the proposed revision of eligibility described in Chapter 2 and shown on Figure 2-2.

Under this alternative, the existing Suslota, Caribou Creek, Trail Creek, Lost Creek, Soda Lake, Reeve Field, Tanada Lake, Copper Lake, and Boomerang trails are within corridors classified as ineligible. Improvements proposed under this alternative for the Caribou Creek, Trail Creek, Lost Creek, Reeve Field, Copper Lake, Tanada Lake, and Boomerang trails all fall within the ineligible corridors. Proposed improvements that would occur in areas classified as eligible wilderness are as follows:

- The constructed motorized re-route for the Soda Lake trail (10 acres impacted).
- The constructed non-motorized Mentasta traverse, Rock Creek, Tanada Spur, and 4-mile trails (41.9, 2.8, 4.2, and 1.6 acres impacted, respectively).
- The non-motorized Platinum-Soda, Platinum-Reeve, Wait-Nabesna, and Sugarloaf routes (no layout impacts).

After improvements, recreational ORV use would be permitted on the Caribou Creek, Trail Creek, Lost Creek, Soda Lake, Reeve Field, Copper Lake, Tanada Lake, and Boomerang trails, with 0 to 200 percent increases in use projected, depending on the trail. Subsistence ORV use would continue on all trails and would increase slightly on most improved trails.

Untrammelled Quality. Changes to the untrammelled quality of wilderness could occur if the wilderness resource were manipulated as a result of a management action, such as fire suppression, dam construction, trail improvement using man-made materials, or manipulation of wildlife populations. Under this alternative, the Soda Lake re-route would be located within eligible wilderness and designed and constructed to accommodate multiple uses, including ORVs. The design for this re-route includes short segments of geo-block, a man-made material, to harden creek crossings and wet areas. Consequently, in the vicinity of the constructed re-route, there would be a

moderate impact to the untrammeled quality of eligible wilderness, and long-term motorized use on one trail alignment. The existing, degraded portion of the Soda Lake trail would be closed and allowed to recover. Over time, the closed segment might meet the criteria for eligible wilderness.

In other portions of the analysis area, there would be negligible impacts on the untrammeled quality of eligible wilderness.

Natural Quality. Changes to the natural quality of wilderness could occur if wilderness and the surrounding area were affected by plant and animal communities, physical resources, and biophysical processes. Under this alternative, construction activities for motorized and non-motorized trail improvements would disturb 60.5 acres and result in plant community and soil changes within the area affected by construction. These improved or new trails could serve as potential pathways for plant community change through introduction of invasive plant species, but to date none have been documented. Impacts are limited but noticeable to all visitors using the trails and would result in moderate impacts to the natural quality of eligible wilderness in the vicinity of the new or improved trails.

Limited subsistence ORV use would continue to occur off existing trail corridors classed as ineligible and into eligible wilderness. This ORV use could be a potential pathway for plant community change through introduction of invasive plant species, but to date none have been documented. Vegetation and soil damage associated with current and anticipated low levels of off-trail subsistence ORV use is limited. Within eligible wilderness, this would result in a negligible impact on the natural quality of wilderness.

Undeveloped Quality. All impacts associated with degraded portions of ORV trails, such as bare ground, rutting, mud/muck holes, vegetation damage, and trail braiding, would be contained within the trail corridors classified as ineligible. Some subsistence ORV use would occur off existing trails and in eligible wilderness. Impacts associated with off-trail use are highly localized, of minor severity, and are not observable to the average backcountry visitor.

Under this alternative, the Soda Lake trail would be re-routed. The re-route would be located within eligible wilderness and designed and constructed to accommodate recreational and subsistence ORV use. The design for this re-route includes mechanized construction resulting in a 48-inch tread. Construction would include sideslope cut and fill and would result in long term alteration of soils and vegetation within the disturbed area. Consequently, in the vicinity of the constructed re-route, there would be a moderate impact to the undeveloped quality of eligible wilderness, and long-term motorized use on one trail alignment. The existing, degraded portion of the Soda Lake trail would be closed and allowed to recover. Over time, the closed segment could meet the criteria for eligible wilderness.

An estimated 50.5 acres of vegetation and soil impacts would occur in association with the construction of the non-motorized Mentasta traverse, Rock Creek, Tanada spur, and 4-mile trails. These impacts would be detectable and noticeable to all visitors using the trails, so would result in a moderate impact to the undeveloped character of eligible wilderness in the vicinity of the constructed trails.

The identification and layout of non-motorized routes would result in very minimal ground disturbance, but could eventually result in some impacts to soils and vegetation such as trampling, vegetation breakage, and soil compaction and would result in negligible impacts to the undeveloped character of the eligible wilderness.

Solitude or Primitive and Unconfined Quality. Under this alternative, ORV use in the ineligible trail corridors would increase 43 percent over the 20-year period because of trail improvements. This increased use would result in an increase in non-motorized use in eligible wilderness, associated with the motorized trail corridors. Additionally, those visitors using eligible areas adjacent to ineligible trail corridors might experience some motorized noise, particularly during August and early September (hunting season). Taken together, these impacts would have a minor effect on solitude or primitive and unconfined quality of eligible wilderness.

The construction of the Soda Lake re-route would introduce approximately 150 recreational and subsistence ORV users into areas previously inaccessible to motorized use. Most of this use would occur during hunting season and, within the re-route corridor, would have a moderate impact on solitude or primitive and unconfined quality of the eligible wilderness.

The construction of the non-motorized Mentasta Traverse, Rock Creek, Tanada Spur, and 4-mile non-motorized trails and layout of four non-motorized routes has the potential to increase non-motorized use in the vicinity of these trails/routes. Increased use of these areas could result in an increase in number of people or parties encountered and could result in a moderate impact to the solitude or primitive and unconfined quality of the eligible wilderness.

In summary, the constructed Soda Lake re-route that would accommodate motorized uses would result in moderate impact to wilderness character that could preclude that trail corridor (916 acres) from future wilderness consideration. These effects would be mitigated by the closure to ORV use and recovery of the existing degraded trail corridor (946 acres). Constructed non-motorized trails would have moderate impacts on the undeveloped character of eligible wilderness and opportunities for solitude and a primitive experience, but these improvements would not preclude the trail corridors from future consideration for wilderness designation.

Cumulative

The impacts of other nearby past, present, and foreseeable future actions on wilderness quality are described under Alternative 1. The net effect of these impacts in combination with the moderate direct and indirect impacts likely under Alternative 5 would be long-term, moderate, adverse impacts to wilderness quality, primarily related to the presence of motorized trails and increased ORV use in and near the wilderness.

Conclusion

Under Alternative 5, negligible adverse impacts to the untrammeled and natural qualities of wilderness would occur related to the proposed trail activities in the designated wilderness. There would be minor adverse effects on the undeveloped quality of wilderness resource values because of the impacts associated with trail improvement and a beneficial impact associated with requiring ORV users to stay on designated trails. Total ORV use on trails leading to the wilderness would nearly triple. The resulting increase in the level of non-motorized use in the wilderness area would result in more opportunity for wilderness users to encounter sights and/or sounds of other users, and a decrease in their opportunities for solitude. The result would be a moderate, adverse change from current conditions for this wilderness quality. Overall, including the moderate effect on wilderness character in areas eligible for wilderness designation, Alternative 5 would be expected to result in moderate impacts to wilderness character and would result in continued conditions that represent a moderate change from natural conditions.

For designated wilderness, a moderate determination is made because subsistence ORV use on designated trails will continue to result in localized long-term effects that alter the wilderness character so that it is readily noticeable to visitors and/or reduces the integrity of wilderness. Because this alternative contains physical impacts within existing trail alignments, the moderate level of impacts to wilderness anticipated from this alternative would not result in impairment of park resources.

4.4.5 Visitor Opportunities/Access

4.4.5.1 Methodology

Analysis of expected impacts to visitor opportunities and access within the analysis area was based primarily on careful consideration of the specific management actions associated with the proposed alternatives. In general, the type and physical extent of the actions such as trail closures, reconstruction or new construction, and improved maintenance will translate into changes from the current conditions that in turn affect visitor opportunities and access. Consequently, a fundamental step in the assessment of visitor opportunities and access was to identify portions of the trail system where physical conditions would be expected to improve or deteriorate based on management actions and how those changes would likely affect visitor experience. Trail closures or restrictions incorporated into the respective alternatives also were evaluated to characterize changes to the set of opportunities and access conditions available for ORV users. In addition, projected changes in future ORV use levels were evaluated to assess, at a qualitative level, the degree to which increased or decreased ORV use would translate into changes to opportunities, access, and experiences for other types of recreational visitors. Finally, the alternatives were reviewed to characterize the new opportunities and experiences they would provide for other recreational visitors, primarily non-motorized trail users.

4.4.5.2 Impact Threshold Criteria

To determine the intensity of effects on visitor opportunities the impacts were compared against the following threshold criteria. Note that the term “visitors” includes all those enjoying or utilizing park resources, including local residents.

Negligible: Trails would not cause resource or visual impacts that would detract from a natural setting. Trail use would not interfere with a visitor’s ability to experience remoteness with few social encounters.

Minor: Trail impacts would be contained within an existing alignment and would only detract slightly from a natural setting. Generally, trail use would not interfere with a visitor’s ability to experience remoteness with few social encounters; however, there would be seasonal variations (such as hunting season or some weekends) when a feeling of remoteness would be harder to experience and more social encounters could be expected. Overall visitor satisfaction would not be measurably affected.

Moderate: Impacts associated with degraded trails would detract from a natural setting. At most times during the summer/fall season, visitors would need to get away from trail corridors to experience remoteness with few social encounters. Visitor satisfaction might be measurably affected. Some visitors would choose to pursue activities in other available local or regional areas.

Major: Impacts associated with degraded trails would detract from a natural setting and would result in motorized trails only being utilized by ORVs (not hikers, horses, or others). At all times during the

summer/fall season, visitors would need to get away from trail corridors to experience remoteness with few social encounters; increased use would result in more off-trail social encounters and less chance to experience remoteness, even in an off-trail setting. Changes in visitor use and experience would be readily apparent. The majority of visitors would choose to pursue activities in other available local or regional areas.

4.4.5.3 Assumptions

The response of ORV users to physical and administrative changes in the trail system is captured in the projections of future ORV use presented in Table 4-1. For this user group, changes in the set of opportunities and access conditions are represented by expected future user numbers.

Non-motorized trail users will respond to physical changes in trail conditions in a logical manner, by avoiding trails that have extensive areas with degraded conditions and taking advantage of improved trail conditions where those would occur.

The visitor experience for an unknown but presumably large proportion of non-motorized trail users is diminished by encounters with ORV users on the trails. Under current access and use patterns (i.e., relatively low overall ORV use, particularly outside of the hunting season, with that use distributed across many trails), non-motorized users are assumed to have ample opportunities for their preferred experience, even on motorized trails. In the future, however, many of these users may choose to avoid trails on which ORV use would expand substantially, and would likely opt for separate-use (non-motorized) trails to the extent they are available.

4.4.5.4 Alternative 1 Effects on Visitor Opportunities/Access

Direct and Indirect

Under Alternative 1 (No Action), there would be no expected change in present management of the trail system in the analysis area. ORV use for subsistence purposes and for access to inholdings would continue without restrictions. Recreational ORV use would continue to be allowed year-round on six trails. Portions of three trails (Suslota, Tanada, and Copper Lake past the Boomerang trail turn-off) totaling 38.3 miles of trail would continue to be seasonally closed to recreational ORV use during the summer months, in an effort to minimize resource impacts. Trail maintenance would continue at current levels and no actions to re-route, re-construct, or harden existing trails would be undertaken.

Alternative 1 would result in continued deterioration in trail conditions within the analysis area, at a minor to moderate level of change to the existing conditions (see Section 4.22, Trail Condition for corresponding discussion). These trail conditions would continue to effectively limit non-motorized use to only six ORV trails in the analysis area (Caribou Creek, Copper Lake, Lost Creek, Reeve Field, Soda Lake, and Trail Creek trails). Of these six trails, hiking is recommended only on the first 2.5 miles of the Copper Lake trail and on the first mile of Reeve Field trail. For the remaining four trails hiking is possible. Hiking is currently not recommended on the Suslota, Tanada Lake and Boomerang trails and these conditions would remain under this alternative. Some non-motorized backcountry users probably avoid using the ORV trail system because of deteriorated trail conditions, shifting their activity to off-trail areas or trail opportunities elsewhere in the region. This type of visitor response might increase in the future with continued deterioration of trail conditions. It is likely that the visitor experience for current trail users, both motorized and non-motorized, is diminished by the current condition of the trail system.

Opportunities for non-motorized users to access the backcountry on maintainable motorized or non-motorized trails in the analysis area are currently quite limited, as there are two trails managed for non-motorized use (Lost-Trail route, accessed via either Lost Creek or Trail Creek ORV trails, and Skookum Volcano, accessed from the Nabesna Road) (Figure 1-1). Most of the trail mileage that can be used to access the backcountry is on shared-use trails that have varying degrees of degraded trail conditions. This situation would continue throughout the planning period under Alternative 1. Numerous off-trail, backcountry opportunities for more experienced non-motorized users also exist throughout the analysis area, and these would continue under Alternative 1.

Opportunities for motorized use in the analysis area under Alternative 1 would be the same as at present. ORV use within the area would remain restricted to a degree by the seasonal closure of three trails to recreational ORV use, an adverse impact to that user group. Other trails in the analysis area would continue to provide motorized recreational opportunities.

Total ORV use by the end of the 20-year planning period under Alternative 1 is expected to reach 1,172 round trips, an increase of approximately 28 percent over the baseline use level (Table 4-1). Motorized users would benefit from continuation of the current level of access to the trail system, although the quality of the opportunity would continue to be diminished because of degraded conditions on the trail system. At this rate of change, increased ORV use is likely to have only minor, adverse effects on the visitor experience or opportunities for other types of users. Opportunities for remoteness and freedom from social encounters would decrease somewhat for both motorized and non-motorized users of the trail system, but those opportunities are considered to be high currently (encounter rates are low) and would remain so in the future. ORV use on six of the trails would likely continue to deter some potential non-motorized users and displace them to other locations. Opportunities for frontcountry users who remain in the Nabesna Road corridor and off-trail backcountry users would not likely be affected under this alternative.

In summary, Alternative 1 would have negligible effects on opportunities available to motorized users, frontcountry users, and off-trail backcountry users, and would not interfere with the ability of these user groups to experience remoteness. Alternative 1 would have a minor, long-term, adverse impact for non-motorized trail users, as a result of continued limitations on trail-based opportunities and an expected increase in encounter rates. Considering the range of effects for all visitor opportunities and user groups, the overall level of direct and indirect effects on visitor opportunities for Alternative 1 would be negligible to minor.

Cumulative

The projected changes in ORV use levels discussed above are reflective of relatively long-term local and regional trends in population, land development, and game management as they relate to future ORV use. Demand for non-motorized trail use in the analysis area would be expected to increase in the future as a result of population growth, although limited opportunities for non-motorized backcountry trail access might restrain this type of activity. Assumptions for cumulative impact analysis (see Section 4.1.2) indicate that minimal changes are expected in conditions related to inholdings and development on non-NPS lands in the analysis area. Overall park visitation is expected to continue to increase slowly, and the development of additional infrastructure along the Nabesna Road (such as plans for additional campsites) will create long-term beneficial impacts in the form of new opportunities for visitors within the road corridor. These changes are likely to result in increased recreational use within the Nabesna Road corridor over time, and might include some increased level of non-ORV use on the trail system. Any such increases in non-motorized use are not expected to result in additional changes in conditions or experience levels for motorized or non-motorized trail users. On balance, the cumulative effects of these past, present and (primarily)

expected future changes represent a beneficial impact through increased visitor opportunities within the analysis area.

As discussed in Section 3.3.2.1, there are approximately 94 miles of additional motorized trails in the analysis area. These trails vary in condition, but most are fair with some degraded segments (Connery 1987). They receive little to no use (less than 20 passes per year) and all the use is by local federally qualified subsistence ORV users. To the average park visitor, these trails are not evident. Only two undeveloped trailheads can be seen from the Nabesna Road. None of the trails are marked or signed. Given the low level of use and seasonal nature of the use (mostly during the hunting season), these trails have a negligible impact on visitor opportunities in the area.

The negligible to minor direct and indirect impacts discussed above for Alternative 1 would, to a degree, offset the minor positive effects of other past, present and expected future actions on visitor opportunities and access. Because the changes associated with Alternative 1 would primarily apply to non-motorized trail users, on balance the cumulative changes to visitor opportunities for all user groups within the analysis area would likely represent a beneficial impact, or at most, a negligible to minor, adverse impact.

Conclusion

Opportunities for non-motorized users to access the backcountry on maintainable trails in the analysis area would continue to be quite limited throughout the planning period under Alternative 1, but would not be diminished. For non-motorized trail users within the analysis area, Alternative 1 would likely have a minor, adverse increase in the level of impact relative to the existing conditions. This change would occur primarily as a result of continued deterioration of the trail system, and an expected moderate increase in ORV use might contribute slightly to the future impacts. Opportunities for motorized use in general would remain unchanged from current conditions, although three trails would continue to be seasonally closed to recreational ORV use, and the analysis area would continue to provide motorized recreational opportunities. Overall, Alternative 1 would likely result in minor, adverse impacts to visitor opportunities, access, and experiences for backcountry users in the analysis area. Among the respective users groups, impacts under Alternative 1 would range from negligible (no change) to minor adverse impacts. The overall or composite level of direct, indirect, and cumulative effects across the range of visitor opportunities and user groups for Alternative 1 would be negligible to minor.

4.4.5.5 Alternative 2 Effects on Visitor Opportunities/Access

Direct and Indirect

Under Alternative 2, recreational ORV use would not be limited to winter months when the ground is frozen, but would be allowed year-round on the nine trails throughout the analysis area. Trails in the designated wilderness would remain closed to recreational ORV use. In addition, trails would remain open for ORV use for subsistence and to access private inholdings. Trail maintenance would continue at current levels, and no trail improvements would occur under this alternative.

Alternative 2 would result in the continued deterioration of trail conditions within the analysis area, generally at a minor to moderate level of change from the existing conditions, in response to expected increases in ORV use. These trail conditions would continue to effectively limit non-motorized use to only six trails in the area (Caribou Creek, Copper Lake, Lost Creek, Reeve Field, Soda Lake, and Trail Creek trails). Some non-motorized backcountry users would probably continue to avoid using the trail system because of deteriorated trail conditions, a response that might increase somewhat in

the future with continued deterioration of trail conditions. The visitor experience for some current trail users, both motorized and non-motorized, would likely continue to be diminished by the current condition of the trail system.

Opportunities for non-motorized users to access the backcountry on maintainable trails in the analysis area are currently quite limited, as there are two trails managed for non-motorized use (Lost-Trail route, accessed via either Lost Creek or Trail Creek ORV trails, and Skookum Volcano, accessed from the Nabesna Road). Most of the trail mileage that can be used to access the backcountry is on shared-use trails that have varying degrees of degraded trail conditions. This situation would continue throughout the planning period under Alternative 2. Numerous off-trail, backcountry opportunities for more experienced non-motorized users also exist throughout the analysis area, and these would continue under Alternative 2.

Opportunities for motorized use in the analysis area under Alternative 2 would increase compared to current conditions, as ORV use within the area would no longer be restricted by the seasonal closure of three trails to recreational ORV use. Motorized users would benefit from continuation of the current level of access to the trail system, although the quality of the opportunity would continue to be diminished because of degraded conditions on the trail system. The analysis area would continue to provide motorized recreational opportunities.

Total ORV use by the end of the 20-year planning period under Alternative 2 is expected to increase by approximately 28 percent over the baseline use level (Table 4-1). At this rate of change, increased ORV use is likely to have only minor effects on the visitor experience or opportunities for other types of users. Opportunities for remoteness and freedom from social encounters would decrease somewhat for both motorized and non-motorized users of the trail system, but those opportunities are considered to be high currently and would remain so in the future. ORV use on nine trails would likely continue to deter some potential non-motorized users and displace them to other locations. Opportunities for frontcountry users who remain in the Nabesna Road corridor and off-trail backcountry users would not likely be directly affected under this alternative.

In summary, Alternative 2 would have a minor, beneficial effect on opportunities available to motorized users, no or neutral effects on frontcountry users and off-trail backcountry users, and would not interfere with the ability of these users to experience remoteness. Alternative 2 would have a minor, long-term, adverse impact on non-motorized trail users, as a result of continued limitations on trail-based opportunities and an expected increase in encounter rates. Considering the range of effects for all visitor opportunities and user groups, the overall level of adverse, direct and indirect effects on visitor opportunities for Alternative 2 would be negligible to minor.

Cumulative

Assessment of potential cumulative impacts to visitor opportunities and access under Alternative 2 involves the same types of factors and similar changes from current conditions as discussed for Alternative 1. Demand for non-motorized trail use in the analysis area would be expected to increase somewhat in the future as a result of population growth, although limited opportunities for non-motorized backcountry trail access might restrain this type of activity. Expected changes in facilities along the Nabesna Road would create long-term beneficial impacts in the form of new or expanded opportunities for visitors within the road corridor, and might induce some increased level of non-ORV use on the trail system. Any such increases in non-motorized use are not expected to result in additional changes in conditions or experience levels for motorized or non-motorized trail users. As discussed for Alternative 1, the 94 miles of additional motorized trails in the analysis area have low levels of use that is seasonal in nature, and have a negligible impact on visitor opportunities in the

area. On balance, the cumulative effects of these past, present and expected future changes represent a beneficial impact through increased visitor opportunities within the analysis area.

The negligible to minor adverse direct and indirect impacts under Alternative 2 would, to a degree, offset the minor positive effects of other past, present and expected future actions on visitor opportunities and access. Because the changes associated with Alternative 2 would primarily apply to non-motorized trail users, on balance the cumulative changes to visitor opportunities for all user groups within the analysis area would likely represent a beneficial impact, or at most a negligible to minor, adverse impact.

Conclusion

Alternative 2 would result in continued limitation of opportunities and experience levels for non-motorized users to access the backcountry on maintainable trails within the analysis area, a minor, adverse impact as a result of continued deterioration of the trail system. An expected increase in ORV use might contribute slightly to the future adverse impacts. Opportunities for motorized use in general would increase because all nine trails would be open to recreational ORV use. The analysis area would continue to provide motorized recreation opportunities. Opportunities for frontcountry users who remain in the Nabesna Road corridor and off-trail backcountry users would not likely be directly affected under this alternative. Overall, this alternative would likely result in minor, adverse impacts to visitor opportunities and experiences for backcountry users in the analysis area. Among the respective user groups, impacts under Alternative 2 would range from negligible (no change) to minor adverse impacts. The overall or composite level of direct, indirect, and cumulative effects across the range of visitor opportunities and user groups for Alternative 2 would be negligible to minor.

4.4.5.6 Alternative 3 Effects on Visitor Opportunities/Access

Direct and Indirect

Under Alternative 3, the NPS would attempt to address resource impacts primarily through trails administration, with relatively little investment in trail improvements. Trail maintenance would continue at current levels. Approximately 2.5 miles of re-routed motorized trail would be constructed and four new non-motorized trails and routes would be built. Under this alternative, recreational ORV use would not be allowed on any of the trails in the analysis area, and all nine trails and the wilderness trail systems would be open to subsistence ORV use year-round. The trails that currently receive ORV use to access private inholdings (Suslota, Soda Lake, Reeve Field, Copper Lake and Tanada Lake) would continue to be open for this use.

The physical condition level for the trail system and for individual trails would change incrementally under Alternative 3, with the potential change ranging from minor, adverse impacts to slight beneficial impacts. Because much of the trail system would remain in a degraded condition regardless, these trail conditions would continue to effectively limit non-motorized use to only six trails in the area (Caribou Creek, Copper Lake, Lost Creek, Reeve Field, Soda Lake, and Trail Creek trails). Some non-motorized backcountry users would probably continue to avoid using the trail system because of deteriorated trail conditions. The visitor experience for some current trail users, both motorized and non-motorized, would likely continue to be diminished by the current condition of the trail system.

Opportunities for non-motorized users to access the backcountry on maintainable trails in the analysis area are currently quite limited. This situation would change under Alternative 3 with the

construction of four new non-motorized trails and routes (Platinum-Reeve, Platinum-Soda, Rock Creek, and Sugarloaf) in the analysis area, which would substantially increase visitor opportunities for non-motorized backcountry users. Numerous off-trail, backcountry opportunities for more experienced non-motorized users also exist throughout the analysis area, and these would continue under Alternative 3.

With the elimination of recreational ORV use under Alternative 3, opportunities for motorized use in the analysis area would decrease substantially compared to current conditions. Current recreational ORV users would be displaced to areas outside of the park, possibly resulting in indirect, off-site effects such as crowding on other available trails in the region.

Total ORV use by the end of the 20-year planning period under Alternative 3 is expected to decrease by approximately 39 percent over the baseline use level (Table 4-1). At this rate of change, decreased ORV might have slight effects on the visitor experience or opportunities for other types of users. Opportunities for remoteness and freedom from social encounters would increase somewhat for both motorized and non-motorized users of the trail system, but those opportunities are considered to be high currently and would remain so in the future. While recreational ORV use on the trails would cease, ORV use for subsistence and access to inholdings likely would continue to deter some potential non-motorized users and displace them to other locations. Opportunities for frontcountry users who remain in the Nabesna Road corridor would not likely be directly affected under this alternative.

In summary, Alternative 3 would have a moderate to major, long-term, adverse effect on opportunities available to recreational motorized users, and no or neutral effects on frontcountry users and off-trail backcountry users. Alternative 3 would have a long-term, beneficial impact on non-motorized trail users, primarily as a result of expanding the set of trail-based opportunities available. Considering the range of positive, neutral, and adverse effects for all visitor opportunities and user groups, the overall balance of direct and indirect effects on visitor opportunities for Alternative 3 would likely be a minor to moderate adverse impact level based largely on the reduced opportunities for ORV users.

Cumulative

Assessment of potential cumulative impacts to visitor opportunities and access under Alternative 3 involves the same types of factors from current conditions as discussed for Alternatives 1 and 2. Demand for non-motorized trail use in the analysis area would be expected to increase somewhat in the future as a result of population growth. Expected changes in facilities along the Nabesna Road would create long-term beneficial impacts in the form of new or expanded opportunities for visitors within the road corridor, and might also induce some increased level of non-motorized backcountry use, particularly in conjunction with the expansion of those opportunities through construction of four new non-motorized routes and trails. Any such increases in non-motorized use are not expected to result in additional changes in conditions or experience levels for motorized or non-motorized trail users. As discussed previously, the 94 miles of additional motorized trails in the analysis area have low levels of use that is seasonal in nature, and have a negligible impact on visitor opportunities in the area. On balance, the cumulative effects of these past, present and expected future changes represent a beneficial impact through increased visitor opportunities within the analysis area.

The overall level of cumulative impacts under Alternative 3 would reflect the varying beneficial and adverse direct and indirect impacts of Alternative 3 in conjunction with the beneficial effects of other past, present and expected future actions on visitor opportunities and access. The balance of cumulative impacts to visitor opportunities within the analysis area would be generally beneficial for

frontcountry users and non-motorized users, and moderate and adverse for motorized recreational users. Based on the respective sizes of the user groups, the composite cumulative impact level under Alternative 3 would likely be minor and adverse.

Conclusion

Impacts to visitor opportunities and access under Alternative 3 would involve an overall expansion of visitor opportunities and access for non-motorized backcountry users and a substantial decrease in opportunities for motorized users, particularly with removal of opportunities for recreational ORV use. While trail conditions might improve slightly under Alternative 3, there would be continued limitation of opportunities and experience levels for non-motorized trail use on existing trails within the analysis area from continued deterioration of the trail system, a minor adverse impact. Because of trail closures to recreational ORV use, Alternative 3 is expected to have moderate to major, adverse impacts to visitor opportunities, access, and experiences for recreational ORV users in the analysis area. Conversely, opportunities for non-motorized users to access the backcountry on maintainable trails in the analysis area would be increased substantially through the development of four new non-motorized trails or routes, with a corresponding beneficial impact for this user group. Overall, the net impact for non-motorized trail users is considered to be a beneficial impact.

Among the respective user groups, direct and indirect changes under Alternative 3 would range from beneficial impacts to moderate or major adverse impacts. Factoring in the neutral to beneficial cumulative impacts, the composite level of direct, indirect, and cumulative effects across the range of visitor opportunities and user groups for Alternative 3 is considered to represent a minor adverse impact level.

4.4.5.7 Alternative 4 Effects on Visitor Opportunities/Access

Direct and Indirect

Under Alternative 4, the NPS would make substantial improvements to eight of the nine trails (all but the Suslota Trail) to bring them to a design-sustainable or maintainable condition to provide reasonable access while protecting park resources. Prior to implementing the trail improvements, the NPS would allow recreational ORV use only on trails currently in fair or good condition. Once improvements are completed, trail maintenance would increase to a level that would correct natural resource damage and keep trail conditions at the planned design standard. Following completion of the improvements recreational ORV use would be allowed on trails in the National Preserve, but not in the National Park or on the Suslota trail or on trails in the designated wilderness, a long-term closure of 61.2 miles (65 percent) of the trails to recreational ORV use. Trails would continue to be open to ORV use for subsistence purposes and for access to private inholdings. Because of the costs associated with trail improvements, this alternative includes a trail use fee for all recreational ORV users (but not subsistence users or property owners). In addition to the actions to improve the motorized trails, this alternative includes the creation of seven new non-motorized trails or routes.

The overall condition class of the trail system and for the other individual trails would improve substantially under Alternative 4 relative to current conditions. Because the trail system would no longer be in a substantially degraded condition, the physical condition of the trails would not be expected to effectively limit non-motorized use to only six trails in the area. The visitor experience for current trail users, both motorized and non-motorized, would likely be enhanced by the improved condition of the trail system. Opportunities for non-motorized users to access the backcountry under Alternative 4 would further improve with the construction of seven new non-motorized trails and routes (4-Mile, Platinum-Reeve, Platinum-Soda, Rock Creek, Sugarloaf, Tanada Spur, and Wait-

Nabesna) in the analysis area, which would substantially increase visitor opportunities for non-motorized backcountry users. Numerous off-trail, backcountry opportunities for more experienced non-motorized users also exist throughout the analysis area, and these would continue under Alternative 4. Opportunities for frontcountry users who remain in the Nabesna Road corridor would not likely be directly affected under this alternative.

With the elimination of recreational ORV use in the park (Boomerang, Copper Lake, and Tanada Lake trails) and on the Suslota trail under Alternative 4, the number of opportunities for motorized use in the analysis area would be redistributed compared to current conditions. Current recreational ORV users of the above trails would be displaced to other trails in the analysis area (Figure 2-7) or to areas outside of the park, potentially resulting in crowding on those other available trails. While the physical set of opportunities for recreational ORV use would be reduced relative to current conditions, the quality of the remaining opportunities would increase as a result of improved conditions on the trail system. Total ORV use by the end of the 20-year planning period under Alternative 4 is expected to increase by approximately 93 percent over current conditions (Table 4-1). Within the analysis area, recreational ORV use is projected to double on the Caribou Creek, Reeve Field, and Soda Lake trails, and to increase by approximately 35 percent on both Lost Creek and Trail Creek trails. Based on the projected future use level as a key indicator, the overall change for motorized users under Alternative 4 is considered to be a beneficial impact.

With total ORV use by the end of the 20-year planning period under Alternative 4 expected to increase by approximately 93 percent over the baseline use level, opportunities for remoteness and freedom from social encounters would decrease for both motorized and non-motorized users of the trail system and for off-trail users in areas near the trail system. Those opportunities are considered to be high currently, however, and would remain so in the future. During hunting season, ORV use on the existing trails would likely continue to deter some potential non-motorized users and displace them to other locations. Non-motorized users on the Black Mountain trails or wilderness trails south of Tanada Lake may be adversely affected by the projected 233-percent increase in subsistence ORV users in the wilderness (from a combined level of 95 round trips to a combined level of 316 round trips under Alternative 4; Table 4-1). During hunting season, non-motorized users accessing Tanada Lake (via the non-motorized Sugarloaf or Wait-Nabesna routes or via the motorized Tanada Re-route) would be affected by the tripling in subsistence ORV use (from 65 to 265 round trips) on the Tanada Re-route.

Non-motorized users would therefore experience some degree of negative impacts under Alternative 4 as a result of decreased opportunities for solitude and freedom from social encounters. Conversely, non-motorized users would benefit from an enhanced visitor experience and increased opportunities as a result of improvements to the existing trail system. With the addition of seven new non-motorized trails and routes, these users would also have alternative locations for their activity within the analysis area and a substantial overall increase in the set of available opportunities. On balance, Alternative 4 would result in beneficial impacts on visitor opportunities for non-motorized backcountry users.

In summary, despite closures to recreational ORV use in the park and on Suslota trail, Alternative 4 would have beneficial effects on motorized trail users because of the overall increase in projected ORV use (93 percent over current conditions) and in recreational ORV use (54 percent over current conditions) in the analysis area. Impacts to non-motorized trail users would be beneficial because of the new non-motorized trails and routes, to frontcountry users would be negligible, and to off-trail backcountry users would be minor, long-term, and adverse because of increased visitor use in the analysis area. Considering the range of effects for all visitor opportunities and user groups, the overall balance of direct and indirect effects on visitor opportunities for Alternative 4 would be

beneficial, based on the increased or improved opportunities for motorized users and non-motorized trail users.

Cumulative

Demand for non-motorized trail use in the analysis area would be expected to increase somewhat in the future as a result of population growth. Expected changes in facilities along the Nabesna Road would create long-term beneficial impacts in the form of new or expanded opportunities for visitors within the road corridor and might also induce some increased level of non-motorized backcountry use, particularly in conjunction with the expansion of those opportunities through construction of six new non-motorized trails. Any such increases in non-motorized use are not expected to result in additional changes in conditions or experience levels for motorized or non-motorized trail users. As discussed previously, the 94 miles of additional motorized trails in the analysis area have low levels of use that is seasonal in nature, and have a negligible impact on visitor opportunities in the area. On balance, the cumulative effects of these past, present and expected future changes represent a beneficial impact through increased visitor opportunities within the analysis area.

The overall level of cumulative impacts under Alternative 4 would reflect the varying, and largely beneficial, direct and indirect impacts under Alternative 4 in conjunction with the beneficial effects of other past, present and expected future actions on visitor opportunities and access. Based on the respective sizes of the user groups, the balance of cumulative impacts to visitor opportunities within the analysis area would be beneficial.

Conclusion

Impacts to visitor opportunities and access under Alternative 4 would involve an overall expansion of visitor opportunities and access for both motorized and non-motorized backcountry users. Because trail conditions would improve considerably under Alternative 4, limitation of opportunities and experience levels from deterioration of the trail system would no longer occur. Opportunities for non-motorized users to access the backcountry on maintainable trails in the analysis area would be increased substantially through the development of seven new non-motorized trails or routes, with a corresponding beneficial impact for this user group. Based on projected increases in total and recreational ORV use levels, Alternative 4 is also expected to have long-term, beneficial impacts overall to visitor opportunities and experiences for recreational ORV users in the analysis area. Alternative 4 is expected to have minor adverse impacts to visitor opportunities and experiences for off-trail backcountry users in the analysis area because of increased ORV use and reduced opportunities for remoteness. Among the respective user groups, direct and indirect changes under Alternative 4 would range from minor adverse impacts to beneficial impacts. Factoring in the neutral to beneficial cumulative impacts, the composite level of direct, indirect, and cumulative effects across the range of visitor opportunities and user groups for Alternative 4 is considered to represent a beneficial impact level.

4.4.5.8 Alternative 5 Effects on Visitor Opportunities/Access

Direct and Indirect

Under Alternative 5, the NPS would improve most degraded segments of the nine trails to a design-sustainable or maintainable condition to provide reasonable access while protecting park resources. On unimproved trails or trail segments, impact standards would be applied to ensure that resource impacts do not expand, that unimproved trail segments improve in condition over time, and that unmanaged proliferation of trails is minimized. Once the trail improvements are in place, trail

maintenance would increase to a level that would correct resource damages and keep trail conditions at the planned design standard. Because of the costs associated with trail improvements, this alternative would include a trail use fee for all recreational ORV users. Following completion of the improvements, this alternative would allow recreational ORV use on both National Park and Preserve trails, except for Suslota trail, a long-term closure of 7.3 miles (8 percent) of the trails to recreational ORV use. Trails would continue to be open to ORV use for subsistence purposes and for access to private inholdings. In addition to the actions to improve the motorized trails, this alternative includes construction of eight new non-motorized trails or routes.

Under Alternative 5, the overall condition class of the trail system and for the individual trails would improve substantially relative to current conditions. Because the trail system would no longer be in a substantially degraded condition, the physical condition of the trails would not be expected to effectively limit non-motorized use in the area. The visitor experience for current trail users, both motorized and non-motorized, would likely be enhanced by the improved condition of the trail system. Numerous off-trail, backcountry opportunities for more experienced non-motorized users also exist throughout the analysis area. Opportunities for frontcountry users who remain in the Nabesna Road corridor would not likely be directly affected under this alternative.

Recreational ORV users would have access to all of the existing motorized trails within the analysis area except for the Suslota Lake trail. Based on the number of trails and trail mileage open to ORV use, Alternative 5 would result in a minor increase in the number of opportunities available for motorized use relative to current conditions. Total ORV use by the end of the 20-year planning period under Alternative 5 is expected to increase by approximately 83 percent over the baseline use level (Table 4-1). Based on the projected future use level, the overall change for motorized users under Alternative 5 is considered to be a beneficial impact.

Non-motorized users would benefit from the improved physical conditions on the existing trail system under Alternative 5, which would enhance their visitor experience. Opportunities for non-motorized users to access the backcountry under Alternative 5 would further improve with the construction of eight new non-motorized trails and routes in the analysis area, including the nearly 30-miles of constructed non-motorized trail associated with the Mentasta Traverse (Figure 2-10). These trails and routes would substantially increase the set of visitor opportunities for non-motorized backcountry users.

With a projected 83-percent increase in total ORV use by the end of the planning period, opportunities for remoteness and freedom from social encounters could decrease somewhat for both motorized and non-motorized users of the existing trail system and for off-trail users in areas near the trail system. Those opportunities are considered to be high currently, however, and would remain so in the future. ORV use on the existing trails would likely continue to deter some potential non-motorized users and displace them to other locations at times, such as during hunting season. Non-motorized users on the Black Mountain trails or wilderness trails south of Tanada Lake may be adversely affected by the increase in subsistence ORV users in the wilderness (Table 4-1). Non-motorized users accessing Tanada Lake (via the non-motorized Sugarloaf or Wait-Nabesna routes or via the motorized Tanada Re-route) would be affected by the 380-percent increase in total ORV use (from 65 to 312 recreational and subsistence round trips) on the Tanada Re-route.

Non-motorized users would therefore experience some degree of adverse impacts under Alternative 5 as a result of decreased opportunities for solitude and freedom from social encounters. These changes would likely be more than offset, however, by the benefits resulting from the improvements to the existing trail system and the addition of eight new non-motorized trails and routes, which would provide these users with numerous alternative locations for their activity within the analysis area. On

balance, Alternative 5 would result in a substantial increase in visitor opportunities for non-motorized backcountry users that would be considered a beneficial impact.

In summary, Alternative 5 would have overall long-term beneficial effects on motorized and non-motorized trail users, no or neutral effects on frontcountry users, and minor overall long-term adverse impacts for off-trail backcountry users. Considering the range of effects for all visitor opportunities and user groups, the overall balance of direct and indirect effects on visitor opportunities for Alternative 5 would be beneficial, based on the increased or improved opportunities for motorized and non-motorized trail users.

Cumulative

Demand for non-motorized trail use in the analysis area would be expected to increase somewhat in the future as a result of population growth. Expected changes in facilities along the Nabesna Road would create long-term beneficial impacts in the form of new or expanded opportunities for visitors within the road corridor and might also induce some increased level of non-motorized backcountry use, particularly in conjunction with the expansion of those opportunities through construction of eight new non-motorized trails. Any such increases in non-motorized use are not expected to result in additional changes in conditions or experience levels for motorized or non-motorized trail users. As discussed previously, the 94 miles of additional motorized trails in the analysis area have low levels of use that is seasonal in nature, and have a negligible impact on visitor opportunities in the area. On balance, the cumulative effects of these past, present and expected future changes represent a beneficial impact through increased visitor opportunities within the analysis area.

The overall level of cumulative impacts under Alternative 5 would reflect the varying, and largely beneficial, direct and indirect impacts under Alternative 5 in conjunction with the beneficial effects of other past, present and expected future actions on visitor opportunities and access. The balance of cumulative impacts to visitor opportunities within the analysis area would be beneficial.

Conclusion

Impacts to visitor opportunities and access under Alternative 5 would involve an overall expansion of visitor opportunities and access for both motorized and non-motorized trail users. Because trail conditions would improve considerably under Alternative 5, limitation of opportunities and experience levels from deterioration of the trail system would no longer occur. Opportunities for non-motorized users to access the backcountry on maintainable trails in the analysis area would be increased substantially, with a corresponding beneficial impact for this user group. Alternative 5 is also expected to have long-term beneficial impacts to visitor opportunities and experiences for recreational ORV users in the analysis area. Alternative 5 is expected to have minor, adverse impacts to visitor opportunities and experiences for off-trail backcountry users in the analysis area, because of increased ORV use and reduced opportunities for remoteness. Among the respective user groups, direct and indirect changes under Alternative 5 would range from minor adverse impacts to beneficial impacts. Factoring in the beneficial cumulative impacts, the composite level of direct, indirect, and cumulative effects across the range of visitor opportunities and user groups for Alternative 5 is considered to represent a beneficial impact level.

4.4.6 Socioeconomics

4.4.6.1 Methodology

This analysis assesses potential socioeconomic effects primarily in terms of impacts to ORV access to private inholdings and impacts to local businesses. Potential effects are assessed qualitatively based on proposed trail improvements, changes in trail maintenance, and projected changes in ORV use levels. .

4.4.6.2 Impact Threshold Criteria

To determine the significance of effects on the socioeconomic environment impacts are compared against the following threshold criteria:

Negligible: The effects on inholders, local businesses, or other socioeconomic conditions would be below or at the level of detection.

Minor: The effects on inholders, local businesses, or other socioeconomic conditions would be small but detectable. The impact would be slight and would not be detectable outside the Slana/Nabesna area.

Moderate: The effects on inholders, local businesses, or other socioeconomic conditions would be readily apparent. Changes in economic or social conditions would not be detectable outside the Copper Valley area and the community of Tok.

Major: The effects on inholders, local businesses, or other socioeconomic conditions would be readily apparent. Changes in social or economic conditions would be substantial and extend beyond the Copper Valley.

4.4.6.3 Assumptions

The assumptions used to project future subsistence and recreational ORV use by trail and alternative are discussed in Section 4.1.1, Overview of Methodology and Threshold Criteria and noted below, as appropriate.

The park will continue to accommodate reasonable access to inholdings within the analysis area.

Other assumptions used in this analysis are identified in the following subsections, when applicable.

4.4.6.4 General Impacts to Socioeconomics

The proposed alternatives have the potential to affect local and non-local residents by affecting subsistence use and recreational access and opportunities. These issues are addressed in detail in Section 4.4.3, Subsistence, and Section 4.4.5, Visitor Opportunities/Access. The analysis presented in the Subsistence section assesses the potential impacts of each alternative with respect to subsistence fish and wildlife populations, access, and competition. While there are differences among the alternatives, direct and indirect effects to subsistence are expected to range from negligible to minor at most, depending on the resource and alternative.

Sport hunting currently accounts for approximately 85 percent of recreational ORV use. The Visitor Opportunities/Access analysis predicts that improvements to trails would result in an increase in

recreational ORV use for hunting, as well as other activities, such as access to rivers, streams, or lakes for fishing and dispersed camping; and access to jumping off points for non-motorized hiking and backpacking, sport hunting, and mountaineering.

The following sections assess the potential socioeconomic impacts associated with access to private inholdings and impacts to local businesses. Five trails in the access area (Suslota, Soda Lake, Reeve Field, Tanada Lake, and Copper Lake trails) serve as access routes to private inholdings. Changes in trail conditions and management have the potential to affect this access.

Impacts to local businesses could occur as a result of changes in trail condition and management that affect ORV access and use. Potentially affected businesses include outfitter/guides that use ORVs on these trails to transport sport hunters and others. However, there are currently no businesses in the area that do this. One outfitter/guide currently uses ORVs to transport clients to a private inholding located between Copper and Tanada lakes, but once there, ORVs are not used for sport hunting. Outfitter/guides that transport clients to Copper and Tanada lakes and nearby areas by float plane could be affected by the proposed alternatives, as could lodge/cabin owners who promote remote wilderness experiences in the vicinity of Copper and Tanada lakes.

Other businesses that could be affected include businesses that provide ORV trip-related goods and services, such as food and drink (restaurant dining, food purchased at convenience stores, and groceries purchased at food stores), lodging (motels, hotels, bed and breakfast inns, and campgrounds), and gas and service stations. Businesses that provide goods and services related to ORV equipment operation and maintenance also could be affected if changes in trail conditions and management resulted in changes in ORV use.

4.4.6.5 Alternative 1 Effects on Socioeconomics

Direct and Indirect

Land Use and Inholdings. The five trails (Suslota, Soda Lake, Reeve Field, Tanada Lake, and Copper Lake) that currently serve as access routes to private inholdings would all be open for ORV access to inholdings under this alternative. There would be no trail improvements or changes to trail maintenance under this alternative. Portions of three of these trails (Soda Lake, Reeve Field, and Copper Lake trails) would continue to be open for recreational ORV use, and all five would remain open for subsistence ORV use, and use levels are projected to increase on all five trails (Table 4-1). As a result, trail conditions are not expected to improve under this alternative and could deteriorate. Over time, this deterioration could have a minor, adverse effect on people using these trails for ORV access to inholdings.

Impacts to Businesses. Under this alternative recreational ORV use would continue to be allowed on parts of seven of the nine trails and subsistence ORV use would continue on all nine trails, with use expected to increase at annual rates of 2 percent and 2 to 3 percent, respectively. There would be no trail improvements or changes to trail maintenance under this alternative and trail conditions would not be expected to improve under this alternative and could deteriorate. Subsistence use would increase on the Copper Lake and Tanada Lake trails and recreation use would increase on the Copper Lake trail. These relatively modest increases (2 to 3 percent and 2 percent per year, respectively) in ORV use could have adverse impacts on the wilderness perceptions of visitors toward the lodges/cabins in the vicinity of Copper and Tanada lakes, as well as visitors being transported to drop-off/pick-up points in this area. As a result, negligible to minor, adverse impacts could be expected for businesses that transport clients to Copper and Tanada lakes and nearby areas by float plane, and lodge/cabin owners located in this area.

Increases in recreational and subsistence ORV use would likely be accompanied by modest increases in related spending at local businesses that provide ORV trip-related goods and services, and also at businesses that provide ORV operation and maintenance-related goods and services. This potential impact would be beneficial.

Cumulative

As described in Section 4.1.2, overall visitation to the park could increase as a result of the development of recreational infrastructure along Nabesna Road, including the expansion of existing trailheads and improvements to or construction of multi-purpose trailheads. This increase in visitation could have beneficial impacts to local businesses, such as lodging, restaurants, gas stations, and other businesses that provide recreation-related goods and services. This potential effect viewed in conjunction with Alternative 1 would be beneficial but largely confined to local communities.

Conclusion

Deteriorating trail conditions could have minor, adverse direct, indirect, and cumulative effects on people using these trails for ORV access to inholdings. Increases in subsistence ORV use on the Copper Lake and Tanada Lake trails and recreational ORV use on the Copper Lake trail could have negligible to minor adverse impacts on local businesses because of the reduced wilderness perceptions of visitors toward the lodges/cabins in the vicinity of Copper and Tanada lakes, as well as visitors being transported to drop-off/pick-up points in this area. Increases in recreational and subsistence ORV use would likely be accompanied by corresponding modest increases in related spending at local businesses supporting these uses, a beneficial impact. On balance, because of the projected increases in visitor use and related benefits to local businesses, impacts to socioeconomics under Alternative 1 would be beneficial.

4.4.6.6 Alternative 2 Effects on Socioeconomics

Direct and Indirect

Land Use and Inholdings. The five trails (Suslota, Soda Lake, Reeve Field, Tanada Lake, and Copper Lake) that serve as access routes to private inholdings would all be open for ORV access to private inholdings under this alternative. There would be no trail improvements or changes in trail maintenance under this alternative. All five of these trails would be open for recreational ORV use, and subsistence ORV use would continue on all of the trails. As a result, trail conditions under this alternative would deteriorate. Over time, this deterioration could have a minor, adverse effect on people using these trails for ORV access to inholdings.

Impacts to Businesses. Recreational ORV use would be allowed on all nine trails under this alternative. Trail conditions would deteriorate. Opening the Suslota and Tanada Lake trails for recreational use would offer additional trails additional opportunities for independent visitors. Recreational ORV use is projected to increase from baseline levels at an annual average rate of 3 percent under this alternative, with relatively high recreational ORV use projected for the Suslota and Tanada Lake trails, which are currently closed to recreational use (Table 4-1). On the other seven trails, projected recreational ORV use estimates for 10 years in the future would be broadly equivalent to current use numbers.

Under this alternative, the number of annual recreational ORV users accessing Tanada Lake via the Tanada Lake trail would increase from 0 to 105 round trips in 10 years (Table 4-1). This increase in use could have adverse impacts on the wilderness perceptions of visitors toward the lodges/cabins in

the vicinity of Tanada Lake, as well as visitors being transported to drop-off/pick-up points in this area. The impacts to these businesses (lodges/cabins and transporters) would be adverse and minor when viewed in terms of the impact threshold criteria (Section 4.4.6.2). Impacts to local businesses from increased local spending associated with projected increases in use are expected to be beneficial under this alternative.

Cumulative

The impacts of other nearby past, present, and foreseeable future actions on socioeconomics are described under Alternative 1, and would result in beneficial socioeconomic impacts to local communities. The net effect of these impacts in combination with the direct and indirect impacts likely under Alternative 2 would be long-term socioeconomic benefits to local communities.

Conclusion

Deteriorating trail conditions could have minor, adverse direct, indirect, and cumulative effects on people using these trails for ORV access to inholdings. Increases in recreational ORV users accessing Tanada Lake via the Tanada Lake trail could have negligible to minor adverse impacts on local businesses because of the reduced wilderness perceptions of visitors toward the lodges/cabins in the vicinity of Tanada Lake, as well as visitors being transported to drop-off/pick-up points in this area. Increases in visitor use would likely be accompanied by corresponding modest increases in related spending at local businesses supporting these uses, a beneficial impact. On balance, because of the projected increases in visitor use and related benefits to local businesses, impacts to socioeconomics under Alternative 2 would be beneficial.

4.4.6.7 Alternative 3 Effects on Socioeconomics

Direct and Indirect

Land Use and Inholdings. The five trails (Suslota, Soda Lake, Reeve Field, Tanada Lake, and Copper Lake) that serve as access routes to private inholdings would all be open for ORV access to private inholdings under this alternative. The Soda Lake Re-route would benefit private inholdings that would be bypassed by the new trail alignment. In addition, closure of all five trails to recreational ORV access may result in minor improvements in conditions that could benefit people using these trails to access inholdings. Potential impacts to people using these trails for ORV access to inholdings would be beneficial.

Alternative 3 includes monitoring of trail conditions. If this monitoring indicated that standards were not being met and the magnitude or degree of resource impacts was increasing over time, the NPS could use the appropriate authorities to temporarily or permanently close specific trail segments to all types of ORV use or to specific types of access until conditions stabilized or recovered. These management actions would affect ORV use for accessing inholdings if other adequate and feasible access were not provided for. If it were to occur, the closure of a trail used to access inholdings would have a major and adverse impact on those individuals affected, but viewed in terms of the impact threshold criteria (Section 4.4.6.2) this adverse impact would be considered moderate because it would not extend beyond the Copper Valley area.

Impacts to Businesses. All nine trails would be closed to recreational use under this alternative. The outfitter/guides who have permitted use of the analysis area primarily use wheeled and float planes to access remote airstrips and lakes in their respective areas. Two lodges/cabins operate in the vicinity of Tanada and Copper lakes. Closure of the nine trails for recreational ORV use would likely have

beneficial impacts for these businesses. The closure to recreational use would decrease overall ORV use on the trails and reduce potential negative impacts on the wilderness perceptions of outfitter/guide clients transported via float plane to these areas.

No change in recreational ORV use compared to Alternative 1 is expected on the wilderness trails, Suslota, or Tanada Lake trails (Table 4-1). Recreational ORV users would decrease by 114 round trips on the Lost Creek trail and 120 round trips on the Trail Creek trail compared to Alternative 1 (Table 4-1). These numbers represent the number of ORV round trips on the trail, but do not indicate the number of users, as individuals tend to use more than one trail. Closure of these trails would displace those recreational ORV users who would otherwise have used these trails. It is likely that some of this use would be re-directed to other trails in the region. Impacts to businesses supporting recreational ORV use would likely be adverse, assuming trail closure would result in a corresponding reduction in related local spending, and would likely be minor. Impacts to recreational users themselves are discussed in Section 4.4.5, Visitor Opportunities/Access.

Cumulative

The impacts of other nearby past, present, and foreseeable future actions on socioeconomics are described under Alternative 1, and would result in beneficial socioeconomic impacts to local communities. The net effect of these impacts in combination with the direct and indirect impacts likely under Alternative 3 would be long-term socioeconomic benefits to local communities.

Conclusion

Reductions in ORV use and Soda Lake re-route would improve trail conditions, a beneficial impact to people using ORV trails for access to inholdings. If monitoring led to trail closures to ORV use to access inholdings, impacts to inholders would be moderate and adverse. Closure of the nine trails for recreational ORV use would likely have beneficial impacts for wilderness-related businesses because potential negative impacts on the wilderness perceptions of outfitter/guide clients transported via float plane to these areas would be reduced. Impacts to businesses supporting recreational ORV use would likely be minor and adverse, assuming trail closure would result in a corresponding reduction in related local spending. On balance, because of the benefits to inholders and businesses that rely on wilderness experiences, impacts to socioeconomics under Alternative 3 would be beneficial.

4.4.6.8 Alternative 4 Effects on Socioeconomics

Direct and Indirect

Land Use and Inholdings. Improvements would be made to four of the five trails (all but the Suslota trail) that serve as access routes to private inholdings and would result in substantial improvements to the conditions of the affected trails. Recreational use would not be allowed on three of these trails (Copper Lake, Tanada Lake, and Suslota trails), but would be expected to double on the Reeve Field trail used to access inholdings by year 10 of the 20-year planning period (Table 4-1). Further, subsistence use is expected to substantially increase on the Copper Lake and Tanada Lake trails and the wilderness trail systems. Individuals using ORVs to access inholdings would benefit from trail improvements, but may be adversely affected by increases in other types of use. Any adverse impacts would likely be minor. The Soda Lake Re-route would benefit private inholdings that would be bypassed by the new trail alignment.

Alternative 4 includes monitoring of trail conditions. If this monitoring indicated that standards were not being met and the magnitude or degree of resource impacts was increasing over time, the NPS

could use the appropriate authorities to temporarily or permanently close specific trail segments to all types of ORV use or to specific types of access until conditions stabilized or recovered. These management actions could affect ORV use for accessing inholdings if other adequate and feasible access were not provided. If it were to occur, temporary or permanent closure of a trail used to access inholdings would have a major and adverse impact on those individuals affected, but viewed in terms of the impact threshold criteria (Section 4.4.6.2) this adverse impact would be considered moderate because it would not extend beyond the Copper Valley area.

Impacts to Businesses. Four of the nine trails (Boomerang, Copper Lake, Tanada Lake, and Suslota) would be closed to recreational ORV use under this alternative. Trail improvements to the other six trails would result in a substantial improvement in the condition of the degraded trails, with current recreational use projected to double on three of the trails (Soda Lake, Caribou Creek, and Reeve Field), and with more modest increases (3 percent per year) projected for Lost Creek and Trail Creek trails. Substantial increases in subsistence ORV use are projected for the Copper Lake and Tanada Lake trails and trails in the wilderness in particular (Table 4-1).

Trail improvements under this alternative would make it easier for subsistence users to get to the wilderness boundary and beyond. Under this alternative, there are no off-trail controls proposed for subsistence users, which would likely result in a gradual expansion of un-managed trails further into the wilderness, providing access to places such as Grizzly and Sheep lakes, which are currently used by transporters as drop-off/pick-up points. The gradual expansion of the trail system would also potentially affect areas currently being hunted by guided groups. These impacts would likely adversely affect the experience of outfitter/guide clients, and could over time result in a decrease in demand for services. If this were to happen, the impact to businesses would be felt locally, and, based on the impact threshold criteria (Section 4.4.6.2), considered adverse and minor.

Wilderness perceptions of outfitter/guide clients viewing increased ORV use or braiding in the affected areas from the air may be adversely affected, but this disturbance would not be occurring at their destination and, therefore, is unlikely to noticeably affect demand for these services.

Increases in recreational and subsistence ORV use would likely be accompanied by increases in related spending at local businesses that provide ORV trip-related goods and services, and increases in spending at businesses providing ORV operation and maintenance-related goods and services. This potential impact would be beneficial.

Cumulative

The impacts of other nearby past, present, and foreseeable future actions on socioeconomics are described under Alternative 1, and would result in beneficial socioeconomic impacts to local communities. The net effect of these impacts in combination with the direct and indirect impacts likely under Alternative 4 would be long-term socioeconomic benefits to local communities.

Conclusion

Individuals using ORVs to access private inholdings would benefit from trail improvements, but may experience minor adverse effects from increases in other types of use. If trail condition monitoring resulted in trail closures to ORV use to access inholdings, impacts to inholders would be moderate and adverse. Trail improvements and corresponding increases in ORV use in and near the wilderness, combined with the absence of off-trail controls for subsistence users could indirectly provide access to drop-off/pick-up points used by transporters and areas currently being hunted by guided groups. Because outfitter/guide clients could view increased ORV use from the air, the demand for hunting

outfitter/guide services could decrease over time, a minor, adverse impacts to these types of businesses. Impacts to businesses supporting increased recreational and subsistence ORV use would likely be beneficial. On balance, because of the benefits to access for inholders and the projected increases in visitor use and related benefits to local businesses, impacts to socioeconomics under Alternative 4 would be beneficial.

4.4.6.9 Alternative 5 Effects on Socioeconomics

Direct and Indirect

Land Use and Inholdings. Improvements under Alternative 5 would be made to all five trails that serve as access routes to private inholdings and would result in improvements to the conditions of the affected trails. Suslota trail would be closed to recreational ORV use, but the Copper Lake, Tanada Lake, Soda Lake, and Reeve Field trails would be open to recreational ORV use. Large increases in recreational ORV use are projected for those four trails (Table 4-1). On the Copper Lake, Tanada Lake, and Reeve Field trails, individuals using ORVs to access inholdings would benefit from trail improvements, but may be adversely affected by increases in other types of use. Any adverse impacts would likely be minor. The Soda Lake Re-route would benefit private inholdings that would be bypassed by the new trail alignment.

Alternative 5 includes monitoring of trail conditions. If this monitoring indicated that standards were not being met and the magnitude or degree of resource impacts was increasing over time, the NPS could use the appropriate authorities to temporarily or permanently close specific trail segments to all types of ORV use or to specific types of access until conditions stabilized or recovered. These management actions could affect ORV use for accessing inholdings if other adequate and feasible access was not provided. If it were to occur, the temporary or permanent closure of a trail used to access inholdings would have a major and adverse impact on those individuals affected, but viewed in terms of the impact threshold criteria (Section 4.4.6.2) this adverse impact would be considered moderate because it would not extend beyond the Copper Valley area.

Impacts to Businesses. Trail improvements under this alternative would result in a substantial improvement in the condition of the degraded trails. Recreational ORV use would be allowed on eight of the trails, and recreational ORV use levels are projected to increase from 0 to 234 round trips on the Tanada Lake trail; double on the Soda Lake, Caribou Creek, and Reeve Field trails; increase by 20 percent a year on the Copper Lake trail; and increase by a more modest 3 percent per year on the Lost Creek trail (Table 4-1).

Trail improvements under this alternative would make it easier for subsistence users to get to the wilderness boundary and beyond. There are currently two lodge or cabin owners (one between Copper and Tanada lakes and one by Tanada Lake) that promote wilderness experiences at their lodge/cabins. Increased motorized use in the vicinity of these lakes could impact these businesses and the quality of the experience for their clients. Making these areas more accessible could also adversely affect transporters who use Copper and Tanada lakes, and Grizzly and Sheep lakes (located in the wilderness south of Tanada Lake) as float plane drop-off/pick-up points. If this were to happen, the impact to businesses would be felt locally, and considered adverse and minor based on the impact threshold criteria (Section 4.4.6.2).

Increases in recreational and subsistence ORV use would likely be accompanied by increases in related spending at local businesses that provide ORV trip-related goods and services, as well as businesses that provide ORV operation and maintenance-related goods and services. This potential impact would be beneficial. .

Cumulative

The impacts of other nearby past, present, and foreseeable future actions on socioeconomics are described under Alternative 1, and would result in beneficial socioeconomic impacts to local communities. The net effect of these impacts in combination with the direct and indirect impacts likely under Alternative 5 would be long-term socioeconomic benefits to local communities.

Conclusion

Individuals using ORVs to access private inholdings would benefit from trail improvements, but may experience minor adverse impacts from increases in other types of use. If trail condition monitoring resulted trail closures to ORV use to access inholdings, impacts to inholders would be minor and adverse. Trail improvements and corresponding increases in ORV use in and near the wilderness could indirectly provide access to drop-off/pick-up points used by transporters and areas currently being hunted by guided groups. This potential minor adverse impact would be offset by benefits to these businesses from limiting off-trail use in wilderness areas. Impacts to businesses supporting increased recreational and subsistence ORV use would likely be beneficial. On balance, because of the benefits to access for inholders, the benefits to wilderness-related business from limiting off-trail use, and the projected increases in visitor use and related benefits to local businesses, impacts to socioeconomics under Alternative 5 would be beneficial.

4.4.7 Natural Soundscapes

4.4.7.1 Methodology

The impact analysis for natural soundscapes was based on a qualitative comparison of the existing sound environment conditions described in Section 3.5.7 with the expected changes in sound-producing activity associated with the proposed alternatives. Future changes to the existing sound conditions could result from short-term trail construction activity and from long-term ORV use on trails open to motorized use. Assessment of the long-term impacts was based on review of literature addressing noise generated by mechanized equipment and consideration of the spatial and temporal distribution of mechanized equipment within the analysis area. As discussed in Section 3.5.7, it is reasonable to assume that ORV sound could typically be heard for up to approximately 0.5 mile from an active motorized trail and would not likely be detectable beyond that range; depending upon site-specific terrain and vegetation conditions near a trail, it is possible that ORV sound would not be detectable more than approximately 0.25 mile from the source.

Subject to reasonable regulation, motorized access for subsistence purposes and for accessing private inholdings is specifically allowed by law (ANILCA Sections 811 and 1110[a]) on most federal land in Alaska, including land designated as wilderness. Therefore, public land managers exhibit a degree of tolerance for the accompanying sounds associated with motorized access. Management objectives or restrictions that would eliminate sound created by legitimate motorized access are legally inappropriate in Alaska. The state is not opposed to the NPS managing activities that produce sound consistent with existing policies; however, implementation of those policies must be consistent with the applicable provisions of ANILCA. The analysis approach for addressing soundscapes for Wrangell-St. Elias National Park and Preserve recognizes that sound from legal motorized access is a given for baseline and future conditions, and none of the alternatives would prohibit motorized access that is legally allowed under ANILCA Sections 811 and 1110(a).

4.4.7.2 Impact Threshold Criteria

To determine the significance of effects on soundscapes, the expected impacts are compared against the following threshold criteria:

Negligible: Effects to the natural sound environment would be at or below the level of detection, short-term, and would not be of any consequence to the visitor experience or to biological resources.

Minor: Effects to the natural sound environment would be detectable, although the effects would be short-term and localized and would be small and of little consequence to the visitor experience or to biological resources.

Moderate: Effects to the natural sound environment would be readily detectable, long-term, and localized.

Major: Effects to the natural sound environment would be obvious and long-term, and would have substantial consequences to the visitor experience or to biological resources in the area.

4.4.7.3 Assumptions

This analysis assumes that ORV noise levels in the analysis area are comparable to noise levels reported in available literature.

4.4.7.4 Alternative 1 Effects on Natural Soundscapes

Direct and Indirect

Under Alternative 1 (No Action), the NPS would continue the present management direction, guided by the conditions of the 2007 lawsuit settlement. Trail maintenance would continue at current levels and no trail improvements would occur under this alternative. Therefore, any incremental impacts to natural soundscapes associated with ORV management would occur as a result of changes in ORV use levels and/or in the distribution of that use. Recreational ORV use would continue to be limited to winter months when the ground is frozen on several trails (i.e., Suslota trail, Tanada Lake trail, and the Copper Lake trail past the Boomerang trail turn-off) in the analysis area. The remaining six trails would be open to recreational ORV use year-round, as is the current case. Because there would be no change in the geographic distribution of ORV activity, changes in ORV use levels would be the sole source of future changes in soundscape impacts for this alternative.

It is assumed that over the next 20 years, ORV use would increase by 102 subsistence round trips and 153 recreational round trips under this alternative, resulting in 1,172 total ORV round trips per year (Table 4-1). That figure represents an increase of 28 percent over the current use level by the end of the planning period.

Exposure of analysis area visitors and biological resources to non-natural sounds varies with their type of activity and location. Sightseers, campers, and others who remain within the Nabesna Road corridor, for example, would typically hear mechanical noise from vehicles traveling on the road and from airplanes flying overhead in the general vicinity. For people in this user group the frequency of hearing mechanized equipment would likely be greatest in the western part of the road corridor (because of traffic volumes that are highest at the entry portal and decline with progression to the east), while people who travel to or near the end of the road would likely hear a smaller number of vehicles and planes. Visitors on the Nabesna Road who travel past trailheads for trails open to ORV

use also could hear ORV noise, if they happened to pass by such a trail at a time when ORVs were operating within audible range of the road (up to approximately 0.5 mile, depending on site-specific conditions). Most park visitors, both motorized and non-motorized users, and wildlife that travel through the analysis area by trail experience both the Nabesna Road sound environment and the soundscape along the trails, most of which are shared-use trails open to ORV use. Non-motorized users and wildlife that travel off-trail in the backcountry are likely to hear mechanical noise with the lowest frequency, although park visitors use vehicles or airplanes to access the backcountry and likely hear airplane noise at some time during their stay.

Because a moderate increase in total ORV use is assumed under this alternative, visitors and wildlife would be somewhat more likely to encounter ORVs or hear noise from nearby ORVs. Future ORV use under Alternative 1 is estimated at 1,172 round trips per year, and that activity would be distributed among nine trails located throughout the analysis area. Although the number of ORV trips or use days is greater than the number of ORV users and ORV use is relatively concentrated during the hunting season within August and September, the use numbers suggest that the number of daily ORV trips on a given trail is relatively low. Therefore, it is anticipated that all types of visitors would experience relatively infrequent noise disturbance from encounters with ORV users during the summer months.

In addition to ORV noise, visitors to the analysis area and wildlife would continue to experience noise intrusions from propeller airplanes and from vehicle traffic along the Nabesna Road. The frequency of noise intrusions from these sources may increase with general trends of visitor uses (as discussed under cumulative impacts), but any such changes would not be a result of ORV management actions under Alternative 1. The amount of aircraft use for transporting visitors into the National Park and Preserve usually would be minimal. Based on recalled observations by NPS staff, airplanes likely cross back and forth over the analysis area several times a day throughout the week. Considering all sources of mechanical noise, the NPS anticipates that visitors and wildlife currently experience infrequent noise intrusions, and that these do not degrade visitor experiences. That condition would continue under Alternative 1. Alternative 1 is expected to result in a moderate increase in ORV use and the noise associated with ORV use. Because ORV noise is just one of three primary sources of mechanical noise in the analysis area, and because ORV noise is localized to the areas within approximately 0.5 mile or less of the motorized trails, the net effect of this alternative would be a minor increase in the existing level of impacts to natural soundscapes.

Cumulative

Several of the cumulative effects assumptions described in Section 4.1.2 that would be applicable to soundscapes are discussed in this section. Projections show that there is potential for moderately increased recreational use in the analysis area over the next 20 years. Based on the increased number of users to the analysis area, it is anticipated that mechanical noise levels would generally rise over time. The influence of ORV use would be minor; however, the other changes to airplane and vehicle traffic noise could result in increased noise in the analysis area. Additionally, construction of facilities along the Nabesna Road would have short-term and long-term, minor, adverse effects on soundscapes due to construction equipment (short-term) and increased visitor use activity (long-term). Based on the assumptions above, the overall sound environment would change slightly.

As described in Section 3.3.2.1, there are an additional 94 miles of motorized trails in the analysis area. These trails are generally in fair condition with some degraded segments (Connery 1987). ORV use associated with these trails is limited to local federally qualified subsistence users and is very light (generally less than 20 passes per year). The use of these trails is generally seasonal in nature, occurring during the months of August and September. The average park visitor using

Nabesna Road for driving, sightseeing, or camping would never hear ORVs using these trails. Hikers using the nine trails analyzed in detail in this document might hear ORVs associated with these trails for short periods of time during August or September. Overall, impacts to the natural soundscape from the use of these trails would be negligible.

These expected future impacts, in combination with the minor, long-term, adverse direct and indirect impacts to soundscapes that have already occurred, would result in net long-term, minor, adverse cumulative impacts to soundscapes in the analysis area. The minor increase in ORV noise expected under Alternative 1 would be experienced by a relatively small subset of total visitors in the analysis area and would represent a limited incremental contribution to the cumulative impacts.

Conclusion

This alternative would have minor, adverse impacts to soundscapes because direct, indirect and cumulative impacts would slightly increase over a 20-year period. Some of these actions would minimally increase the frequency of noise intrusions in the analysis area over an extended period of time. While these changes would be detectable through monitoring, it is unlikely that the typical visitor would notice the change. Therefore, the minor impacts to soundscapes under Alternative 1 are not anticipated to degrade the quality of the visitor experience or affect biological resources.

The minor impacts to natural soundscapes anticipated from this alternative would not result in an impairment of park resources that fulfill specific purposes identified in the establishing legislation or that are essential to the integrity of the park.

4.4.7.5 Alternative 2 Effects on Natural Soundscapes

Direct and Indirect

Under Alternative 2, recreational ORV use would not be limited to winter months when the ground is frozen, but would be allowed on the nine trails throughout the analysis area, but not in designated wilderness. Trail maintenance would continue at current levels and no trail improvements would occur under this alternative. Therefore, any incremental impacts to natural soundscapes associated with ORV management would occur as a result of changes in ORV use levels and/or in the distribution of that use.

It is assumed that the number of ORV round trips would grow from 917 to 1,171 per year over the next 20 years, an overall increase of 28 percent over the current use level (Table 4-1). Subsistence ORV use would increase slightly (by 41 round trips, or 9 percent) and recreational ORV use would increase more rapidly (by 213 round trips, or 49 percent) under this alternative.

Patterns of exposure to non-natural sounds for various types of analysis area visitors were summarized in the discussion of direct and indirect impacts for Alternative 1. Because a moderate increase in total ORV use over current conditions is assumed under Alternative 2, visitors and wildlife would be somewhat more likely than at present to encounter ORVs or hear noise from nearby ORVs, particularly during the hunting season when ORV use is highly concentrated. Future ORV use under Alternative 2 is estimated at 1,171 round trips per year, and that activity would be distributed among nine trails located throughout the analysis area (Table 4-1). The user numbers suggest that the number of daily ORV trips on a given trail is relatively low. Therefore, it is anticipated that all types of visitors and wildlife would continue to experience relatively infrequent noise disturbance from encounters with ORV users during the summer months under Alternative 2.

In addition to ORV noise, visitors to the analysis area and wildlife would continue to experience noise intrusions from propeller airplanes and from vehicle traffic along the Nabesna Road. The frequency of noise intrusions from these sources may increase with general trends of visitor uses (as discussed under cumulative impacts), but any such changes would not be a result of ORV management actions under Alternative 2. The amount of aircraft use for transporting visitors into the National Park and Preserve usually would be minimal. Based on recalled observations by NPS staff, airplanes likely cross back and forth over the analysis area several times a day throughout the week. Considering all sources of mechanical noise, the NPS anticipates that visitors and wildlife currently experience infrequent noise intrusions, and that these do not degrade visitor experiences. That condition would continue under Alternative 2. Alternative 2 is expected to result in a moderate increase in ORV use and the noise associated with ORV use. Because ORV noise is just one of three primary sources of mechanical noise in the analysis area, and because ORV noise is localized to the areas within approximately 0.5 mile or less of the motorized trails, the net effect of this alternative would be a minor, adverse increase in the existing level of impacts to natural soundscapes.

Cumulative

The minor impacts of other nearby past, present, and foreseeable future actions on soundscapes are described under Alternative 1. The net effect of these impacts in combination with the direct and indirect impacts likely under Alternative 2 would be long-term, minor, adverse impacts to soundscapes, primarily related to increased visitor use in the analysis area over the next 20 years. The minor increase in ORV noise expected under Alternative 2 would be experienced by a relatively small subset of total visitors in the analysis area and would represent a limited incremental contribution to the cumulative impacts.

Conclusion

This alternative would have minor, long-term, adverse impacts to soundscapes because impacts would slightly increase over a 20-year period. Some of these actions would minimally increase the frequency of noise intrusions in the analysis area over an extended period of time. While these changes would be detectable through monitoring, it is unlikely that the typical visitor would notice the change. Therefore the minor impacts to soundscapes under Alternative 2 are not anticipated to degrade the quality of the visitor experience or affect biological resources.

The minor impacts to natural soundscapes anticipated from this alternative would not result in an impairment of park resources that fulfill specific purposes identified in the establishing legislation or that are essential to the integrity of the park.

4.4.7.6 Alternative 3 Effects on Natural Soundscapes

Direct and Indirect

Under Alternative 3, the NPS would attempt to address resource impacts primarily through trails administration, with relatively little investment in trail improvements. Trail maintenance would continue at current levels. Approximately 2.5 miles of motorized trail would be improved and four new non-motorized trails would be routed or constructed. Under this alternative, recreational ORV use would not be permitted on any of the trails in the analysis area, and all nine trails and the wilderness trails would be open to subsistence ORV use year-round. The trails that currently receive ORV use to access private inholdings (Suslota, Soda Lake, Reeve Field, Copper Lake and Tanada Lake) would continue to be open for this use.

Actions implemented under Alternative 3 would create changes in the existing soundscapes through short-term noise associated with construction of motorized trail improvements and one new non-motorized trail and through changes in long-term noise patterns associated with ORV use. Three non-motorized routes also would be marked, but these actions would not involve heavy equipment. Short-term noise impacts would primarily include noise from mechanical earth-moving equipment and would also include noise from trucks bringing in supplies and material (e.g., rocks, porous pavement panels) for the new trails.

It is assumed that over the next 20 years, subsistence ORV use would increase at a moderate rate, by 102 round trips or 21 percent, and recreational ORV use would decrease from 437 to 0 round trips under this alternative (Table 4-1). As a result, total ORV use at the end of the planning period is projected to be 582 round trips per year, an overall reduction of 37 percent from the current user level. Therefore, ORV use patterns under Alternative 3 would result in a substantial overall reduction in the frequency of noise generated by ORV use within the analysis area.

In addition to ORV noise, visitors to the analysis area and wildlife would continue to experience noise intrusions from propeller airplanes and from vehicle traffic along the Nabesna Road. The frequency of noise intrusions from these sources may increase with general trends of visitor uses (as discussed under cumulative impacts), but any such changes would not be a result of ORV management actions under Alternative 3. In addition, it is possible that the creation of new recreational opportunities through the development of four new non-motorized trails or routes would result in an increased level of non-motorized use in the analysis area, with corresponding changes in vehicle and aircraft traffic volumes for users to access the area. Given the relatively low amount of existing non-motorized trail use, however, it is not likely that additional future use of this type would cause perceptible changes in the existing soundscape.

Considering all sources of mechanical noise, the NPS anticipates that visitors and wildlife currently experience infrequent noise intrusions, and that these do not degrade the visitor experience. That condition would continue or improve under Alternative 3. Alternative 3 would result in a substantial decrease in total ORV use and the noise associated with ORV use. Because ORV noise is just one of three primary sources of mechanical noise in the analysis area, and because ORV noise is localized to the areas within approximately 0.5 mile or less of the motorized trails, the net effect of this alternative would likely be a negligible to minor decrease in the existing level of impacts to natural soundscapes.

Cumulative

The impacts of other nearby past, present, and foreseeable future actions on soundscapes are described under Alternative 1, and are characterized as minor adverse changes. The net effect of these impacts, in combination with the small but beneficial direct and indirect impacts likely under Alternative 3, would still be considered minor and adverse. The long-term beneficial impacts to soundscapes related to the decreased ORV use in the analysis area over the next 20 years would represent a limited incremental change to the overall sound environment.

Conclusion

This alternative would have beneficial direct and indirect impacts to soundscapes because less ORV noise would be anticipated in the analysis area year-round. Subsistence ORV use would slightly increase over the next 20 years, but no recreational ORV use would be allowed, resulting in a projected reduction in total ORV use in the analysis area, compared to current conditions. The additional opportunities for non-motorized users could bring additional airplane and vehicle noise as more visitors accessed the analysis area, but these adverse effects on the natural soundscape are not

expected to be more than negligible. Based on the small contribution of ORV noise relative to other noise sources experienced by visitors, the overall level of impact to natural soundscapes under Alternative 3 would be determined by the expected cumulative impacts. Those are characterized as minor adverse impacts and are not expected to degrade the quality of the visitor experience or affect biological resources.

The minor impacts to natural soundscapes anticipated from this alternative would not result in an impairment of park resources that fulfill specific purposes identified in the establishing legislation or that are essential to the integrity of the park.

4.4.7.7 Alternative 4 Effects on Natural Soundscapes

Direct and Indirect

Under Alternative 4, the NPS would make substantial improvements to eight of the nine trails (all but the Suslota trail) to bring them to a design-sustainable or maintainable condition to provide reasonable access while protecting park resources. Improvements also would be done to the wilderness trail systems. Once improvements are in place, trail maintenance would increase to a level that would correct natural resource damage and keep trail conditions at the planned design standard. Following completion of the improvements recreational ORV use would be allowed on trails in the National Preserve, but not in the National Park or on the Suslota trail. Trails would continue to be open to ORV use for subsistence purposes and for access to private inholdings. In addition to the actions to improve the motorized trails, this alternative includes construction of three new non-motorized trails and marking of four new non-motorized routes. Marking non-motorized routes would not involve heavy equipment.

Actions implemented under Alternative 4 would change the existing soundscapes through: 1) short-term noise associated with construction of motorized trail improvements and three new non-motorized trails, 2) long-term noise associated with increased maintenance of the motorized trails, and 3) changes in long-term noise patterns associated with ORV use. Short-term noise impacts primarily would include noise from mechanical earth-moving equipment and also would include noise from trucks bringing in supplies and material (e.g., rocks, porous pavement panels) for the new trails. Because these effects would be short-term and localized to the vicinity of the construction activity, they would be of little consequence to the visitor experience or to biological resources and would be considered minor adverse impacts.

Long-term impacts would be intermittent noise from mechanical use throughout the analysis area, and would primarily be associated with ORV use on the motorized trails as opposed to trail maintenance activity. Under this alternative it is assumed that over the next 20 years, subsistence ORV use would more than double, increasing from 480 to 1,100 round trips (a 129 percent increase), and recreational ORV use would increase by 54 percent, from 437 to 671 round trips per year (Table 4-1). As a result, total ORV use at the end of the planning period is projected to be 1,771 round trips per year, an overall increase of 93 percent from the current user level. Therefore, ORV use patterns under Alternative 4 would result in a substantial overall increase in the frequency of noise generated by ORV use within the analysis area. Much of the increased use would be focused on the improved Copper and Tanada Lake trails, which access the wilderness trail systems. There would be an estimated doubling of subsistence ORV use in the wilderness and no monitoring/management actions or designated trails to control off-trail use.

In addition to ORV noise, visitors to the analysis area and wildlife would continue to experience noise intrusions from propeller airplanes and from vehicle traffic along the Nabesna Road. The frequency

of noise intrusions from these sources may increase with general trends of visitor uses (as discussed under cumulative impacts), but any such changes would not be a result of ORV management actions under Alternative 4. In addition, it is possible that the creation of new recreation opportunities through the development of seven new non-motorized trails and routes would result in an increased level of non-motorized trail use in the analysis area, with corresponding changes in vehicle and aircraft traffic volumes for users to access the area. Given the relatively low amount of existing non-motorized trail use, however, it is not likely that additional future use of this type would cause perceptible changes in the existing soundscape.

Considering all sources of mechanical noise, the NPS anticipates that visitors and wildlife currently experience infrequent noise intrusions, and that these do not degrade the visitor experience. That condition would likely continue under Alternative 4. While Alternative 4 is expected to result in a substantial increase in total ORV use and the noise associated with ORV use, that change would still equate to a minor or moderate increase in the existing level of impacts to natural soundscapes. The increased frequency of ORV noise would be a long-term change localized to the areas within approximately 0.5 mile or less of the motorized trails, making these impacts moderate (relative to the impact threshold criteria). However, the change may not be detectable in general to users or wildlife, and the effects to any individual user or animal would be short-term and likely of little consequence. For example, a visitor or animal might briefly hear ORV noise three times during a day, instead of twice under typical current conditions. These aspects of the change in soundscapes suggest the direct and indirect impact level under Alternative 4 would be minor.

Cumulative

The impacts of other nearby past, present, and foreseeable future actions on soundscapes are described under Alternative 1, and are characterized as minor. The net effect of these impacts, in combination with the minor direct and indirect impacts likely under Alternative 4, would still be considered long-term, minor, adverse impacts to soundscapes. The minor increase in noise related to the increased ORV use in the analysis area over the next 20 years would be experienced by a relatively small subset of total visitors in the analysis area and would represent a limited incremental contribution to the cumulative impacts.

Conclusion

This alternative would have minor, long-term, adverse direct and indirect impacts to soundscapes because more ORV noise would be anticipated in the analysis area year-round. Based on the increased number of ORV trips in the analysis area, it is anticipated that the frequency of ORV noise levels would increase, although that change would remain localized to the areas near the motorized trails. Impacts from potential increases in airplane and vehicle noise related to bringing additional non-motorized users to the analysis area are expected to be negligible. Some of the proposed trail improvement and construction activities would result in short-term, negligible to minor, adverse impacts on the natural soundscape. Based on the small contribution of ORV noise relative to other noise sources experienced by visitors, the overall level of impact to natural soundscape under Alternative 4 would be determined by the expected cumulative impacts. Those are characterized as minor adverse impacts and are not expected to degrade the quality of the visitor experience or affect biological resources.

The minor impacts to natural soundscapes anticipated from this alternative would not result in an impairment of park resources that fulfill specific purposes identified in the establishing legislation or that are essential to the integrity of the park.

4.4.7.8 Alternative 5 Effects on Natural Soundscapes

Direct and Indirect

Under Alternative 5, the NPS would improve most degraded segments of the nine trails to a design-sustainable or maintainable condition to provide reasonable access while protecting park resources. On unimproved trails or trail segments, impact standards would be applied to ensure that resource impacts do not expand, that unimproved trail segments improve in condition over time, and that unmanaged proliferation of trails is minimized. Trails in the designated wilderness would be designated for subsistence ORV users and no off-trail use would be permitted. Once the trail improvements are in place, trail maintenance would increase to a level that would correct natural resource damage and keep trail conditions at the planned design standard. Following completion of the improvements, this alternative would allow recreational ORV use on both National Park and Preserve trails, but not on the Suslota trail. Trails would continue to be open to ORV use for subsistence purposes and for access to private inholdings. In addition to the actions to improve the motorized trails, this alternative includes construction of four new non-motorized trails and marking of four new non-motorized routes. Marking non-motorized routes would not involve heavy equipment.

Actions implemented under Alternative 5 would change the existing soundscapes through: 1) short-term noise associated with construction of motorized trail improvements and four new non-motorized trails, 2) long-term noise associated with increased maintenance of the motorized trails, and 3) changes in long-term noise patterns associated with ORV use. Short-term noise impacts would primarily include noise from mechanical earth moving equipment and would also include noise from trucks bringing in supplies and material (e.g., rocks, porous pavement panels) for the new trails. Because these effects would be short-term and localized to the vicinity of the construction activity, they would be of little consequence to the visitor experience or to biological resources and would be considered minor adverse impacts.

Long-term impacts primarily would be intermittent noise from mechanical use throughout the analysis area and would primarily be associated with ORV use on the motorized trails, as opposed to trail maintenance activity. Under this alternative it is assumed that over the next 20 years, subsistence ORV use would increase moderately, from 480 to 642 round trips (a 34-percent increase), and recreational ORV use would more than double, increasing from 437 to 1,037 round trips per year (Table 4-1). As a result, total ORV use at the end of the planning period is projected to be 1,679 round trips per year, an overall increase of 83 percent from the current user level. Therefore, ORV use patterns under Alternative 5 would result in a substantial overall increase in the frequency of noise generated by ORV use within the analysis area.

In addition to ORV noise, visitors to the analysis area and wildlife would continue to experience noise intrusions from propeller airplanes and from vehicle traffic along the Nabesna Road. The frequency of noise intrusions from these sources may increase with general trends of visitor uses (as discussed under cumulative impacts), but any such changes would not be a result of ORV management actions under Alternative 5. In addition, it is possible or even likely that the creation of new recreation opportunities through the development of eight new non-motorized trails and routes would result in an increased level of non-motorized trail use in the analysis area, with corresponding changes in vehicle and aircraft traffic volumes for users who access the area. Given the relatively low amount of existing non-motorized trail use, however, it is likely that additional future use of this type would cause at most negligible changes in the existing soundscape.

Considering all sources of mechanical noise, the NPS anticipates that visitors and wildlife currently experience infrequent noise intrusions that do not degrade the park experience, and that condition would likely continue under Alternative 5. While Alternative 5 is expected to result in a substantial increase in total ORV use and the noise associated with ORV use, ORV noise is just one of three primary sources of mechanical noise in the analysis area. In addition, the increased frequency of ORV noise would be localized to the areas within approximately 0.5 mile or less of the motorized trails. The net effect of this alternative would likely be a minor or moderate increase in the existing level of impacts to natural soundscapes based on the impact threshold criteria. However, the change may not be detectable in general to users or wildlife, and the effects to any individual user or animal would be short-term and likely of little consequence. For example, a visitor or animal might briefly hear ORV noise three times during a day, instead of twice under typical current conditions. These aspects of the change in soundscapes suggest the direct and indirect impact level under Alternative 5 would be minor.

Cumulative

The impacts of other nearby past, present, and foreseeable future actions on soundscapes are described under Alternative 1, and are characterized as minor. The net effect of these impacts, in combination with the minor direct and indirect impacts likely under Alternative 5, would still be considered long-term, minor, adverse impacts to soundscapes. The minor increase in noise related to increased ORV use in the analysis area over the next 20 years would be experienced by a relatively small subset of total visitors in the analysis area and would represent a limited incremental contribution to the cumulative impacts.

Conclusion

This alternative would have minor, long-term, adverse direct and indirect impacts to soundscapes because more ORV noise would be anticipated in the analysis area year-round. Based on the increased number of ORV trips in the analysis area, it is anticipated that the frequency of ORV noise would increase, although that change would remain localized in the areas near the motorized trails. Impacts from potential increases in airplane and vehicle noise related to bringing additional non-motorized users to the analysis area are expected to be negligible. Some of the proposed trail improvement and construction activities would result in short-term, negligible to minor, adverse impacts on the natural soundscape. Based on the small contribution of ORV noise relative to other noise sources experienced by visitors, the overall level of impact to natural soundscapes under Alternative 5 would be determined by the expected cumulative impacts. Those are characterized as minor adverse impacts and are not expected to degrade the quality of the visitor experience or affect biological resources.

The minor impacts to natural soundscapes anticipated from this alternative would not result in an impairment of park resources that fulfill specific purposes identified in the establishing legislation or that are essential to the integrity of the park.

4.5 Unavoidable Adverse Impacts

Unavoidable adverse impacts are any adverse impacts that could not be fully mitigated or avoided if the action were implemented. The following descriptions by alternative focus on significant environmental issues, or those that would involve major or moderate impacts if action were taken.

4.5.1 *Alternative 1*

Under Alternative 1, ORV trails in the analysis area that currently are dominated by degraded conditions (such as the Suslota and Tanada Lake trails and the portion of Copper Lake past the turnout to Boomerang trail) would continue to degrade. ORV use on the Copper Lake, Suslota, and Tanada Lake trails is projected to increase by 20 percent over current conditions (from 250 to 300). Adverse trail conditions, combined with increasing total ORV use under Alternative 1 would translate to moderate, adverse impacts to soil, wetlands, and vegetation.

Without trail re-routing or trail improvements, the long-term recovery of soils on degraded trail segments would be unlikely. Impacted wetland soils would continue to subside and existing damage on permafrost soils would continue, even along trails closed to recreational ORV use under this alternative. Trail braiding would likely expand, resulting in permanent, localized impacts to previously undisturbed wetland communities. Vegetation, particularly the low shrub and herbaceous communities, also would continue to be moderately, adversely affected.

ORV use on the portion of the Copper Lake trail not subject to seasonal closures could adversely affect spawning nests under Alternative 1. Suitable Chinook salmon spawning habitat exists at the trail-stream crossing where the Copper Lake trail crosses a portion of Tanada Creek. If disturbed, spawning habitat impacts from ORV crossings could cause direct fish egg mortality in this location.

Total ORV use on trails in and leading to both designated and eligible wilderness areas would continue to allow conditions that result in moderate diminishment of undeveloped quality, one of the wilderness qualities.

4.5.2 *Alternative 2*

Under Alternative 2, degraded ORV trails in the analysis area would continue to degrade, to an even greater extent than under Alternative 1. ORV use on the Copper Lake, Suslota, and Tanada Lake trails is projected to increase by 88 percent over current conditions (from 250 to 470). Adverse trail conditions, combined with increasing total ORV use under Alternative 2 would translate to major, adverse impacts on soil, wetlands, and vegetation.

Without trail re-routing or trail improvements, the long-term recovery of soils on degraded trail segments would be unlikely under Alternative 2. With increasing ORV use on degraded trails, the continuing progression of soil compaction, displacement, subsidence, and ponding would be evident. Without trail improvements or closures, localized soil erosion along degraded trails would accelerate, and those soils would be unable to support native vegetation. Wetland and permafrost soils would continue to deteriorate on the most degraded trails. With projected levels of ORV use on these trails, continued trail braiding could result in permanent, major impacts to previously undisturbed wetland communities. Braiding and the lack of vegetative recovery would result in major, adverse impacts to vegetation, particularly the low shrub and herbaceous communities.

ORV use on the lower portion of the Copper Lake trail could adversely affect spawning nests under Alternative 2, as is projected for Alternative 1. Suitable Chinook salmon spawning habitat exists at the trail-stream crossing where the Copper Lake trail crosses a portion of Tanada Creek. If disturbed, spawning habitat impacts from ORV crossings could cause direct fish egg mortality in this location. Throughout the analysis area, levels of ORV use could contribute to increasing sediment, affecting fish habitat.

Total ORV use on trails in and leading to the designated wilderness would continue to allow conditions that result in moderate diminishment of undeveloped quality, one of the wilderness qualities.

4.5.3 *Alternative 3*

In addition to the moderate, adverse impacts to soils, wetlands, vegetation, and fish habitat described under Alternative 1, closing trails to recreational ORV use under Alternative 3 would have a moderate to major, adverse impact on opportunities available to recreational ORV users in the analysis area. Total ORV use on trails in and leading to designated and eligible wilderness areas would continue to allow conditions that result in moderate diminishment of undeveloped quality, one of the wilderness qualities.

4.5.4 *Alternative 4*

Under Alternative 4, total ORV use is expected to increase by approximately 93 percent over current conditions by the end of the 20-year planning period. At this rate of change, increased ORV use could result in increased hunting pressure, a moderate, adverse effect to wildlife and subsistence. Non-motorized users on the Black Mountain trails or wilderness trails south of Tanada Lake may be adversely affected by the 233 percent increase in subsistence ORV users in the wilderness.

Total ORV use on trails in and leading to the designated wilderness would nearly triple. The impacts associated with a significant increase in subsistence ORV use and proliferation of unmanaged motorized trails would have major adverse effects on the undeveloped quality of wilderness resource values. The increase in the level of ORV use in and adjacent to the wilderness area would result in more opportunity for non-motorized wilderness users to encounter sights and/or sounds of motorized traffic, and a decrease in their opportunities for solitude. This alternative also would result in moderate adverse effects on wilderness character in areas eligible for wilderness designation. Widespread, long-term effects to the wilderness character and associated values, and reduced integrity of wilderness within the designated wilderness would result in major adverse impacts.

4.5.5 *Alternative 5*

Under Alternative 5, total ORV use is expected to increase by approximately 83 percent over current conditions by the end of the 20-year planning period. At this rate of change, increased ORV use could result in increased hunting pressure, a moderate, adverse effect to wildlife and subsistence. Total ORV use on trails in and leading to the wilderness would nearly triple, resulting in moderate adverse impacts to solitude or primitive and unconfined quality as wilderness users are more likely to encounter sights or sounds of motorized traffic. This alternative would also result in moderate adverse effects on wilderness character in areas eligible for wilderness designation.

4.6 Sustainability and Long-Term Management

4.6.1 *The Relationship between Local Short-Term Uses of the Environment and the Maintenance and Enhancement of Long-Term Productivity*

This section describes whether any proposed actions would trade long-term management possibilities, or the productivity of park resources, for immediate park uses. Any actions that would affect future generations or would result in environmental problems if continued over the long term are included.

Under Alternative 1, recreational ORV use would not be permitted on the most degraded trails in the analysis area. Although these seasonal closures would benefit park resources, recreational ORV use would continue on other trails in the analysis area, including several degraded trail segments. As a result, Alternative 1 would provide short-term, recreational use of the analysis area at the cost of long-term, environmental productivity.

Under Alternative 2, continued permitting of recreational ORV use on severely degraded trails throughout the analysis area would involve a trade-off between short-term, recreational use of the analysis area and long-term, environmental productivity. With continued recreational ORV use on unimproved trails, long-term, environmental problems (discussed in Section 4.1) related to soils, wetlands, and vegetation would occur.

Alternatives 3, 4, and 5 do not include actions that would trade long-term productivity of park resources for short-term park uses. Recreational ORV use would not be allowed under Alternative 3. Under Alternatives 4 and 5, trails open to recreational ORV use would be improved to maintainable or design-sustainable conditions to protect park resources.

4.6.2 Irreversible and Irretrievable Commitment of Resources

Irreversible impacts are those effects that cannot be changed over the long term or are permanent. An effect to a resource is irreversible if the resource cannot be reclaimed, restored, or otherwise returned to its condition before the disturbance. An irretrievable commitment of resources refers to the effects on resources that, once gone, cannot be replaced.

By not improving trail conditions, and by continuing to allow ORV use (either recreational or subsistence) on degraded trails, Alternatives 1, 2, and 3 would involve localized, long-term, permanent effects on soils, wetlands, and vegetative communities within the park. As described in Section 4.1, these localized effects would be most widely distributed under Alternative 2. These localized effects would represent a small portion of the entire analysis area, particularly under Alternatives 1 and 3 where recreational ORV use would be limited.

New trail construction under Alternatives 3, 4, and 5 would result in the localized, permanent commitment of park resources directly beneath the permanent trail treads, a small portion of the analysis area. No other irreversible or irretrievable commitments of park resources would be expected under Alternative 4 or 5.

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