Chapter 3:
Affected Environment

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3.0 CHAPTER 3: AFFECTED ENVIRONMENT

3.1 Introduction

This chapter describes the existing environment that could be affected by implementing actions proposed by the alternatives. Physical, biological, and human impact topics identified in Chapter 1 are discussed.

3.2 Overview: Geography and Climate

Located less than 200 miles east of Anchorage, the Wrangell-St. Elias National Park and Preserve encompasses 13.2 million acres and is the National Park System's largest unit. Together with the adjacent Kluane National Park in Canada, this area includes the largest designated wilderness in North America. The Alaska, Chugach, and Wrangell-Saint Elias ranges converge in Wrangell-St. Elias in what is referred to as the "mountain kingdom of North America." The park includes North America's largest assemblage of glaciers, and the greatest collection of peaks above 16,000 feet, including Mount St. Elias (18,008 feet), the second highest peak in the United States (NPS 2009a).

The analysis area falls within the Nabesna District of Wrangell-St. Elias National Park and Preserve (Figure 1-1). This area is traversed by the Nabesna Road, a 42-mile gravel road from Slana to Nabesna that crosses the headwaters of the Copper and Tanana drainages. The Nabesna road is 263 miles and a travel time of approximately 5 hours from Anchorage and 238 miles from Fairbanks. The trailheads for seven of the nine trails (Suslota, Caribou, Trail Creek, Lost Creek, Reeve Field, Tanada Lake, and Copper Lake) considered in this ORV Management Plan/EIS can be accessed directly from Nabesna Road (Figure 1-1). The other two trails, Boomerang and Soda Lake, are accessed from the Copper Lake trail and Lost Creek trail, respectively (Figure 1-1). The first several miles of the Nabesna Road traverse relatively flat landscape. The highest point (3,320 feet) along the Nabesna Road (at mile 25.2) separates waters west of the divide, which drain into the Copper River and ultimately the Gulf of Alaska, from waters east of the divide, which drain into the Nabesna River, a tributary of the Tanana and Yukon rivers, eventually emptying into the Bering Sea. The Copper and Nabesna rivers originate from the meltwaters of the Copper and Nabesna glaciers, respectively, which flow northward into the analysis area.

The analysis area is bounded by the Mentasta Mountains to the north and the Wrangell Mountains to the south. The Mentasta Mountains trend in a northwest-southeast direction from Mentasta Pass to the Nabesna River. From there the slightly higher Nutzotin Mountains continue into Canada. These two mountain ranges form the eastern portion of the Alaska Range, which arches across the state. At an elevation of 8,235 feet, Noyes Mountain is the highest peak in the Mentasta Mountains; its summit, which can be seen from the Nabesna Road, lies on the park's northern boundary (NPS 2009b). The high, glacier-covered volcanoes of the Wrangell Mountains also trend northwest-southeast and the prominent peaks also are visible from the Nabesna Road (NPS 2009b). These include Mount Sanford (16,237 feet), Mount Wrangell (14,163 feet), Capital Mountain (7,731 feet), Tanada Peak (9,240 feet), and Mount Jarvis (13,421 feet).

Much of the analysis area consists of glacial moraines and lakes (Winkler 2000). The largest lakes are Tanada Lake, located immediately west of a portion of the Tanada Lake trail, and Copper Lake, located between the Copper Lake and Tanada Lake trails. South of the Nabesna Road are Tanada Peak and Sugarloaf (5,530 feet), a flat-topped hill composed of the Wrangell Lavas (Winkler 2000). Further west, the Boyden Hills rise to an elevation of 7,260 feet south of Soda Lake trail.

The analysis area lies in a subarctic climatic zone (Happe et al. 1998). Although portions of the park abut the coast, high mountains and icefields act as barriers to the ocean's moderating influence (NPS 1986). The result is that the analysis area has an interior continental climate. Winters are long, dark, and extremely cold with highs of 5 to 7 degrees Fahrenheit (ºF) and nighttime lows dipping to -50ºF (NPS 2006b). Temperatures may remain below freezing for up to 5 months each year. Exceptionally dry snow typically covers the ground to depths of around 2 feet. Spring brings clear skies, increasingly longer days, and warmer temperatures with average highs of 40 to 50ºF. Lows dip into the teens and single digits. June and July are the warmest months, with highs reaching near 80ºF. Snow is possible any month of the year in the highcountry. Summers are relatively wet with frequent drizzling rains, and, in general, rainfall increases in August and September. Fall arrives by mid-August and brings generally clear weather. First lowland snows often fall in September.

3.3 Physical Environment

3.3.1 Soils

3.3.1.1 Soil Types in the Analysis Area

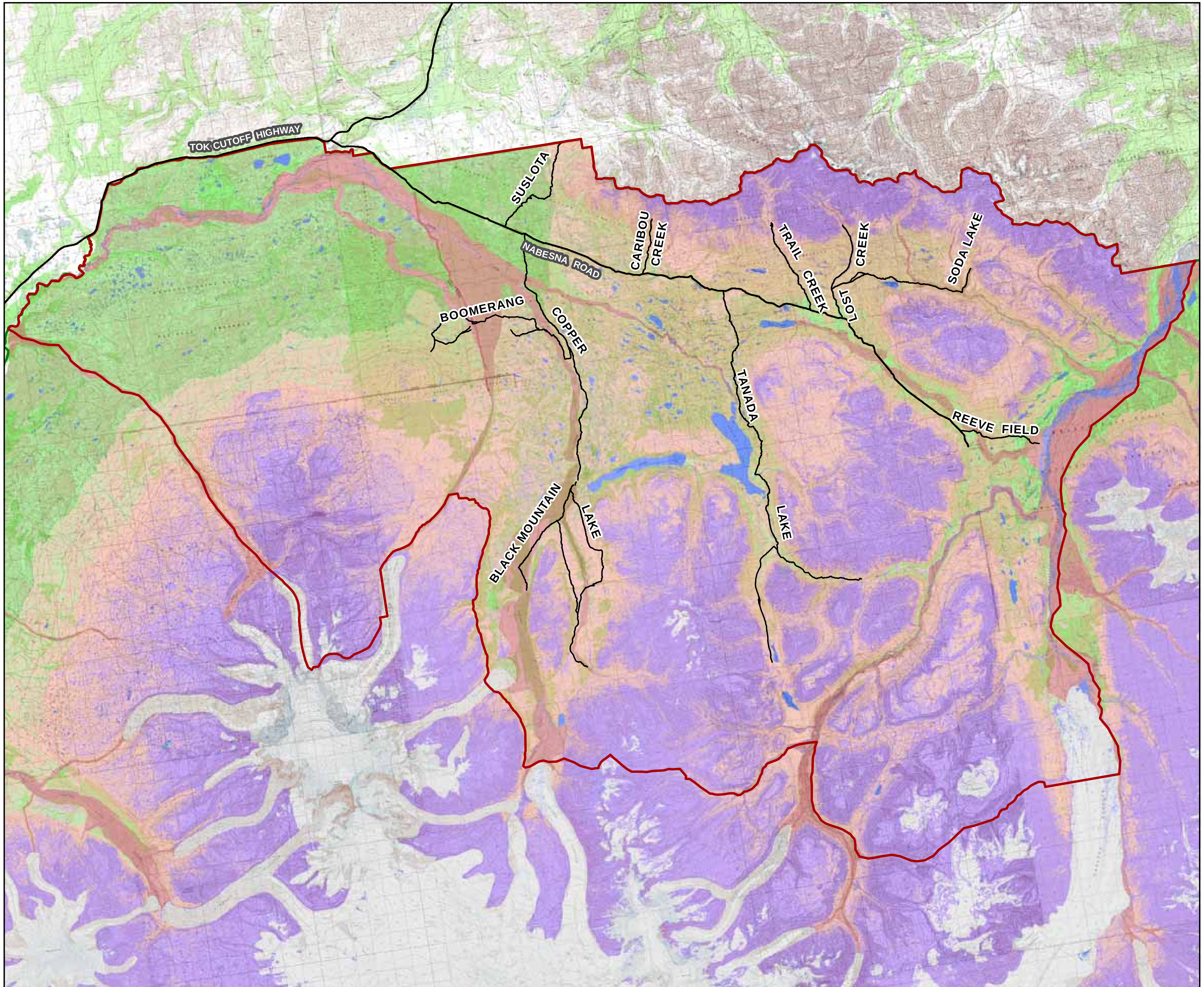
Soils in the analysis area overlie a variety of complex geological materials (Winkler 2000). Along the western extent of the Nabesna Road are extensive, flat-lying alluvial deposits of the Copper River and deposits from glacial Lake Atna and glacial Lake Boomerang. Relatively recent lava flows and intrusive rocks from the Wrangell Volcanic Field abut the analysis area to the south. The Mentasta Mountains along the northern and eastern portions of the analysis area are comprised of Paleozoic and Mesozoic intrusive, sedimentary, as well as the younger volcanic rocks of the Wrangellia Terrane.

Project-level soils mapping has not been completed for the entire analysis area. Soil landscape mapping has been conducted as part of a larger landcover mapping effort (Geographic Resources Solutions 2008). The base layer was developed using satellite imagery, and the landcover map was refined based on field observations, aerial photography, and other GIS data. Generalized groups of soil landscapes are shown on Figure 3-1. At the highest elevations, primarily near the southern extent of the analysis area, soil landscapes consist of Boreal Glaciated Forests, Boreal Glaciated Rocky Barrens and Scrub, and Snow/Glacier. Other high-elevation soil landscapes are Boreal Alpine Rocky Barrens and Scrub. This soil type intermixes with Boreal Alpine Organic-rich Meadows and Boreal Alpine Rocky-Loamy Meadows, and together the soils in these three groups cover much of the analysis area.

The northwestern extent of the analysis area includes Boreal Subalpine Rocky Scrub and Woodlands, and Boreal Upland Rocky-loamy Scrub and Forests, intermixed with Boreal Lowland Loamy Scrub and Forests, Boreal Lowland Organic-rich Meadows, and Boreal Lowland Scrub and Forest Bogs. Smaller patches of these soil landscapes also are mapped in other portions of the analysis area, including along the Nabesna River in the eastern extent of the analysis area. Soil landscapes immediately along the rivers and creeks in the analysis area include Boreal Riverine Rocky-loamy Barrens and Scrub and Boreal Riverine Rocky-loamy Forests. These surface water features include Nabesna River and its tributaries, Jack Creek and Jacksina Creek, as well the Copper River, which enters the analysis area from the south, and its tributaries, Drop Creek, which flows across Boomerang trail, and Boulder Creek, which forms the western boundary of the analysis area.

Small areas of maritime soil landscapes are mapped in the analysis area, although these are too small to be readily visible on Figure 3-1. The remaining portions of the analysis area consist of water mapped as Alpine Lakes, Lowland Lakes, and Rivers.

Figure 3-1
Generalized Groups of Soil Landscapes



Existing Roads
Existing Motorized Trails
Analysis Area

Soil Landscapes

Boreal Alpine
Boreal Alpine Rocky Barrens and Scrub
Boreal Lowland
Boreal Riverine
Boreal Subalpine and Upland
Maritime
Snow/Glacier/Boreal Glaciated
Water

Source: Geographic Resources Solutions 2008.

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Soil types at the Tanada Lake trailhead, Suslota trail, and Reeve Field were evaluated in Allen et al. (2000). Although the soil descriptions for these trails do not represent a complete survey of all trails in the analysis area, they are included because they describe soil types along trails that are susceptible to damage from ORV trails, particularly in the case of the Tanada Lake and Suslota trails. Soils at the Tanada Lake trailhead are Histic Pergelic Cryaquepts with thick organic horizons over predominantly silty soils. Soils at the Suslota site are Pergelic Cryaquepts, characterized by organic matter over silt or clay and subject to periods of saturation. Soils at Reeve Field are Pergelic Cryaquepts with organic materials dominating the upper 20 centimeters; soils are clayey and very moist or wet.

3.3.1.2 Permafrost

Permafrost, or permanently frozen ground, develops when soils remain below freezing for two or more years. The park is in a zone of discontinuous permafrost; permafrost occurs in many areas of the park, although not beneath large lakes, major streams, or south-facing bluffs (NPS 2006c). Permafrost may occur 1 to 10 feet below the surface soil and reach up to 200 feet thick. In summer, some thawing occurs in the active zone—the upper layer of soil that seasonally thaws. The thickness of this active zone affects the size and survival rate of trees and other plants. In general, shallow permafrost occurs in the Wrangell-St. Elias National Park and Preserve in north-facing slopes and valley bottoms; areas with thick moss layers to insulate and prevent thawing; and in woodlands, fens, muskegs, and bogs with primarily black spruce trees. Where permafrost is near the surface, soils are cold, saturated with surface water that cannot drain through the permafrost, and are low in nutrients.

Permafrost presence and absence generally correlates with vegetation type in the analysis area (Happe et al. 1998). The vegetation types that most commonly occur in areas with shallow permafrost (less than 50 centimeters) are: Mesic Sedge-Grass Meadow, Mesic Sedge-Herb Meadow Tundra, Sedge-Willow Tundra, Open Low Mixed Shrub-Sedge Tussock Bog, Closed Low Shrub Birch-Willow Shrub, and Dryas Dwarf Shrub Tundra. These types correspond with the Low Shrub, Dwarf Shrub, and Herbaceous vegetation types described further in Section 3.4.2. These shallow permafrost vegetation types occur on 65 percent or more of the impacted areas in Suslota, Caribou Creek, Tanada Lake, Copper Lake, and Boomerang trails, based on overlaying vegetation with trail areas mapped by St. Mary's University of Minnesota (SMU) (2008). Suslota, Tanada Lake, and portions of Copper Lake trails include extremely degraded portions, as described in Section 3.3.2.

3.3.1.3 Soil Susceptibility to ORV-related Damage

Except where noted, the following information is summarized from Loomis and Liebermann (2006), an overview of the extensive literature available on the effects of ORVs on soil in Alaska. ORV impacts on soils include abrasion, shearing, compaction, displacement (to the outward edges at curves), soil removal (e.g., erosion or splashing), and horizon mixing. The type, severity, and duration of ORV impacts on soils depend on soil and environmental conditions and on ORV use. Temperatures in Alaska limit decomposition processes; as a result, soils develop more slowly and have less potential for recovery from disturbance than soils in warmer climates.

Mucky silt loam and organic silt loam, particularly while saturated and underlain by permafrost, tend to be susceptible to churning and displacement of vegetation and organic matter from ORV use, and consequently have little resistance to ORV impacts. Based on assessments of ORV trails in the analysis area (Allen et al. 2000, Happe et al. 1998), these soil types have greater numbers of trail braids, trail width, ponding, thaw depth, and subsidence depth than well-drained soils. Well-drained gravel-cobble or gravely silt loams had lower numbers of braids, trail widths, ponding, and intermediate thaw depth, demonstrating more resistance to ORV impacts.

In soils susceptible to ORV impacts, shallow mats of roots and organic soils stabilize the soil surface. Reductions in vegetative cover can increase soil bulk density and reduce soil insulation, which can lower water-holding capacity, increase soil subsidence, and increase depth to permafrost (Allen et al. 2000, Ahlstrand and Racine 1990). Saturated ORV trails become excessively widened through braiding, which increases the extent of impacted soils. Wetland soils are unstable and easily churned into impassible muck-holes. Even after the ORV passage, wetland soils can continue to subside. On upland areas, ORV tracks are prone to channelized water flow and subsequent erosion. On ground underlain by permafrost, soil damage 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. Allen et al. (2000) reports 52 miles of braided trails within the Nabesna trail system (excluding the Chisana area), with more than four braids wide for 19 of those miles.

Repeated ORV use on trails generally results in the destruction of the surface organic horizon (e.g., plants, roots, organic litter) and compaction of the soil. This disrupts the drainage pattern and reduces water-holding capacity of the soils and eventually results in ponding water in the trail ruts. Since standing water has a greater heat absorption capacity than bare soil or vegetation, the melting of underlying permafrost is accelerated (Allen et al. 2000). Re-vegetation is an important factor in soil and thermal stabilization. The level of ORV use directly affects the amount of subsidence and the ability of soil to rebound. Soil damage increases with heavier ORVs and with cumulative vehicle use. Damage occurs most rapidly during the first few ORV passes (Ahlstrand and Racine 1990). Even after trail use ends, complete recovery by natural means requires many years (Ahlstrand and Racine 1990).

3.3.1.4 Current Condition of Soils along ORV Trails in Analysis Area

Meyer and Anderson (2007) assessed the trail network in the analysis area from 2004 to 2006 to document trail conditions. The results of their assessment are shown in Figure 3-2 and described in Section 3.3.2. In addition to evaluating trail condition, Meyer and Anderson (2007) also assessed several characteristics relevant to soils, including extent of mud and muck-holes, extent of rutting and subsidence, soil drainage, and natural trail surfaces. The attributes that reflect the highest degree of soil degradation are summarized in Table 3-1. The trails characterized with substantial portions (at least 50 percent) in degraded conditions for all four attributes include Boomerang, Copper Lake, Suslota, and Tanada Lake.

Although most of the Reeve Field trail is not deeply rutted, it has developed muddy areas and muck-holes with poor drainage and susceptible surface types through 88 percent or more of its area. Lost Creek and Trail Creek trails were rated with the smallest extent of degraded soil conditions. Gravel substrates dominate both trails (91 percent of Lost Creek and 74 percent of Trail Creek). Caribou Creek and Soda Lake trails also have relatively few degraded areas. These trails cross native fine mineral and organic soils more than other substrates (93 percent of Caribou Creek and 68 percent of Soda Lake).

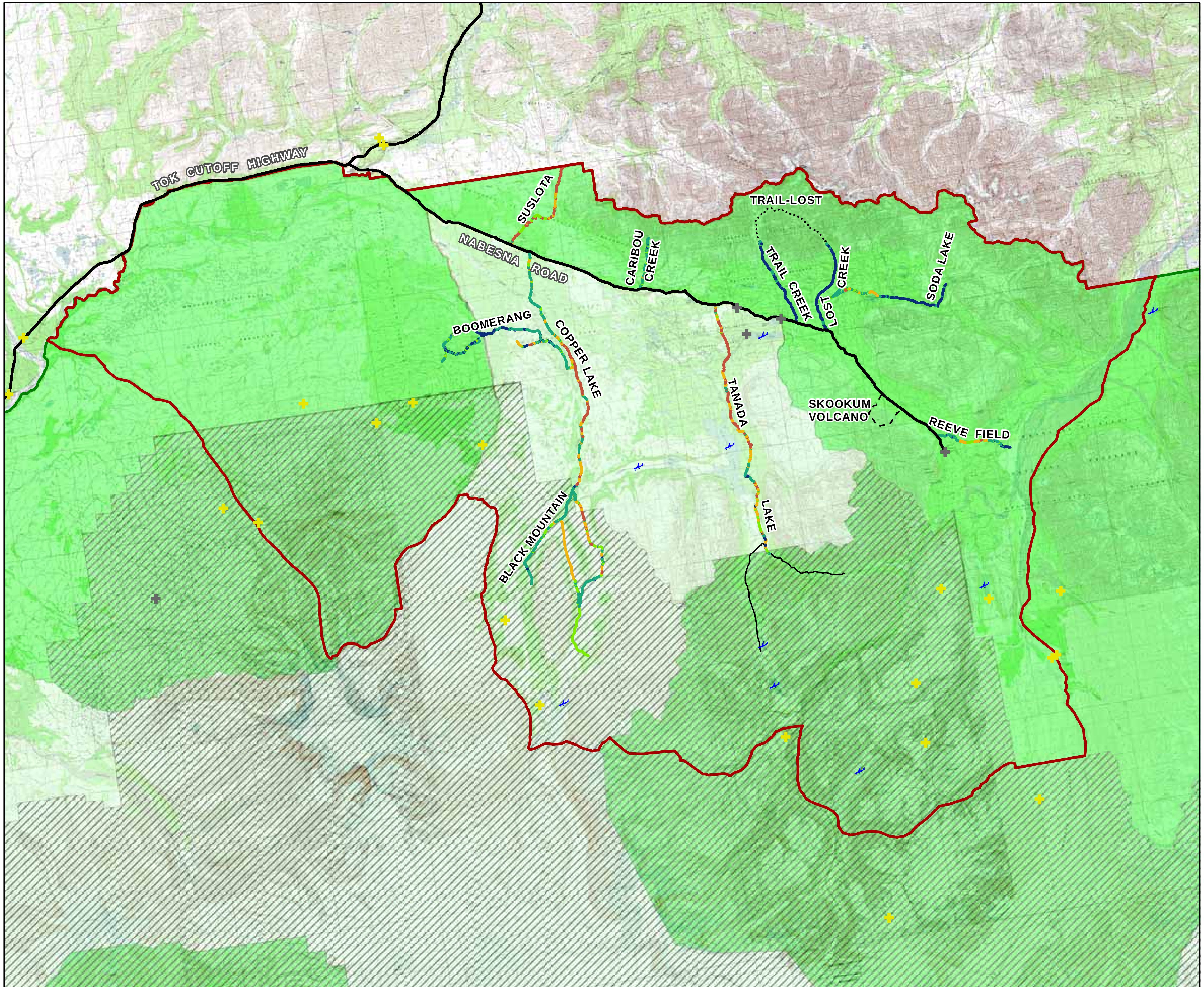

Figure 3-2
Analyzed Road and Trail Network

Trail conditions assessed in 2004 - 2006 by Meyer and Anderson.
Most airstrips shown on this map are not maintained and are not suitable for general public use.
Suitability for use is highly dependent on weather conditions, type of aircraft, and pilot skill.

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Table 3-1. Existing Soil Degradation by Trail in the Analysis Area

Trail Name	Total Area Impacted (acres)	Extremely Muddy, Muck-Hole, or Multiple Muck-Holes		Rutting or Subsidence 9 to 60 Inches Deep		Saturated, Ponded, or Flowing		Native Fine Mineral, Native Organic, Wetland Vegetated, or Floating Organic Surface Type	
		Area (acres)	Extent (%)	Area (acres)	Extent (%)	Area (acres)	Extent (%)	Area (acres)	Extent (%)
Black Mountain	4.7	0.3	7	0.1	1.1	1.2	26.4	1.8	38.5
Boomerang	32.9	17.7	54	21.9	66.4	25.8	78.3	26.1	79.4
Caribou Creek	8.3	0.9	11	0.4	5.2	1.2	14.7	7.7	92.6
Copper Lake	228.0	165.1	72	152.6	66.9	117.5	51.5	222.5	97.6
Lost Creek	3.5	<0.1	<1	<0.1	<1	<0.1	<1	0.2	7.1
Reeve Field	29.4	26.4	90	3.8	13.1	25.8	87.9	27.5	93.7
Soda Lake	17.8	6.7	37	6.9	39.0	4.5	25.4	12.0	67.6
Suslota	180.5	133.5	74	106.4	59.0	133.0	73.7	176.6	97.9
Tanada Lake	253.5	221.3	87	201.7	79.6	202.5	79.9	235.1	92.7
Trail Creek	4.8	<0.1	<1	<0.1	<1	0.1	1.7	0.2	4.3
Total	**763.3**	**571.9**	**75**	**493.8**	**65**	**511.6**	**67**	**709.8**	**93**

3.3.2 Trail Condition

3.3.2.1 Summary of Existing Trails in the Analysis Area

At the time Wrangell-St. Elias National Park and Preserve was established, people had been using ORVs in backcountry areas included within the new park for over 30 years. While some of the current ORV trails may have originated as informal foot or game trails, people developed others to provide access to cabins, lodges, mining claims, and hunting areas. As discussed in Chapter 1, this ORV Plan/EIS focuses on nine trails and the existing trail systems in designated wilderness south of Copper Lake (Black Mountain) and south of Tanada Lake. There are approximately 94 miles of other motorized trails in the area, and they are shown in Figure 3-3. Location and condition information on these trails is based on trail inventory done in 1986 (Connery 1987). Most receive light use (less than 20 passes per year) by local subsistence ORV users and consequently have few impacts associated with them. Some were receiving no use in 1986 and would be hard to locate now. Figure 3-4 shows representative conditions for this set of trails: Lightly used, with tracks and some ruts visible, but vegetated tread in most portions. This photo was taken on the Jacksina trail. Use on these trails is not expected to increase within the planning period. The exception is the Batzulnetas trail, used to access private lands, subsistence fishwheel sites, and an NPS fish research facility on Tanada Creek. This trail receives a high level of motorized use (greater than 200 passes per year) and has segments in degraded condition. No recreational ORV use is permitted on this trail. A map of all known existing trails in the analysis area is shown in Figure 3-3 and the effects of these trails are considered in cumulative effects analysis in Chapter 4 of this document.

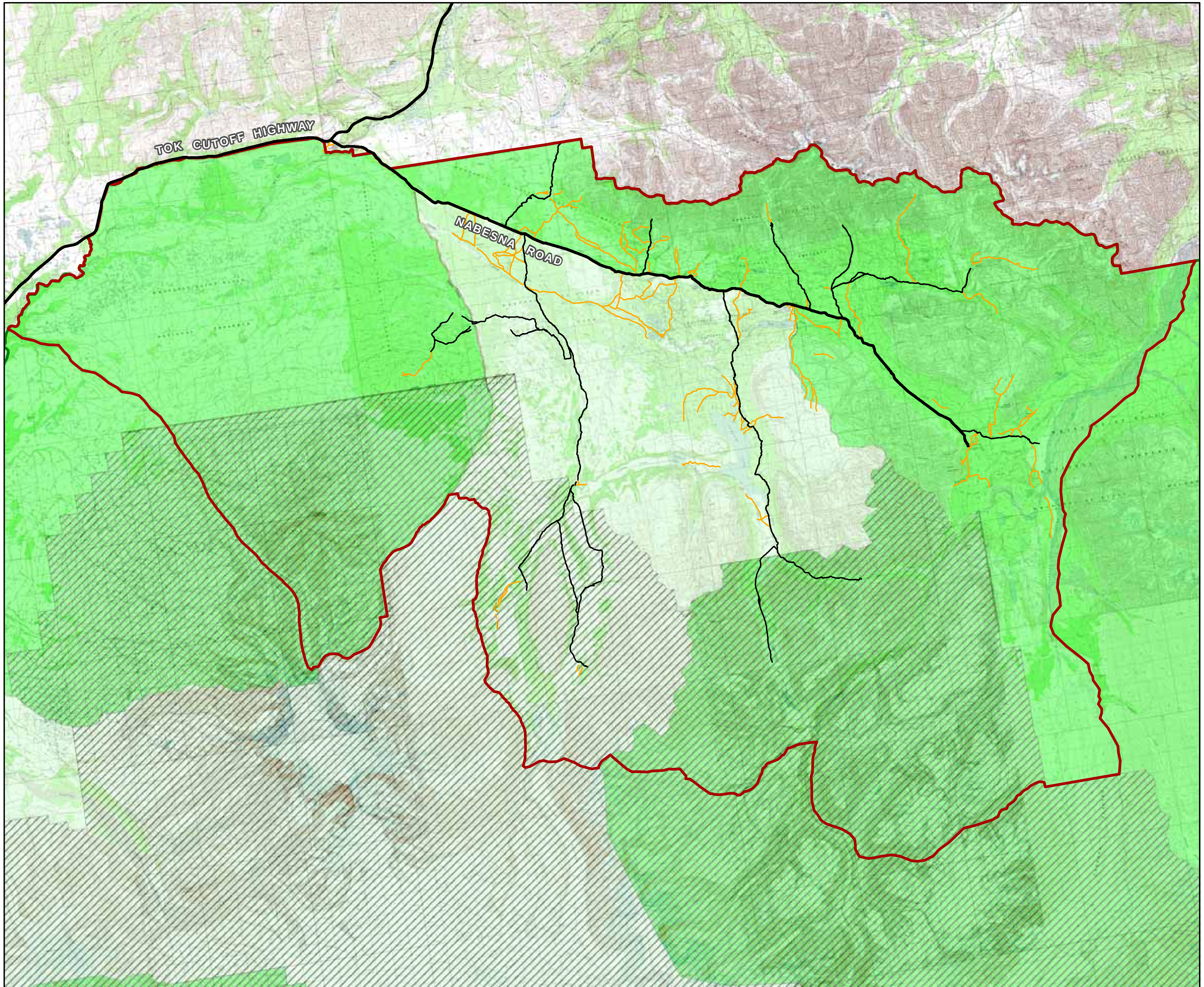
The nine trails considered in detail in this analysis and the wilderness trail systems are primarily accessed using the Nabesna Road, a 42-mile gravel road from Slana to Nabesna that crosses the headwaters of the Copper and Tanada river drainages. The trailheads for seven of the nine trails (Suslota, Caribou Creek, Trail Creek, Lost Creek, Reeve Field, Tanada Lake, and Copper Lake) can be accessed directly from Nabesna Road. The other two trails, to Boomerang Lake and Soda Lake, are accessed from the Copper Lake trail and the Lost Creek trail, respectively. The following discussion provides an overview of trails in the analysis area, based primarily on information provided in the park's ORV brochure (NPS 2009c);

Figure 3-2 is a map of the analyzed trails in the analysis area.

Suslota Trail

The Suslota trail is accessed at mile 11 of the Nabesna Road. From the road, the trail extends approximately 8 miles within the National Preserve to the unit boundary with an estimated travel time by ORV of 4 to 6 hours. Traveling this trail can be extremely difficult because the trail crosses areas of muskeg, mud bogs, standing water, and tussocks. Physical conditions on the trail vary over time based on season of use, seasonal rainfall, and amount of recent use, but are generally poor and very wet. This trail is open to ORV use for subsistence purposes but is closed to recreational ORV use and is not recommended for hiking. The trail is also used to access private lands north of the park. Trail counter data from 2008 showed very light use on this trail (52 ORVs), with 88 percent of that use occurring during hunting season (NPS 2008b). Snowmachine use on the trail is very light (0–5 round trips/week) and consists of local use for trapping.

Figure 3-3
Existing Road and Trail Network



Existing Roads
Analyzed Motorized Trail
Other Motorized Trails
Analysis Area
Wrangell-St. Elias
Park
Park/Wilderness
Preserve
Preserve/Wilderness

Trail conditions assessed in 2004 - 2006 by Meyer and Anderson.
Other trails from 1984 trail inventory.

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Figure 3-4. Jacksina Trail, Representative of Other Motorized Trail Conditions

Copper Lake Trail

Access for the Copper Lake trail is at mile 12.2 of the Nabesna Road. Trail length is approximately 19.4 miles to the wilderness boundary, where recreational ORV use ends. Travel time on this trail by ORV is estimated at approximately 4 to 6 hours. Physical conditions on the trail vary over time based on season of use, seasonal rainfall and amount of recent use. The trail surface for the first 6 miles is generally firm soil, but the remainder of the trail crosses numerous mud bogs and can be very wet. The first 2.5 miles of the trail to the Tanada Creek crossing can be suitable for hiking, but most use is by ORV. This trail is currently open to ORV use for subsistence purposes but is closed to recreational ORV use south of the Boomerang trail turn-off and is not recommended for hiking. Copper Lake trail is also used to access inholdings on the east and west side of Copper Lake. Trail counter data from 2008 showed 75 percent of the use on the trail occurred during hunting season (NPS 2008b). The trail receives light snowmachine use (5–10 round trips per week), mostly consisting of local residents accessing Copper Lake for ice fishing.

Boomerang Trail

The Boomerang trail is accessed via the Copper Lake trail, for which the trailhead is at mile 12.2 of the Nabesna Road. The Boomerang trail begins at approximately mile 8 of the Copper Lake trail and follows a looped route to the west, eventually crossing the Copper River and accessing Boomerang Lake in the preserve (NPS 2008a). The trail is approximately 10 miles long and crosses tussock tundra along most of its course. The trail is generally in a non-braided condition because of the low use level resulting from the fact that tracked rigs are needed to make the crossing of the Copper River. This trail is not suitable for hiking use as the Copper River tends to create a barrier for foot travel.

Black Mountain Trail System

This trail system consists of 22.1 miles of trail in the designated wilderness, south of Copper Lake. It is accessed via the Copper Lake trail. This trail system is closed to recreational ORV use but open for non-motorized use and to federally qualified subsistence ORV users. The trail system consists of three main trails. The Black Mountain spur accesses the west side of Black Mountain and is mostly in good and fair condition. South Copper Lake trail splits into two main trails and is mostly in degraded, very degraded, and severely degraded condition. Most of the existing trail use is associated with subsistence sheep hunting in the Black Mountain area. These trails see very limited winter snowmachine use (0–5 round trips per week).

Caribou Creek Trail

Parking for use of the Caribou Creek trail is at mile 18.9 of the Nabesna Road, while the trailhead is at mile 19.2. The trail is approximately 4 miles long and is recommended for both hiking and ORV use. Most of the ORV use occurs in August and September, during hunting season. Travel times average 1 to 2 hours by ORV and 3 to 4 hours for hikers. The trail surface is primarily soil and rocky creek bed. Again, conditions vary with season and seasonal rainfall but are generally fair to good. Some winter snowmachine use occurs (5–10 trips per week). This use may increase with the installation of a public use cabin in 2009.

Tanada Lake Trail

The Tanada Lake trail is accessed at mile 24.0 of the Nabesna Road. Trail length from the road to the wilderness boundary is approximately 17 miles, and travel time via ORV is typically 8 to 10 hours. Travel along this trail is considered extremely difficult due to deep mud bogs, tussocks, and poor drainage, although conditions improve somewhat beyond Tanada Lake. The poor conditions are worsened after rain and heavy use. This trail is not recommended for use by hikers, but some hikers use the trail to access the lake and surrounding hunting areas. According to trail counter data from 2008, 86 percent of the ORV use on the trail occurs during hunting season, but the trail also provides access to private inholdings (NPS 2008b). The trail is closed to recreational ORV use. Portions of the trail are used in the winter by snowmachines accessing Tanada and Copper Lakes for ice fishing, but use is still light (5–10 round trips per week).

Trail System South of Tanada Lake

This trail system includes the Goat Creek trail (8 miles) and Pass Creek trail (5 miles). Both are located entirely within the designated wilderness south of Tanada Lake. Only non-motorized use and ORV use by federally qualified subsistence users is permitted. Access is via the severely degraded and challenging Tanada Lake trail. Consequently, these trails see little motorized use (estimated at less than 20 round trips per year). Both trails pass through closed and open needleleaf forests; closed and open, tall and low shrub scrubland; and dry and mesic graminoid herbaceous vegetation communities. Trail conditions are fair, with some degraded segments. These trails receive very little winter snowmachine use (0–5 round trips per week).

Trail Creek Trail

The Trail Creek trail is accessed at mile 29.0 of the Nabesna Road, with an approximate trail length of 6 miles and travel time of 2 to 3 hours by ORV. Most ORV use occurs during hunting season. The trail surface consists largely of alluvial gravels within an active floodplain, and conditions are generally good, but rain and snowmelt can cause dramatic changes in the water levels at the numerous stream crossings that make travel conditions more difficult. This trail is considered appropriate for hikers who have good conditioning and backcountry skills. Trail Creek trail receives limited snowmachine use in the winter (0–5 round trips per week), mostly by local residents accessing traplines.

Lost Creek Trail

The Lost Creek trail is accessed at mile 30.8 of the Nabesna Road. Trail length is approximately 6 miles, with the cutoff to Big Grayling/Soda Lake located at the 2 mile mark. Travel time is about 2 to 3 hours by ORV. The trail surface is primarily alluvial gravels within an active floodplain and packed soil, with some sections in forest adjacent to the creek. Conditions are generally good. Again, rain and snowmelt can cause dramatic increases in water levels at the numerous stream crossings along the trail. This trail is considered appropriate for hikers, for which a loop trip via Trail Creek and Lost Creek is popular.

Both Trail Creek and Lost Creek Trails have somewhat indistinct alignments, as braided stream channels actively migrate across the floodplain. Generally, there are several routes of travel within the floodplain to follow. Lost Creek trail receives limited snowmachine use in the winter (0–5 round trips per week), mostly by local residents accessing traplines.

Soda Creek Trail

This trail, formerly known as the Big Grayling Lake trail or Soda Creek trail, is accessed from the Lost Creek trail at the 2 mile mark. It is approximately 2.5 miles from that point to Big Grayling Lake and 10 miles to Soda Creek Mineral Spring. The recreational ORV trail ends at the campsite at Soda Creek, with travel beyond to the mineral spring and Soda Lake by foot. The travel time is about 4 to 5 hours by ORV. Trail conditions vary with season, seasonal rains, and amount of recent use, but are generally fair with a few significantly degraded sections of deep ruts and mud bogs. The trail is considered only fair for hiking use. Trail counter data from 2008 showed 85 percent of the ORV use occurred during hunting season (NPS 2008b). The Soda Creek Trail also accesses and crosses private inholdings.

Reeve Field Trail

The Reeve Field trail is accessed at mile 40.2 of the Nabesna Road. It has an approximate length of 5.3 miles and a travel time of about 3 to 4 hours by ORV. The trail surface is firm soil and a few short corduroy improvements for the first 2 miles, with tussocks and mud bogs present in the remainder of the trail. Travel on this trail is considered difficult due to the mud bogs and tussocks. The first mile of the trail to Jack Creek is considered an easy hike, but crossing Jack Creek can be hazardous under high water conditions. This trail receives very little hiking use and most ORV use occurs during hunting season. Reeve Field Trail is also used to access private inholdings. Reeve Field trail receives limited snowmachine use in the winter (0–5 round trips per week), mostly by local residents accessing traplines. It is also used as the start of a winter access route to Chisana.

3.3.2.2 Trail Conditions

Condition Classification

In 2004 NPS regional office staff initiated a Global Positioning System (GPS)-based inventory of trail alignments and detailed physical characteristics of the established ORV trails (Meyer and Anderson 2007). Based on these data, the NPS classified trail segments by their physical conditions, using five categories ranging from good to extremely degraded. Condition classification was based on several measured factors, including trail width, rutting, mud/muck index, slope, and soil substrate. Trail conditions for the nine trails in the Nabesna District addressed within the 2007 settlement are summarized in Table 3-2 and examples of trail conditions by class are shown in Figures 3-5 through 3-9. Overall, out of 116 total miles of trail inventoried, 23 miles (20 percent) were considered in good condition, while 39 miles of trail (33 percent) were considered in fair condition. Trail segments that were considered degraded totaled 15 miles (13 percent), with 20 miles (17 percent) considered very degraded and almost 19 miles (16 percent) considered extremely degraded. The aggregate trail mileage in the three degraded condition categories amounted to 54 miles, or 47 percent of the total mileage for the nine trails. The Copper Lake trail (which includes the Black Mountain trail system) had the highest number of miles considered degraded at 24 miles. The Lost Creek trail had no miles of degraded trail and the Trail Creek trail only had approximately 0.1 mile of degraded trail. By comparison, 96 percent of the Suslota trail was in some level of degraded condition, with 57 percent considered extremely degraded. Similarly, nearly 84 percent of the Tanada Lake trail was considered to be in a degraded condition with almost 43 percent being extremely degraded.

Table 3-2. Condition Classification by Trail

Trail Name	Miles of Trail by Condition Class					
	Good	Fair	Degraded	Very Degraded	Extremely Degraded	Total Miles[1]
Boomerang	5.0	8.2	2.1	1.5	0.1	16.9
Caribou Creek	0.2	2.7	0.6	0.2	0.0	3.7
Copper Lake[1]	0.4	17.5	7.3	9.8	6.5	41.5
Lost Creek	5.5	0.4	0.0	0.0	0.0	5.9
Reeve Field	0.6	2.5	0.8	1.0	0.1	5.0
Soda Lake	5.6	4.2	1.2	0.8	0.3	12.1
Suslota	0.0	0.3	1.6	1.3	4.2	7.4
Tanada Lake	0.6	2.3	1.6	5.6	7.5	17.6
Trail Creek	5.3	0.7	0.1	0.0	0.0	6.1
Total	**23.2**	**38.8**	**15.3**	**20.2**	**18.7**	**116.2**

[1] Total miles include unofficial trail cutoffs that were observed in the field during the trail condition assessment. For that reason, trail lengths shown in this Table differ from trail lengths in other tables

[2] Black Mountain trails included in Copper Lake trail totals.

Source: Assessment Characteristics from Meyer and Anderson (2007) GIS layer.

Figure 3-5. Example of Good Trail Condition along Lost Creek Trail

Figure 3-6. Example of Fair Trail Condition along Trail Creek Trail

Figure 3-7. Example of Degraded Trail Condition along Copper Lake Trail

Figure 3-8. Example of Very Degraded Trail Condition along Tanada Lake Trail

Figure 3-9. Example of Extremely Degraded Trail Condition along Suslota Trail

Trail Widths

Trail widths for trails in the Nabesna District are summarized in Table 3-3. Track widths were estimated in the field in 2008 at points perpendicular to the direction of travel (SMU 2008) (St Mary's University of Minnesota 2008). Trail width classifications range from 3–6 feet, which is typical of a well-used ORV trail, up to 160–320 feet, which is indicative of a braided impact area. Approximately 62 miles of trail were considered to have typical ORV width (3–6 feet), while very braided trail segments (160–320 feet) totaled 1.6 miles. Only a 1.3-mile segment of the Tanada Lake trail and a 0.3-mile segment of the Copper Lake trail were wider than 160 feet, although four other trails (Boomerang, Reeve Field, Soda Creek, and Suslota) also had trail segments with widths greater than 20 feet. Nearly 83 percent of the Tanada Lake trail was classified as having braided conditions (widths more than 6 feet). The Lost Creek, Caribou Creek, and Trail Creek trails were generally classified as typical ORV width and had little or no mileage in categories wider than 3–6 feet.

Table 3-3. Widths of Trails

Trail Name	Miles of Trail by Width in Feet							
	3–6 Feet	6–20 Feet	20–40 Feet	40–80 Feet	80–160 Feet	160–320 Feet	None	Total
Boomerang	12.8	2.5	1.2	0.3	0.0	0.0	.2	17.0
Caribou Creek	3.4	0.2	0.0	0.0	0.0	0.0	0.0	3.6
Copper Lake	16.4	9.1	3.7	4.6	2.5	0.3	0.0	36.6
Lost Creek	5.9	0.0	0.0	0.0	0.0	0.0	0.0	5.9
Reeve Field	3.6	1.1	0.2	0.1	0.0	0.0	0.0	5.0
Soda Lake	10.2	0.9	0.3	0.6	0.0	0.0	0.0	12.0
Suslota	0.2	1.7	1.0	3.1	1.3	0.0	0.0	7.3
Tanada Lake	3.0	3.6	3.6	3.5	2.5	1.3	0.0	17.5
Trail Creek	6.0	0.1	0.0	0.0	0.0	0.0	0.0	6.1
Total Miles	**61.5**	**19.2**	**10.0**	**12.2**	**6.3**	**1.6**	**0.2**	**111.0**

Source: St. Mary's University of Minnesota (2008) ORV width GIS layer

3.3.2.3 Subsistence vs. Recreational ORV Trail Use

The NPS requires recreational ORV users to obtain a permit for their planned use, and encourages all subsistence users to obtain permits. A major component (approximately 85 percent) of recreational ORV use includes the use of ORVs to support sport hunting. This includes accessing dispersed campsites and potentially transporting harvested meat. A smaller component includes the use of ORVs to access fishing, dispersed camping, or non-motorized hiking. A portion of recreational ORV users in the analysis area are individuals who have long-standing ties to the area or have family members still living in the area. These individuals may have moved to urban areas of the state for job opportunities and are no longer federally qualified subsistence users. During the 16-year period from 1995 to 2010, the NPS issued a total of 4,544 permits for ORV use at Wrangell-St. Elias Park and Preserve (NPS 2008b; see Table 3-4). Recreational users accounted for 75 percent of these permits, while subsistence users represented 25 percent of the permits issued. The proportion of subsistence permits to total annual ORV permits issued ranged from approximately 18 percent (2008) to 31 percent (2001). Overall, the average number of permits issued for these years was 284, with a peak at 376 total permits issued in 2009 and a low of 179 permits in 1997. The total number of annual permits exceeded the 16-year average of 284 permits in 11 of the past 16 years, suggesting that ORV use since 2000 has generally been higher than in years prior to 2000. In general, the numbers of recreational ORV permits issued in the analysis area have increased over time (NPS 2009d), as have the numbers of subsistence ORV permits, at a slower rate. However, estimating actual use from permit numbers introduces some uncertainty about the level of recreational ORV use because permittees indicate the trails they *intend* to visit prior to going to the field. Those trail lists are not necessarily indications of actual use, because permit holders might end up using trails other than those indicated. In addition, a permit holder might end up making multiple trips. Similarly, estimating actual use from the number of subsistence permits, which are not required, underestimates subsistence use. The NPS estimates that only 25 percent of subsistence ORV users obtain permits.

Table 3-4. Number of Permits Issued for Subsistence and Recreational ORV Use, 1995–2010

Year Permit Issued	Number of Permits Issued		
	Subsistence	Recreation	Total
1995	52	172	224
1996	63	205	268
1997	45	134	179
1998	71	184	255
1999	78	181	259
2000	79	219	298
2001	88	200	288
2002	88	201	289
2003	85	251	336
2004	45	138	183
2005	66	228	294
2006	82	230	312
2007	86	210	296
2008	63	280	343
2009	74	302	376
2010	81	263	344
Total	**1,146**	**3,398**	**4,544**

Source: NPS 2008a.

Within the Nabesna District, the NPS uses ORVs administratively for the following purposes: 1) ranger patrols and search and rescue; 2) trail maintenance; 3) support for inventory and monitoring activities; and 4) data collection for specific projects (such as trail assessment, cultural resource surveys, and stream crossing data collected in association with this EIS). Absent the latter category (data collection associated with this EIS), NPS administrative use accounts for less than 10 percent of the total use on any given trail. The exception is the Batzulnetas trail, which accesses an NPS fish-monitoring weir. On that trail, NPS administrative use accounts for at least 50 percent of the total use.

Current recreational and subsistence ORV use levels, as measured by round trips, were estimated based on permit records, ORV permittee phone surveys, harvest data, and trail counter data (Table 3-5). Considering ORV trails throughout the analysis area, current (post-lawsuit settlement) ORV use is fairly evenly split between recreational and subsistence, with 437 and 480 round trips, respectively, on average each year. Trails with the greatest percentages of recreational ORV use (over 70 percent) include Caribou Creek, Lost Creek, Soda Lake, and Trail Creek (Table 3-5). Trails with the greatest percentages of subsistence ORV users (Black Mountain, Copper Lake, Suslota, and Tanada Lake, and the trail system south of Tanada Lake) are those trails closed (seasonally or otherwise) to recreational use.

Table 3-5. Current Recreational and Subsistence ORV Use (annual average round trips) and Proportion of Each on Affected Trails (post-settlement)

Trail	Recreational ORV Use		Subsistence ORV Use[1]		Total ORV Round Trips
	Number of Round Trips	Percent of Total Round Trips	Number of Round Trips	Percent of Total Round Trips	
Black Mountain[2]	0	0.0%	55	100.0%	55
Boomerang	5	50.0%	5	50.0%	10
Caribou Creek	90	75.0%	30	25.0%	120
Copper Lake	20	16.0%	105	84.0%	125
Lost Creek	114	74.0%	40	26.0%	154
Reeve Field	25	55.6%	20	44.4%	45
Soda Lake	63	71.6%	25	28.4%	88
Suslota	0	0.0%	60	100.0%	60
Tanada Lake	0	0.0%	65	100.0%	65
Trails south of Tanada Lake	0	0	40	100	40
Trail Creek	120	77.4%	35	22.6%	155
Total	**437**		**480**		**917**

[1] Includes ORV use for accessing private inholdings.

[2] Black Mountain includes all trails in wilderness south of Copper Lake.

Source: NPS 2009d.

3.4 Biological Environment

3.4.1 Wetlands

Wetlands are defined jointly by the EPA and the U.S. Army Corps of Engineers (Corps) as areas that are inundated or saturated by surface or groundwater at a frequency sufficient to support a prevalence of vegetation adapted for life in saturated soil conditions (Environmental Laboratory 1987). They represent a transition zone between upland and open water habitats. Wetlands are considered to be an ecologically important resource, as they serve a variety of physical, biological, and chemical functions within an ecosystem (discussed in more detail in Section 3.4.1)

On federally managed lands, Executive Order 11990 requires that all federal agencies "avoid adverse impacts associated with the destruction or modification of wetlands wherever there is a practical alternative" and to "include all practicable measures to minimize harm to wetlands." In addition, federal agencies are required to preserve and enhance the "natural" and "beneficial" values of wetlands, while carrying out their responsibilities. Other regulations/laws related to wetlands include Section 404 of the Clean Water Act, which is administered by the Corps. Section 404 establishes requirements for dredge and fill activities within waters of the U.S. (which includes wetlands), and requires a detailed project analysis to determine if wetland impacts may be avoided or, if unavoidable, can be minimized to the extent practicable.

This section describes the current condition of wetland resources in the analysis area. The discussion will first describe the wetland types found within the analysis area. Next the current level of ORV disturbance to these wetlands will be presented, along with a brief discussion of the function and values that these wetlands could serve. In addition, wetlands are susceptible to invasion by exotic plant species; a discussion of these exotic species is presented in Section 3.4.2.

Existing Wetland Resources

Knowledge of existing wetland resources within the Wrangell-St. Elias National Park and Preserve is based on the National Wetland Inventory (NWI) Database of Alaska, inventories of vascular flora conducted by the NPS (Cook et al. 2007), and a remote sensing effort that utilized aerial photography and photo interpolation (SMU 2008, NPS 2008c). Approximately 217,590 acres of wetlands are located within the analysis area. The wetland types found within the analysis area include palustrine emergent (emergent), palustrine scrub-shrub (scrub-shrub), palustrine forested (forested), and riverine wetlands, as well as a small number of palustrine unconsolidated bottom and palustrine aquatic bed (collectively referred to as ponds), and lacustrine wetlands (see Figure 3-10). These classifications are based on the Classification of Wetlands and Deepwater Habitats of the United States (Cowardin et al. 1979), and are summarized below.

Palustrine Emergent Wetlands (emergent)—Emergent wetlands are characterized by erect, rooted, herbaceous hydrophytes that are typically present for most of the growing season. The analysis area contains approximately 36,824 acres of emergent wetlands.

Palustrine Scrub-Shrub Wetlands (scrub-shrub)—Scrub-shrub wetlands are dominated by shrubs, young trees, or mature trees that have been stunted due to environmental conditions. Vegetation is typically less than 6 meters tall. The analysis area contains approximately 102,492 acres of scrub-shrub wetlands.

Palustrine Forested Wetlands (forested)—Forested wetlands contain woody vegetation that is 6 meters tall or taller. The analysis area contains approximately 38,785 acres of forested wetlands.

Palustrine Unconsolidated Bottom and Aquatic Bed Wetlands (ponds)—Two types of ponded wetlands occur within the analysis area. Ponded palustrine wetlands that have at least 25 percent bottom cover of particles smaller than stones (less than 3 inches in size) and a vegetation cover of less than 30 percent are considered to have unconsolidated bottoms. The analysis area contains approximately 5,550 acres of unconsolidated bottom ponded wetlands; however, none are crossed by existing trails. Ponded wetlands that tend to have deeper water and are dominated by plants that grow principally on or below the surface of the water for most of the growing season are considered to have aquatic beds. Approximately 810 acres of aquatic bed ponded wetlands occur within the analysis area; however, none are crossed by existing trails.

Lacustrine Wetlands—Lacustrine wetlands are essentially lakes, and are defined as wetlands situated in a topographic depression or dammed river channel, that lacks vegetation and has a total area that exceeds 20 acres in size. There are approximately 9,526 acres of lacustrine wetlands within the analysis area. The largest of these include Jack Lake, Tanada Lake, and Copper Lake. No lacustrine wetlands are crossed by existing trails.

Riverine Wetlands—Riverine wetlands are freshwater wetland habitats contained within a channel, which are not dominated by trees, shrubs, emergents, moss, or lichens; and do not contain ocean-derived salts in excess of 0.5 percent. The analysis area contains approximately 23,604 acres of riverine wetlands.

Current Condition of Wetlands in the Analysis Area

Due to the remoteness of the area and the lack of human activity, most of the wetlands within the analysis area have been undisturbed. Within the analysis area, the system of roads and trails are the primary source of impact to wetlands. Table 3-6 lists the miles of each wetland type and the acres currently impacted by the trails considered within the analysis area. In all cases, less than one percent of wetlands within each wetland type have been affected. The trails considered within the analysis area consist of the nine trials addressed within the 2007 settlement (Boomerang, Caribou Creek, Copper Lake, Lost Creek, Reeve Field, Soda Lake, Suslota, Tanada Lake, and Trail Creek trails), as well as the trail system south of Tanada Lake and the Black Mountain trail system.

Table 3-6. Disturbances to Wetland Types from Existing ORV Trails in the Analysis Area [1]

Wetland Type	Acres Within the Analysis Area	Miles Crossed by Existing Trails	Acres Impacted by Existing Trails
Palustrine Emergent	36,823.9	22.3	184.3
Palustrine Scrub-Shrub	102,491.9	20.8	254.0
Palustrine Forested	38,784.9	1.5	1.5
Palustrine Unconsolidated Bottom (pond)	5,549.6	0	≤ 0.1
Palustrine Aquatic Bed (pond)	810.1	0	0
Lacustrine	9,526.3	0	≤ 0.1
Riverine	23,603.7	20.0	15.7
Total Disturbance		**64.6**	**455.5**

[1] Trails considered in this Table include the Black Mountain, Boomerang, Caribou Creek, Copper Lake, Lost Creek, Platinum, Reeve Field, Soda Lake, Suslota, Tanada Lake, and Trail Creek trails.

Source: SMU (2008) vegetation geodatabase along ORV trails.

Wetlands are particularly susceptible to impacts from ORVs using the system of roads and trails found within the analysis area (Ahlstrand and Racine 1990, Happe et al. 1998). Root systems in wetlands are typically shallow (often within the top 25 centimeters of soil) and easily impacted by even limited ORV use (Loomis and Liebermann 2006). In addition, ORV use within wetlands has resulted in the creation of large muck-holes, which can become impassable by ORV. When this occurs, ORV users have moved onto adjacent lands in order to bypass these muck-holes, resulting in the expansion of trail widths. This has created a braided pattern of trails through these wetlands, which has increased the acreage of impact per trail mile beyond what would be necessary for a single-track trail. While single-tracked non-braided ORV trails in Alaska impact about 1 acre of vegetation per mile, braided trails can be up to 0.25 mile wide (Myers 2002), resulting in a 160-acre impact per mile.

Most of the wetlands found within the analysis area are high quality wetlands in regards to their function within the landscape and their support of the hydrologic, geochemical, and biological processes that occur within this area. The primary functions and processes provided by wetlands in the analysis area include: flood-flow alteration and storage, which in turn are related to erosion control and sediment stabilization; groundwater recharge and discharge; nutrient cycling; carbon/detrital export; and fish and wildlife habitat.

The wetlands that provide flood-flow alteration/storage include those located in the lower portion of a watershed, which are large in size (relative to the watershed), and contain dense herbaceous vegetation and flat slopes (Corps 2000). Wetlands that contribute to groundwater recharge and discharge include those with gravel or sandy soils (allowing water movement in and out of the wetland) and located near perennial or intermittent watercourses (Corps 2000). Those that contribute to erosion control and sediment stabilization include wetlands with deep and dense root systems located on steep slopes (greater than 7 percent) above water courses or other sediment sensitive resources (Corps 2000). Wetlands that support nutrient cycling and carbon/detrital export include any large wetlands (relative to the watershed), with slow moving deep waters and abundant vegetation (Corps 2000). All wetlands within the analysis area could serve as wildlife habitat for avian species. Riverine and lacustrine wetlands could serve as habitat for fish species, particularly for small fry (see

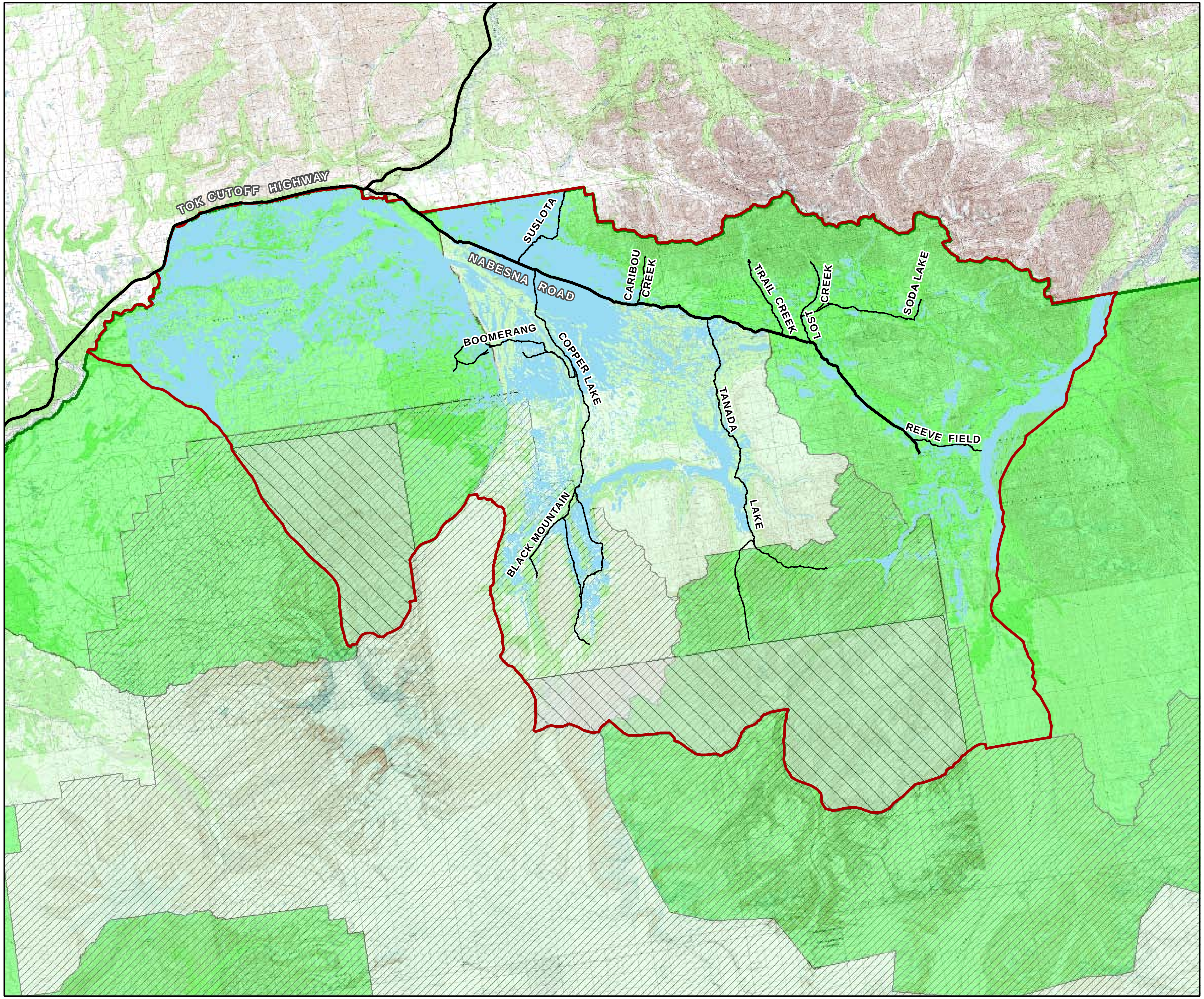

Figure 3-10
Wetlands and Trail Network

- Existing Roads
- Analyzed Motorized Trail
- Analysis Area
- Wetlands
- Areas Outside of Wetland Mapping
- Park
- Park/Wilderness
- Preserve
- Preserve/Wilderness

Sources: SMU 2008, NPS 2008c, National Wetland Inventory database.
SMU mapped wetlands along trails only.

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Section 3.4.3), while large forested and scrub-shrub wetlands serve as high quality habitat for moose, as well as many other wildlife species such as boreal toads and aquatic insects (see Section 3.4.4).

Existing ORV trails have impacted some of the function of wetlands within the analysis area. The ability of vegetated wetlands to control erosion and stabilize sediments has been reduced at the locations where existing trails cross these wetlands. Functional loss occurs as ORV use removes vegetation, alters hydrology, and creates soil conditions that are unsuitable for vegetation. Such damage results in an increase in local sediment loading and erosion to adjacent lands, and has increased the sediment loads within adjacent watercourses to some degree (see Section 3.4.3). The ability of wetlands to provide wildlife habitat has also been impacted by existing trails. ORV use in wetlands has disturbed avian species in adjacent areas. The increase in sediment loads to watercourses has impacted fish habitat (see Section 4.3.3). As noted previously, moose utilize large forested and scrub-shrub habitats and ORV trails have allowed hunters increased access to hunt while reducing the plant cover in some of these areas resulting in a decline in the habitat quality of these wetlands types for moose (see Sections 3.4.3 and 3.4.4 for current conditions of fish and wildlife species and their habitats).

3.4.2 Vegetation

The Wrangell-St. Elias National Park and Preserve encompasses a wide range of natural vegetation types, which have been largely unchanged by human development. However, a system of trails and roads does exist within the analysis area. These trails and roads are used by both subsistence and recreational hunters, park visitors and staff, and for access to private inholdings. Use of these trails by ORVs has resulted in some disturbances to vegetative communities, including direct mortality, reduction in cover and biomass, and alterations in soil composition (see Section 3.3.1). ORV trail corridors often become vectors for dispersal of exotic plant species (Loomis and Liebermann 2006). ORVs can disperse seeds and other reproductive plant parts through dirt and debris stuck in tire treads, wheel wells, or along the undercarriage. ORVs may increase the rate of invasion by exotic plants through seed dispersal and through disruption and disturbance of native plant communities, which allow exotic plants to become more easily established.

This section describes the current condition of vegetation resources. The discussion will first describe the native vegetative communities found within the analysis area. Next, the current level of ORV disturbance to these communities will be presented, followed by a discussion of exotic weeds and sensitive plant species found within the analysis area.

Native Vegetative Communities

Knowledge of the vegetative resources within the Wrangell-St. Elias National Park and Preserve is based on inventories of vascular flora conducted by the NPS (Cook et al. 2007) and a remote sensing effort that utilized aerial photography and photo interpolation (SMU 2008, NPS 2008c). Vegetation types found within the park include a variety of forest, shrub, and herbaceous communities, as described by Viereck et al. (1992). Wetlands occur across these community types and are discussed in Section 3.4.1.

Forest Vegetation Communities

Forest communities are defined as areas where trees provide at least a 10 percent cover. Forest communities within the analysis area include needleleaf and broadleaf communities, as well as mixes of these two forest types.

The needleleaf forest communities are dominated by evergreen tree species such as black and white spruce (*Picea mariana* and *P. glauca*) Paper birch (*Betula papyrifera*) and quaking aspen (*Populus tremuloides*) can also be present, but in smaller numbers. The shrub layers vary in species composition and density depending on tree canopy closure. In forests with canopy closure of 60 percent or more, low shrub species such as bog Labrador tea (*Ledum groenlandicum*), various species of currents (*Ribes* spp.), Bog Bilberry (*Vaccinium uliginosum*), lingonberry (*V. vitis-idaea*), and squashberry (*Viburnum edule*) are common. More open forest types (canopies with less than 60 percent closure) often contain taller shrub species such as *Alnus crispa*, *A. sinuata*, *Rosa acicularis*, and *Salix* spp. Ground cover in younger stands may contain abundant herbaceous species, while older stands are more dominated by ferns, mosses, and lichens. Needleleaf forest communities are typically found on organic soils, with a permafrost layer that varies in thickness depending on local site conditions (Viereck et al. 1992).

The broadleaf forest communities are dominated by deciduous tree species such as quaking aspen, red alder (*Alnus rubra*), black cottonwood (*Populus trichocarpa*), balsam poplar (*Populus balsamifera*), and paper birch. Common understory vegetation includes shrub species such as *Alnus crispa*, *A. tenuifolia*, *Oplopanax horridus, Rosa acicularis, and Viburnum edule,* as well as herbaceous species such as *Calamagrostis canadesis* and *Equisetum* spp. Moss and lichens are typically sparse, and found predominantly on tree trunks, due to their sensitivity to burial by heavy leaf fall and litter. Broadleaf forests are typically found in moist, well drained soils that may or may not contain permafrost (Viereck et al. 1992).

Shrub Vegetation Communities

Shrub communities are defined as areas that contain a predominance of shrubs, and where the tree overstory provides less than 10 percent cover. Shrub communities within the analysis area include tall, low, and dwarf shrub types, as well as a mix of these three shrub types.

Tall shrub communities found within the analysis area contain a predominance of shrubs at least 1.5 meters tall or taller; however, shrub heights of 4 to 6 meters are common in these communities. Tall shrub communities are dominated by various willow species (*Salix alaxensis*, *S. arbusculoides, S. barclayi*, and *S. bebbiana*) or alders (*Alnus* spp.). Understory shrubs can include various species of *Ribes*, *Rosa*, *Rubus*, and *Vaccinium*. Overstory tree canopies can contain balsam poplar, black cottonwood, and spruce species. Common herbaceous species include *Calamagrostis canadensis*, *carex bigelowi*, *Equisetum* spp., and *Eqilobium* spp. Canopy types can be either closed or open. Viereck et al. (1992) defines closed tall shrub communities as those that have at least 75 percent cover of tall shrubs (at least 1.5 meters tall); while open tall shrub communities are defined as those that have between 25 and 75 percent cover of tall shrubs. Closed canopy tall shrub communities are typically found on flood plains or stream banks with moderately drained soils, lacking permafrost. Open canopy tall shrub communities are also found on flood plains as well as recent outwash deposits, and can exist in areas that either contain permafrost or do not (Viereck et al. 1992).

Low shrub communities consist predominantly of shrubs between 20 centimeters to 1.5 meters in height. These communities are dominated by various low shrub species of birch (*Betula glandulosa* or *B. nana*) and willow (*Salix brachycarpa, S. glauca, S. planifolia* and *S. lanata*), as well as *Ledum palustre*, *Vaccinium uliginosum*, and *V. vitis-idaea*. Common herbaceous species include *Calamagrostis canadensis*, *Equisetum* spp., *Eriophorum* spp., and *Sanguisorba stipulate*. Both closed and open canopy types exist within the analysis area. Definitions of closed and open canopy types are similar to those described for tall shrub communities. Closed canopy low shrub communities can be found on permafrost soils, in the foothills of the Wrangell and Mentasta mountain ranges. Open canopy low shrub communities are typically found in poorly drained lowlands or moist slopes near tree-lines. Permafrost is typically present at depths of 30 centimeters to 1.0 meter (Viereck et al. 1992).

Dwarf shrub communities contain shrub species less than 20 centimeters tall and provide at least 25 percent shrub cover. Shrubs from the genus *Dryas* are the dominant species found within these communities; however, *Arctostaphylos* spp., *Empetrum* spp., and *Salix* spp. can be found as co-dominants. Sedges and lichens are also commonly found within dwarf shrub communities. Dwarf shrub communities are typically found on thin, well drained, stony soils in alpine sites; however, they can also be found in some lowland sites if soils are well drained. The presence of permafrost and strong winds typically make sites that support dwarf shrub communities unsuitable for other shrub types. Open and closed canopy types are not differentiated for this shrub community, as the overstory is typically a herbaceous layer; therefore, variations in shrub cover within dwarf shrub communities have a relative small effect on physiognomy (Viereck et al. 1992).

Herbaceous Vegetation Communities

Herbaceous communities are defined as areas with less than 10 percent tree cover and less than 25 percent shrub cover. These communities can be dominated by either graminoids (grasses or sedges), forbs (broad leaved herbs), or bryoids (bryophytes or lichens). Species diversity within these communities is high, as the herbaceous vegetation is a broad group containing many different community types, soil requirements, elevation preferences, and hydrological conditions.

Common species found within graminoid-dominated communities include grasses (i.e., *Poa arctica* and *Arctagrostis latifolia*) and sedges (i.e., *Carex aquatilis, C. bigelowii, C. microchaeta, C. podocarpa*). Graminoid-dominated communities can be found in a range of conditions/areas, from well drained high-altitude alpine meadows to lowland mesic emergent wetlands (wetlands are discussed Section 3.4.1). Common sedges in the more mesic wetlands include *Carex chordorrhiza*, *C. limosa*, *C. livida*, *C. magellanica*, and *C. pluriflora* (Viereck et al. 1992).

Common species found in forb-dominated communities include herbs such as *Anemone* spp., *Erigeron peregrinus*, *Geranium erianthum*, *Pedicularis* spp., *Polygonum* spp., and *Saxifraga* spp., as well as rushes (juncaceae), and monilophytes such as horsetails and ferns (Viereck et al. 1992).

Bryoid-dominated communities can consist either of various species of bryophytes such as *Gymnocolea acutiloba* and *Scapania paludosa*, or lichens. Bryoid-dominated communities consisting of bryophytes typically occur on mesic organic soils that lack permafrost. Those consisting of lichens typically occur on xeric windblown areas with exposed rock or ridge overhangs (Viereck et al. 1992).

Current Condition of Vegetative Communities in the Analysis Area

The use of ORVs within Wrangell-St. Elias National Park and Preserve has resulted in changes to the vegetative communities found along trails, including direct mortality, reduction in cover and biomass, alterations to soil structure, and changes in the composition of dominant species found along trails. Table 3-7 lists the miles of each vegetation type and the number of acres currently impacted by the trails considered within the analysis area. The trails considered within the analysis area consist of the nine trails addressed within the 2007 settlement (Boomerang, Caribou Creek, Copper Lake, Lost Creek, Reeve Field, Soda Lake, Suslota, Tanada Lake, and Trail Creek trails), as well as two additional trail systems in the designated wilderness (trails south of Tanada Lake and Black Mountain trails). Of the vegetative communities crossed by existing trails, the low shrub, needleleaf forest, and graminoid-dominated herbaceous communities have had the greatest number of acres impacted.

Table 3-7. Disturbances to Vegetation Types from Existing ORV Trails in the Analysis Area[1]

Vegetation Type	Sub-Type	Acres Within the Analysis Area	Miles Crossed by Existing Trails	Acres Impacted by Existing Trails
Forest	Broadleaf Forest	19,403.4	2.7	7.0
	Needleleaf Forest	241,345.9	42.2	145.0
	Mixed Forest	31,337.0	5.3	9.5
Shrub	Tall Shrub	37,354.0	5.3	17.9
	Low Shrub	200,631.4	42.9	389.3
	Dwarf Shrub	80,069.5	2.7	18.4
	Mixed Shrub	9,107.6	1.3	6.7
Herbaceous	Bryoid	14,057.0	0.2	0.1
	Forb	7,075.2	2.3	5.4
	Graminoid	89,860.1	12.7	119.0
Total Disturbance[2]			**117.6**	**718.3**

1 Trails considered in this Table include the Black Mountain, Boomerang, Caribou Creek, Copper Lake, Lost Creek, Platinum, Reeve Field, Soda Lake, Suslota, Tanada Lake, and Trail Creek trails.

2 Total disturbance values only include areas that have been defined as vegetated; however, there are portions of the trails that cross sparsely vegetated areas, barren, or areas classified as water. These areas sum to a total of 21.2 acres and 13.6 miles.

Source: St. Mary's University of Minnesota (2008) vegetation geodatabase along ORV trails

Not all vegetative communities found within the analysis area are equally sensitive to ORV use. Communities found on wet, poorly drained organic soils have been impacted to a greater extent by ORV use then those found on dry, course, well drained soils (Happe et al. 1998). This is because wet organic soils are unable to support ORVs, resulting in the churning and displacement of soils and vegetative roots, as well as a loss of the organic mat layer. The loss of the organic layer has caused the permafrost to melt along portions of the trails, resulting in increased subsidence, susceptibility of soils to disturbances, and an increase in the rate of vegetation loss (see Section 4.2.1).

The mesic herbaceous and low shrub communities (specifically the low shrub communities that contain a high percentage of sedge species) are the most sensitive vegetation communities within the analysis area and have experienced the greatest impact due to ORV use. Historic and current use of ORVs within these communities has resulted in a reduction in sedge and lichen cover, an increase in bare ground, and a reduction or loss of vegetative complexity (Happe et al. 1998). Although total vegetative cover on trails has decreased, the percent cover of some graminoid species, such as *Carex* spp. has increased with ORV use (Happe et al. 1998). In addition, ORV use within these communities has resulted in the creation of large muck-holes, which can become impassable by ORV. When this occurs, ORV users have moved onto adjacent lands in order to bypass the muck-holes, resulting in the expansion of trail widths. This has created a braided pattern of trails through these communities, which increase the acreage of impact per trail mile. While single-tracked non-braided ORV trails in Alaska impact about 1 acre of vegetation per mile, braided trails can be up to 0.25 mile wide, resulting in a 160-acre impact per mile (Myers 2002). As shown in Table 3-7, herbaceous and low shrub communities together have an average area of impact along existing trails of 9 acres per mile.

The tall shrub, dwarf shrub, and various forest community types have shown a different response to ORV impacts. The number of impacted acres and width of trails are lower in these communities compared to the herbaceous and low shrub types (Happe et al. 1998). This reduction in trail width is a direct result of these communities typically occurring on course or gravel substrates, which are capable of supporting ORV use. The soils in these communities still experience rutting and compaction due to ORV use, but they have not become churned or experienced subsidence to the same degree as the more mesic soils found in herbaceous and low shrub communities (Happe et al. 1998; also see Section 4.2.1). However, needleleaf forest communities often contain thin organic soils with a high water holding capacity, making these communities somewhat more susceptible to soil disturbance than the tall and dwarf shrub communities. While the most sensitive of the forested community types, the needleleaf forest communities are not as sensitive to ORV disturbance as the herbaceous and low shrub communities (Happe et al. 1998).

The tall shrub, dwarf shrub, and forest communities demonstrate fewer impacts per mile of trail, due to the lack of trail braiding; however, they have experienced a greater loss of vegetation cover compared to the herbaceous and low shrub communities. The greater loss of cover reflects the greater sensitivity of species within these three communities to the direct impact of ORV use, such as the breaking or loss of branches and/or the crushing of entire plants. The slow growth rate of many species within these communities also results in a reduced recovery rate when damage occurs (Happe et al. 1998).

Even though not all vegetative communities are equally sensitive to ORV use, similar impacts have occurred within each community. ORV trails have experienced an increase in the percent cover of grasses and liverworts, but an overall decrease in vegetation cover (Happe et al. 1998). On average, ORV trails in the Wrangell-St. Elias National Park and Preserve have approximately 41 percent less vegetation cover than adjacent undisturbed areas (Happe et al. 1998). A study conducted in the Wrangell-St. Elias National Park and Preserve found that the percent of bare ground increases on trails used by ORVs, with active trails having on average 39 percent bare ground, inactive trails having about 7.5 percent bare ground, and control sites away from trails having about 2 percent bare ground (Happe et al. 1998). In addition, some species have shown extreme sensitivity to ORV use, and are either damaged, rare, or absent from the nine trails, regardless of vegetative community type. These include various species of lichen, moss, herbs, and dwarf shrubs (especially dwarf birch and willow species). For example, Happe et al. (1998) found that lichen cover on trails in Wrangell-St. Elias was approximately 1 percent of the total vegetation cover, while cover in adjacent, undisturbed areas was approximately 14 percent.

Exotic Species and Invasive Weeds

For the purpose of this discussion, native and exotic species are defined per the 2006 NPS Management Policies (NPS 2006a). Native species are defined as all species that have occurred, now occur, or may occur as a result of natural processes on lands designated as units of the National Park System. Native species in a place are evolving in concert with each other. Exotic species are those species that occupy or could occupy park lands directly or indirectly as the result of deliberate or accidental human activities. Exotic species are also commonly referred to as nonnative, alien, or invasive species. Because an exotic species did not evolve in concert with the species native to the place, the exotic species is not a natural component of the natural ecosystem at that place. Genetically modified organisms exist solely due to human activities and therefore are managed as exotic species in parks. Not all exotic species are detrimental to habitat quality or biodiversity; however, they are of concern because they can threaten the genetic integrity of native flora through hybridization, typically flourish in disturbed areas resulting in the exclusion of native vegetation, and can change the structure and function of ecosystems through alterations of geochemical and geophysical processes (McKee 2006). The term “noxious weed” is used when referring to an exotic species that has been officially designated by a federal, state, or county government as injurious to the public health, agriculture, recreation, wildlife habitat, or the biodiversity of native habitats.

By 1996, exotic species had become established within approximately 7 million acres of national park lands within the lower 48 states, with an estimated 4,600 acres of new infestations occurring daily

(NPS 1996). The national parks located in Alaska have not experienced the same level of impact from exotic species as the parks found in the lower 48 states. Several factors have made Alaska less susceptible to invasion from these non-native species. The extreme and highly variable climate in Alaska, as well as the Wrangell-St. Elias National Park and Preserve, makes it difficult for most non-native species to become established. In addition, Alaska's parklands, including Wrangell-St. Elias National Park and Preserve, have been relatively free of the types of disturbances that promote invasion by these opportunistic species (human development and ground disturbing activities). However, as more areas of Alaska become developed, the opportunities for invasion increase. Development, coupled with the effects of global climate change on Alaska's climate, makes the threat of invasion by these non-native species a serious concern in Alaska's national parks (Bauder and Heys 2004, McKee 2006).

The NPS has conducted surveys for exotic and invasive species in Alaska's parklands since 2000 (Bauder and Heys 2004). Since this time, they have documented 38 exotic plant species occurring within the park (Terwilliger and Gilmore 2010). Of these 38 species, 10 have been documented within the analysis area, primarily along the Nabesna Road (see Figure 3-11). The documentation of these 10 exotic plant species within the analysis area does not indicate that other exotics are not also present or could become established in the future, nor does it mean that these are the only locations where these species occur. The NPS plans to continue surveying and monitoring exotic species with the park (including the analysis area), and may discover additional species or new locations during these subsequent surveys. Table 3-8 lists the exotic plant species that have been documented within the analysis area. None of the exotic plant species documented within the analysis area have been designated as noxious on either the federal or state noxious weed lists.

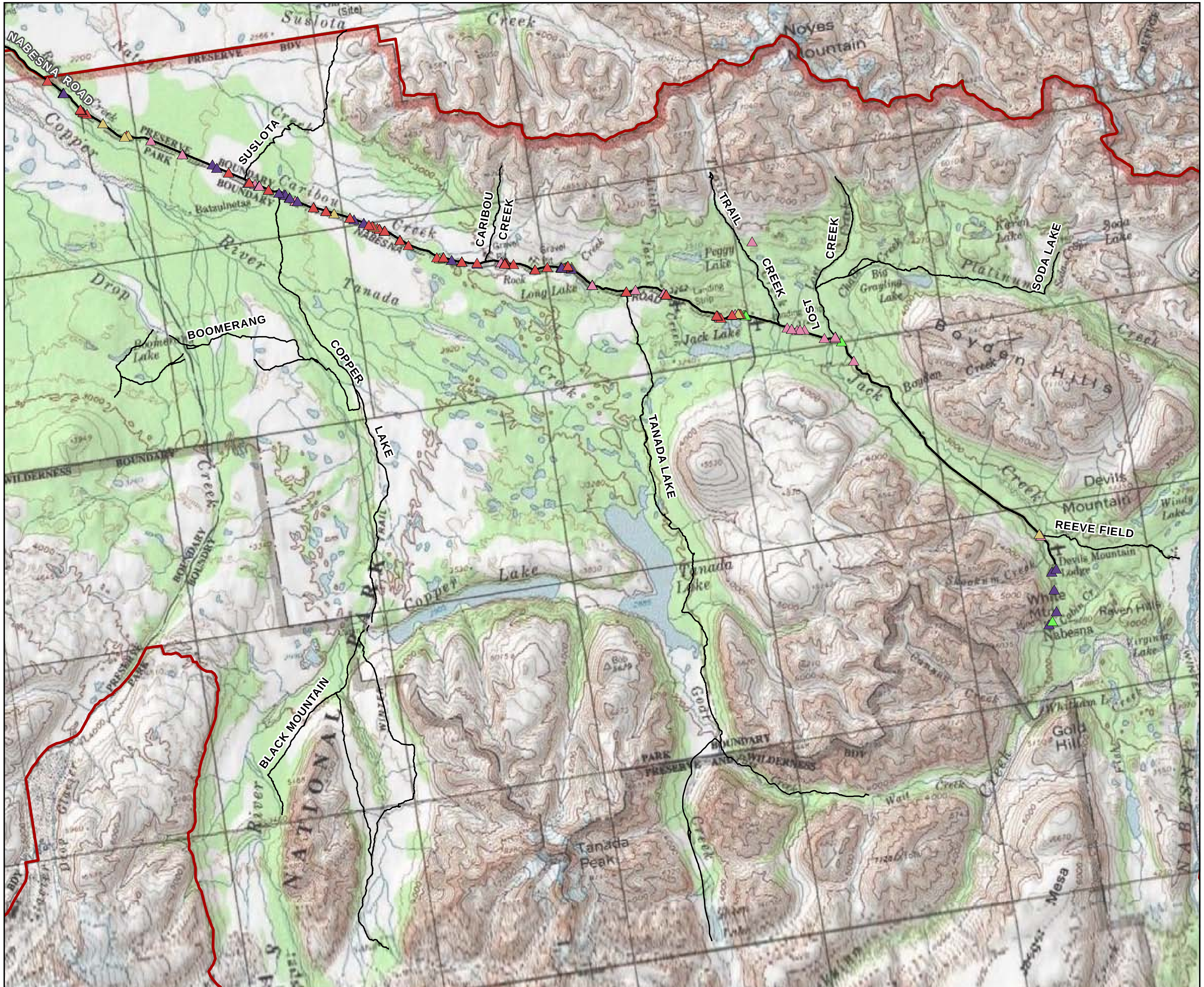
Table 3-8. Exotic Plant Species Documented within the Analysis Area

Scientific Name	Common Name	AKEPIC Rank[1]
Chenopodium album	common lambsquarter	35
Plantago major	common plantain	44
Achillea millefolium	common yarrow	48
Taraxacum officinale	dandelion	58
Lappula squarrosa	european stickseed	44
Descurainia Sophia	flixweed tansymustard	41
Hordeum jubatum	foxtail barley	63
Crepis tectorum	narrowleaf hawksbeard	54
Matricaria discoidea	pineapple weed	32
Melilotus alba	white sweetclover	80

[1] The Alaska Exotic Plant Information Clearinghouse (AKEPIC) rank is used to determine the invasive ability and veracity of an exotic plant species. The ranks range from 0 to 100, with 100 representing the highest level of invasive ability.

Although none of the exotic plant species have been designated as noxious weeds, white sweetclover is a species whose presence is of concern to park managers. White sweetclover is a highly invasive species and has been documented colonizing natural riverine habitats in southeast Alaska (NPS 2007b). It successfully out competes most other herbaceous species along the park road systems, due to its rapid growth, deep tap root, and high seed output. The NPS has conducted control efforts for the white sweetclover, with some success; however, it has continued to spread throughout the road systems in the Copper River Basin.

Figure 3-11
Exotic Plants



Existing Roads

Existing Motorized Trails

Analysis Area

Exotic Plants

△	Common Yarrow	(*Achillea millefolium*)
△	Lambsquarter	(*Chenopodium album*)
△	Narrowleaf Hawksbeard	(*Crepis tectorum*)
△	Herb Sophia	(*Descurainia sophia*)
△	Foxtail Barley	(*Hordeum jubatum*)
△	European Stickseed	(*Lappula squarrosa*)
△	Disc Mayweed	(*Matricaria discoidea*)
△	White Sweetclover	(*Melilotus alba*)
△	Common Plantain	(*Plantago major*)
△	Dandelion	(*Taraxacum officinale* ssp. *officinale*)

Source: WRST Exotic Plant Surveys, 2004-2006. AKEPIC Exotic Plants.

N W E S

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Miles

TETRA TECH EC, INC.

Alaska Region
National Park Service
U. S. Department of the Interior

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Sensitive Species

No federally threatened or endangered plant species, listed under the Endangered Species Act (ESA), are known to occur within the Wrangell-St. Elias National Park and Preserve. The state of Alaska does not recognize a list of rare or sensitive plant species that differs from the federal ESA list; however, the Alaska Natural Heritage Program (AKNHP) does maintain a rare plant tracking list, which the NPS utilizes for its conservation and inventory efforts. The AKNHP identifies 90 rare plants having a state rank of between S1 to S3 within the Wrangell-St. Elias National Park and Preserve (Cook et al. 2007). The group consists of two rare shrub species (*Juniperus horizontalis* and *Salix hookeriana*), one dwarf shrub (*Salix setchelliana*), seven lower vascular species (six in the genus *Botrychium*), 57 forb species, and 24 graminoid species (13 in the genus *Carex*).

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 only represent known occurrences, and do not indicate or represent the absence of a rare plant species. Appendix E lists the AKNHP rare plants that have been recorded within the park, along with the number of occurrences, habitat types in which each species was found, and the region of the park in which the observations were made. Due to the wide diversity of habitat types found within the analysis area, each of these species could potentially be present; however, those species that are found typically in high alpine and mountainous areas are less likely to occur, as these habitat types are less common in the analysis area than lowland habitat types.

3.4.3 Water Quality and Fish Habitat

Fish Resources and Habitat

The surface waters of the analysis area drain into one of two major watersheds: the upper Copper and upper Nabesna watersheds within the Wrangell-St. Elias Park and Preserve boundary (Figure 3-12). These watersheds drain into the Copper River and Yukon River, respectively. Fish resources in the region include anadromous species (in the Copper River watershed only) including Chinook and sockeye salmon, and several species of resident fish (in both watersheds) including Dolly Varden trout, Arctic grayling, burbot, whitefish, sculpin, and few locally present additional species. The region remains mostly undeveloped, other than one main road and a series of trails. While the region is relatively pristine, recent natural events and human actions have caused some limited, and mostly local, alterations in aquatic habitat quality. These include beetle infestation, earthquakes, mining, firewood removal, possible overharvest of some fish resources, and riparian vegetation and stream channel impacts from ORV vehicle use. Two of the main human-related factors that may affect aquatic resources within the analysis area include the type, size, and location of development, particularly roads, and the extent of actively used ORV trails. Important factors positively affecting aquatic habitat in this region include the presence of cool, clear water; adequate nutrient supply; and unimpeded fish passage. Natural conditions (e.g., high turbidity and sediment in glacial streams, low abundance of stream side vegetation, and large woody debris [LWD] sources) limit aquatic habitat quality in some waters.

3.4.3.1 Fish Resource and Habitat Susceptibility to ORV-Related Damage

ORV use on trails can affect aquatic habitat primarily from changes in suspended and deposited sediment in streams and modification of stream banks. Some other potentially adverse effects to aquatic systems are modification and loss of riparian vegetation that may affect stream shading; loss of LWD input to streams because of trail maintenance and use; increased hydrocarbon input to aquatic systems from burnt fuel, leaks, and accidental spills that may be toxic or carcinogenic to aquatic organisms; and direct loss of fish eggs and alevins, and spawning activity disturbance from ORV vehicle stream ford passage.

Increased sediment in streams may affect fish rearing and spawning conditions, benthic macroinvertebrate survival and production, and primary production from reduced water clarity. Trails near streams have been documented in more arid regions to increase sediment erosion substantially, between 5 and 50 times (Hinckley et al. 1984), as a result of increased soil compaction and rill development. Erosion rates of this magnitude in the project area are unlikely due to generally greater vegetative cover and surface organic material and low slopes adjacent to trails. However, some increased erosion and sediment runoff would be expected for trail routes that cross or are very near streams. The dispersion of increased suspended sediment in the short term from trail-stream crossings is fairly limited based on some Alaskan studies (Meyers et al. 2007, and Rinella and Bogan 2003). They found that most extended increase in turbidity occurred within about 10 to 30 meters of an ORV crossing, with little or no observed change at 100 meters from a crossing in most cases. Also, effects on benthic organisms appeared to be limited in a similar fashion (Rinella and Bogan 2003). During seasonal high flows sediment would disperse further downstream, both as suspended sediment, and larger particles as bed load, which would occur in a period of normally elevated sediment levels in streams, reducing its effect.

While loss of riparian vegetation has the potential to increase stream temperature, the amount of riparian vegetation loss or disturbed relative to total stream length on any stream in this region would be small. Streams at this latitude, altitude, and proximity to glacial sources are generally cool (Veach et al. 2004), although some natural warming occurs in Tanada Creek, which originates from a lake (Sarafin 2008). Local stream and lake water temperatures reported in Veach et al. (2004) and Sarafin (2008) generally remain below levels considered to be stressful to cold water fish, 18 degrees Celsius (ºC) (Deschu 1983 as cited in Veach et al. 2004). Therefore, very slight changes likely would have no effect on aquatic organisms. LWD, an important habitat component in streams for pool forming, bank stabilization, and maintaining channel forms in larger segments, could be affected by ORV trail maintenance if trees along trails were cut and moved. Also, stream segments that would normally trap LWD may have trees removed if they occurred at crossings. Again, the greater the number of trail-stream crossings relative to stream length, the greater this type of effect would be on individual stream systems.

3.4.3.2 Water Quality

Naturally high sediment loads and turbidity in glacial streams limit aquatic production (Lloyd 1985, Lloyd et al. 1987). Additional sediment, both bed load and suspended, from human actions also has the potential to reduce production in some stream areas. Elevated turbidity and suspended sediment can adversely affect survival, movement, spawning success, and feeding by fish, especially salmonids (Newcombe and Jensen 1996, Roberson et al. 2006.

In general turbidity and sediment contributions associated with roads and trails are the primary issues of concern relating to the actions of interest. Average turbidity of all sampled flowing streams and standing water (ponds and lakes) in the park is high (99 nephelometric turbidity units [NTUs]) (Veach et al. 2004), primarily related to glacially fed streams emanating from the mountains. The surveys were conducted during summer 2001 and 2002, from mid-June into late August, which is typically a period of high precipitation. However, most streams of the analysis area, as measured by Veach et al. (2004), have low to moderate turbidity, ranging from less than 1 to 14 NTUs. Exceptions occur, however, particularly for the Copper River itself, which was measured at 450 NTUs downstream of

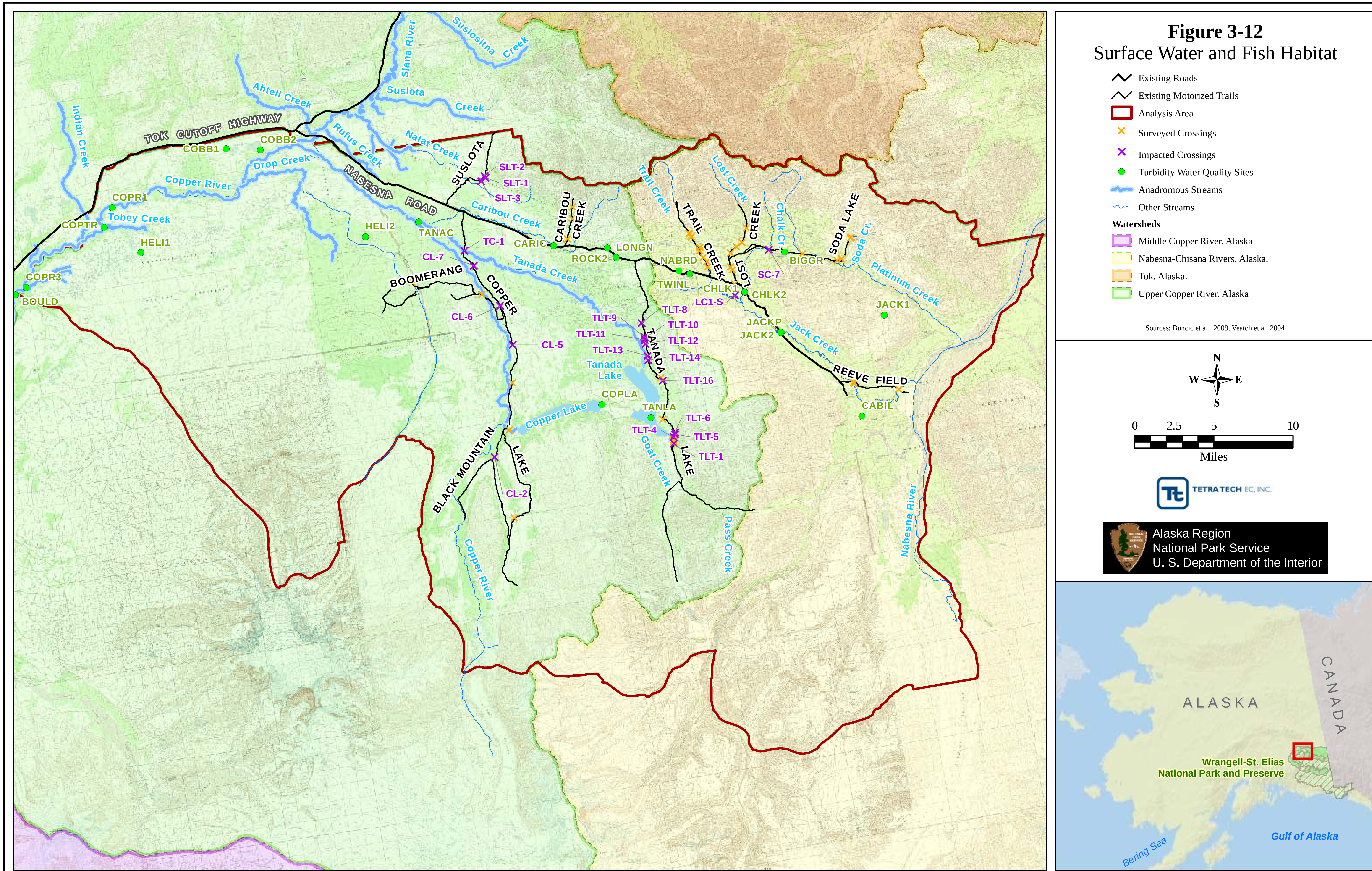

Figure 3-12
Surface Water and Fish Habitat

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the trails in the analysis area (See Table 3-9, Figure 3-12). Lake and pond samples were all clear, with most having turbidity less than 2 NTUs. Visual surveys of the streams along the trail systems noted nearly all as “clear,” with only the Copper River and Drop Creek, both glacially fed streams, as visibly turbid (Buncic et al. 2009). Comparable concentrations of suspended solids were also relatively low (Table 3-9).

Table 3-9. Turbidity and Suspended Solids in Water Bodies Within the Analysis Area

Watershed	Tag	Water Body Name	Turbidity (NTU)	Total Suspended Solids (mg/L)	Notes
Nabesna	CHLK1	Chalk Creek	0.95	2.9	Creek, at road
Copper	TANAC	Tanada Creek (at weir)	1.8	<1.8	Creek at weir
Copper	COPR3	Copper River stop #3	2.6	2	Creek to Copper river, clear
Copper	CARIC	Caribou Creek	3.3	2.2	Creek at road
Nabesna	CABIL	Lower Cabin Creek	8.5	44.8	Creek draining mine area
Nabesna	JACK1	Jack Creek	13	29.5	Creek, glacial near headwater
Copper	COPTR	Copper River trib #1	14	4.4	Creek mucky bottom
Copper	BOULD	Boulder Creek	60	30.4	Creek, muddy
Copper	COPR1	Copper River #1	450	580	Slough of Copper River
Copper	ROCK2	Rock Lake	0.15	<1.80	Lake
Nabesna	BIGGR	Big Grayling Lake	0.3	<1.80	Lake
Copper	LONGN	Long Lake—Nabesna Road	0.4	2.3	Lake
Nabesna	TWINL	Twin Lakes (larger one)	0.45	<1.80	Lake
Copper	TANLA	Tanada Lake	0.5	4.4	Lake
Copper	COBB2	Cobb Lake #2 (bigger)	0.7	<1.80	Lake, 1–2 meter deep
Copper	COPLA	Copper Lake	0.85	<1.80	Lake
Copper	COBB1	Cobb Lake #1 (smaller)	1.3	2.4	Lake, 1–2 meter deep
Copper	HELI2	Northern Lakes—Heli site #2	1.6	16	Lake
Copper	HELI1	Northern Lakes—Heli site #1	1.9	4.4	Lake, shallow

Source: Veach et al. 2004.

The effects of elevated suspended sediment and turbidity vary depending on a number of factors, including duration of exposure, fish species, and life stage. Direct effects to fish from elevated levels of suspended sediment can range from avoidance to direct mortality. Direct short-term mortality (hours to a few days exposure) for most life stages require suspended sediment levels of several thousand milligrams per liter (mg/L) (Newcombe and Jensen 1996, Newcombe and McDonald 1991). Lloyd (1985) determined that for Alaska streams originating in more glacial areas, turbidity (in NTUs) and suspended solids (in mg/L) are about equal (i.e., 1 mg/L suspended sediment is about 1 NTU), so the relation to effect of suspended sediment to NTUs may be similar although there are local differences. Lower level effects such as fish avoidance and reduced growth have also been noted in literature. In one study, levels over about 70 NTUs were avoided by juvenile coho salmon (Bisson and Bilby 1982), and values as low as 25 NTU reduced growth of juvenile steelhead and coho salmon (Sigler et al. 1984). However, fish occasionally encounter levels much higher under natural conditions and have thriving populations. For example, out-migrating salmon in the Fraser River, British Columbia, encounter suspended solids concentrations of 300 to 600 mg/L during the spring (Servizi and Martens 1992). The same is likely true within the Copper River system, which has naturally high glacial suspended solids levels (Table 3-9). In fact, the Copper River has some of the highest natural turbidity levels of any major river in Alaska (Lloyd 1985).

The percentage of fine sediments in the substrate appears to be moderately high in many streams within the analysis area. Substrate composition and percentage of fines (sand, silt, and fine organic matter) affect salmonid egg survival and often affect benthic organism production. While surveying trail crossings of known and suspected fish-bearing streams along the nine trails, Buncic et al. (2009) noted that the substrate at many locations in the analysis area was characterized by sand and silt/clay fractions exceeding 10 or 20 percent. Potential sources of fine sediment to stream substrate include both natural and human-induced factors; specific source(s) for a particular stream segment are not always clear. Increased values of fines can reduce oxygen supply to developing eggs and trap emerging fry, reducing overall survival of spawned eggs. Fine sediment additions to substrate can adversely affect spawning success (Chapman 1988). Potential spawning substrate is considered to be "properly functioning" for salmon if less than 12 percent consists of fines (<0.85 millimeter) (NOAA-NMFS 2004). This threshold is likely similar for stream-spawning trout and char.

3.4.3.3 Copper River Watershed Fish Habitat

The portion of the Copper River watershed in the analysis area includes two major streams (Copper River and Tanada Creek), four minor streams (Suslota Creek, Natat Creek, Caribou Creek, Drop Creek), and numerous unnamed tributaries to these streams (Figure 3-12). Two large lakes, Copper Lake and Tanada Lake, are also present, as well as numerous small lakes and ponds. These lakes and ponds are often important rearing habitat for fish species present within the Copper River system, as well as for supplying overwinter habitat to resident and anadromous fish. As noted above, the streams of this watershed include both clear and glacially turbid streams, with most streams being clear. The majority of the streams within the analysis area are of low gradient (less than 5 percent), which provides easy access by fish to populate these streams, as long as flows are adequate. Additionally, most streams are connected to lakes or ponds, which provide overwintering and rearing habitat for fish that may be present in the streams. Most stream segments have riparian vegetation along the channel, with the majority of riparian vegetation consisting of grasses, shrubs, or small trees, including willow, alder, cottonwood, and aspen. Large trees in the riparian area are limited, and consist primarily of spruce and to a lesser extent birch and aspen. As a result, channel- and pool-forming LWD is naturally limited in these stream systems. As noted earlier, fine substrate sediment may be relatively high in some areas.

The anadromous Chinook and sockeye salmon fish resources of the Copper River system are recognized as a world class resource. A total of 31 fish species have been documented or are expected to be present in the Wrangell–St. Elias National Park and Preserve (Markis et al. 2004). However, the number of species present in the upper Copper River watershed of the analysis area is likely to be only 10 species or less. Documented species present within this area include the anadromous Chinook and sockeye, and resident kokanee, round whitefish, Arctic grayling, lake trout, burbot, and slimy sculpin. Many of these species are important commercially, recreationally, or for subsistence uses both within, and in the case of anadromous species, outside of the analysis area. Tanada Creek supports a controversial subsistence fishery (Sarafin 2008).

A total of 1,568 stream miles are present within the Copper River watershed portion of the analysis area based on geographic information system (GIS) information. It also contains a documented 116 anadromous stream miles (Figure 3-12), including a primary anadromous migration corridor for sockeye salmon, which spawn in or near the major lake systems, and some spawning and rearing habitat for a small number of Chinook salmon. Documentation of fish species including anadromous stocks in many of the streams is limited, but because of the low gradient of streams in the analysis area, it is expected that most streams, including those near trails, would be accessible to fish species present within the major river systems.

Abundance of anadromous fish in analysis area streams is low relative to the total Copper River system. Sockeye salmon spawning in the analysis area average less than 2 percent of the entire Copper River sockeye salmon run, although the sockeye salmon in the Tanada Creek system is the largest known spawning stock within Wrangell–St. Elias National Park and Preserve (Sarafin 2008). Other anadromous stocks in the Copper River watershed of the analysis area make up an even lower percentage of the park region. Overall, escapement to the Tanada Creek system based on weir counts has averaged about 11,000 sockeye salmon and four Chinook salmon annually (1979, 1997, 1998, 2000–2007). Anadromous fish are present in some of the other streams, but counts are not available. Upstream migration of adult salmon occurs during the summer months, typically mid-June through mid September, based on weir counts in Tanada Creek (Sarafin 2008). Local harvest in the Tanada Creek system from the Batzulnetas fishery ranged from zero to 997 sockeye salmon from 1987 through 2007 (Sarafin 2008). Abundance of other fish stocks has not been quantified, but some areas may have reduced numbers from local sport harvest.

Within the Copper River watershed, the presence of ORV trails and their use are factors that may affect aquatic habitat and resource use. Effects of ORV use on aquatic systems in other areas of Alaska have been documented (Meyer et al. 2007, Rinella and Bogan 2003, Wiedemer 2002, Loomis and Liebermann 2006). Types of effects have included loss of riparian vegetation; increased turbidity and suspended sediment; bank erosion; modification of the channel/bank (e.g., increased channel width); adverse effects to benthic diversity, composition, and production; and local hydrologic modifications. Additionally, vehicle traffic through streams following spawning can cause egg mortality if spawning occurs at the crossing site (Gregory and Gamett 2009, Roberts and White 1992). Many of these effects could lead to direct or indirect effects on fish resources.

Many of the adverse effects on aquatic stream systems from ORV use are related to increased levels of suspended solids and turbidity in streams associated with erosion and runoff from the trails (Meyer et al. 2007, Rinella and Bogan 2003). In many ways ORV trails have similar effects on streams to that of roads, by increasing hillslope erosion and sediment runoff from the tracks. Generally the greater the number of road miles there are in a watershed the greater the chance there is to reduce the functioning of a stream system.

Based on studies of ORV crossings, the distance downstream over which elevated turbidity levels remain high is relatively short. Meyer et al. (2007) found that at three crossings examined in Glacier Bay National Park, elevated levels of turbidity were substantially decreased within 15 to 30 meters below the crossing. Rinella and Bogan (2003) found that elevated sediment deposition at crossings investigated on the Kenai Peninsula was measurable 10 meters below most crossing sites, but by 100 meters below most crossings, sediment deposition was near background, although there were some sites with higher levels downstream of these locations. The morphology of the crossing (steep banks were the worst) affected the distance and duration of elevated levels of suspended solids.

While site-specific characteristics are important to the level of change expected in suspended solids, it is likely that the more trail-stream crossings there are in a system, and the greater the number of miles of ORV trails that parallel a stream closely, the greater the chance that an increase in suspended solids in streams will occur. Trails that are distant from streams are less likely to have effects on the streams. EPA (Barbour et al. 1999) noted that a buffer distance of 18 meters between a stream and disturbance area (e.g., road, timber removal) was adequate to maintain stream habitat conditions and was effective at reducing most sediment-laden runoff to the adjacent stream. Based on these considerations, in addition to site-specific evaluation of trail-stream crossings, the number of trail-stream crossings and the number of ORV trail miles within 18 meters of the stream are indications of potential adverse effects to a specific stream system.

Nine major ORV trails were examined in the analysis area (within both watersheds), which include most of the trail miles within the park. In addition, the Black Mountain trail system and the wilderness trails south of Tanada Lake were examined. A survey of the trail-stream crossings known or suspected to have anadromous or resident fish along the nine major ORV trails in the analysis area and the Black Mountain trail system (shown in Figure 3-12) was conducted in 2008 by ADF&G staff (Buncic et al. 2009) under a cooperative agreement with NPS. The authors did not survey crossings in the wilderness trails south of Tanada Lake. The purpose of this survey was to evaluate the current habitat conditions and determine which may have degraded habitat conditions or may develop degraded conditions from future ORV use and to document fish presence within these streams if fish sampling occurred. This survey included 59 crossings along all trails in both watersheds. In the Copper River watershed this included 32 crossings on five of the nine trails in the analysis area: Copper Lake, Boomerang, Suslota, Caribou, and Tanada.

A summary of the status of these ORV trail crossing effects to the aquatic systems, based primarily on Buncic et al. (2009), is provided by trail in Table 3-10. They rated the conditions of the stream bank at the crossings in three categories: "Functioning," "Functioning - at risk," and "Non-Functional," relating to the ability of the stream bank to withstand high flows without severe damage. The ratings do not indicate the specific cause of the adverse rating. Table 3-10 also includes the number of stream crossings for each trail system indicated in the GIS database. Based on the assessment by Buncic et al. (2009), most of the additional crossings in the GIS database were either similar to others assessed, not locatable in their field surveys, not accessible due to high water, or were not expected to have fish habitat at the crossing.

Overall, the portion of trail miles that may contribute additional stream turbidity from runoff based on distance from the stream (<18 meters) is moderately low for most trails, averaging about 5 percent of all trail miles (Table 3-10). The highest relative portion is along Caribou Creek, although the greatest number of miles is the Copper Creek trail, which is also the longest trail system.

Copper Lake Trail and the Black Mountain Trail System

These trails cross tributaries that enter some of the major anadromous streams (Tanada Creek and Copper River) in this portion of the analysis area. A total of eight crossings were examined, including six on the Copper Lake trail and two on the Black Mountain trail system (Figure 3-12, Table 3-10). The GIS database identifies 24 stream crossings along the Copper Lake trail and another 23 stream crossings along the Black Mountain trail system; most of the additional crossings in the GIS database were further up the basin, upstream of Copper Lake, on smaller tributary stream crossings than those surveyed. Of those surveyed, stream bank conditions were all considered functional. Of the sites surveyed, 75 percent were considered to have some potential problem at the crossings that may require management actions (Table 3-10). Most problems were related to sediment degradation and riparian habitat loss or disturbance. Only one crossing (TC-1) was considered not sustainable at the current use level for ORVs, but several may need management actions to reduce adverse effects, such as trail hardening.

Boomerang Trail

This trail also crosses some of the major anadromous streams in the analysis area. However, it is little used. Only two crossings were examined, while a total of nine crossings were noted in the GIS database. Some of the extra sites were multiple crossings at these two sites, while others were at small tributary streams crossed by the trail. The stream bank conditions were considered to be functional at the two crossings, no bank conditions at the crossings were considered degraded, and no aquatic habitat conditions were considered adversely disrupted.

Table 3-10. Trail Stream Crossing Information Relative to Aquatic Habitat Conditions

Trail	Total Trail Length (miles)	GIS Indicated Number of Trail-Stream Crossings	Number of Crossings Surveyed	Stream/ Lake or Tributary to Crossing	Number of Crossings with Known Anadromous Fish Present	Number of Crossings with Known Fish Present	Miles of Trail within 18 meters of Stream	Number of surveyed crossings with potential fish habitat problems				
								Some problem	Sediment	Potential spawning impacts	Fish passage impedance	Degraded Riparian habitat
Copper River Watershed												
Copper Lake	36.7	24	6	Tanada, Copper	2	2	1.4	4	3	1	0	3
Boomerang	16.9	9	2	Copper, Drop	2	2	1.2	0	0	0	0	0
Suslota	7.3	4	3	Natat	3	3	0.2	3	3	0	0	3
Caribou Creek	3.6	11	3	Natat	0	0	0.6	0	0	0	0	0
Tanada Lake	17.6	20	16	Tanada	0	0	0.8	12	9	4	1	10
Black Mountain	4.8	6	2	Copper	0	0	0.18	1	1	0	0	1
Wilderness Trails South of Tanada Lake	12.5	23	0	Goat, Pass	0	0	1.3	0	0	0	0	0
Total Watershed	**99.4**	**97**	**32**		**7**	**7**	**5.68**	**20**	**16**	**5**	**1**	**17**
Nabesna River Watershed												
Trail Creek	6.1	17	9	Trail	0	0	2.9	0	0	0	0	0
Lost Creek	5.9	39	8	Lost	0	0	2.5	1	1	0	1	1
Soda Lake	12.0	23	7	Soda, Platinum, Chalk	0	0	3.1	1	1	0	0	0
Reeve Field	5.0	8	3	Jack	0	3	0.3	0	0	0	0	0
Total Watershed	**29.0**	**87**	**27**		**0**	**3**	**8.8**	**2**	**2**	**0**	**1**	**1**
All	**128.4**	**184**	**59**		**7**	**10**	**14.48**	**22**	**18**	**5**	**2**	**18**

Source: GIS database and Buncic et al. 2009.

Suslota Trail

Three crossings were evaluated, and all crossed a known anadromous fish stream (Natat). While bank conditions were considered functional at all three trail-stream crossings, they were all considered to have degraded aquatic habitat. This included affecting sediment composition and reducing riparian vegetation quality. All three sites were considered to need repair or re-routing. However, most of the trail route is well away from streams (as indicted by only 0.2 mile within 18 meters of streams) reducing potential secondary trail runoff to streams.

Caribou Creek Trail

The small streams crossed by this trail are connected to downstream areas of known anadromous fish habitat (more than 5 miles), but none of the crossings had documented fish presence. Three crossings were surveyed, while a total of 11 trail-stream crossings were noted in the GIS database. Most of the extra crossings are interspersed between those surveyed and likely would be similar to those surveyed. The surveyed sites all had good bank conditions. One crossing had been hardened and none were considered to be causing adverse habitat effects.

Tanada Lake Trail

This trail crosses tributaries that drain into Tanada Lake and Tanada Creek, which have sockeye and Chinook salmon, but generally no fish data are available for streams crossed. Within the Copper River watershed this trail had the most surveyed crossings (16), which generally agreed with number of stream crossings in the GIS database (20). Only half of the crossings had bank conditions considered properly functioning and 75 percent of the surveyed crossings had some potential habitat problems. The majority of habitat problems were related to sediment impacts (9) and riparian vegetation degradation (10). Also, there were locations identified with potential spawning habitat disruption (4) and one small stream crossing had potential juvenile fish passage blockage. A portion of the trail appears also to have intercepted water from adjacent wetlands and become a stream channel. Overall this is one of the more heavily disrupted aquatic habitat areas associated with any trail in the analysis area.

3.4.3.4 Nabesna River Watershed Fish Habitat

Within the Nabesna watershed of the analysis area, the Nabesna River and five minor creeks (Trail, Lost, Soda, Platinum, Chalk, and Jack creeks) occur (Figure 3-12). Multiple small tributaries drain into these creeks as well. No large lakes are present but small lakes and ponds are common. Similar to the Copper River watershed, these streams, lakes, and ponds are important habitat for resident fish. Unlike the Copper River watershed, no anadromous fish are present. While limited data exist for these streams, most stream channels have low gradients (<5 percent) and would therefore be accessible to resident fish. Other habitat conditions (e.g., riparian vegetations and substrate) are similar to those in the Copper River watershed within the analysis area. There are some habitat limitations within the system. These include relatively high fine sediment levels in some streams that may limit fish spawning success and low winter dissolved oxygen levels in ponds. Some human-induced limitations include reduction of LWD from wood harvest in riparian areas, restriction of LWD transport at Nabesna Road crossings, and some restrictions of fish passage at road crossings.

The number of fish species in this watershed is less than in the Copper River watershed, including only four documented species; however, others may be present as noted for the Copper River watershed. The species known to be present include Arctic grayling, burbot, round whitefish, and slimy sculpin (Markis et al. 2004).

There are less than half the stream miles (681 miles) in the Nabesna River watershed of the analysis area than in the Copper River watershed, and no anadromous fish segments because anadromous stocks from the Yukon River do not extend into the park region. Abundance of resident fish is not documented, but some local sport harvest may reduce numbers from natural levels of abundance in some systems, likely those with greatest public access near the Nabesna Road.

The potential effects of ORV trails on fish habitat (e.g., sedimentation, bank erosion, fish passage, riparian vegetation disruption) would be of the same types discussed for the Copper River watershed. Of the nine major trails discussed in the analysis area, four are present in this watershed (Table 3-10). This includes the longest trail (Soda Lake), the shortest trail (Reeve Field), and two intermediate-length trails (Trail Creek and Lost Creek). The report by Buncic et al. (2009) assessed the status of the ORV trail crossings of streams along these four trail systems relative to their effects on the stream and riparian habitat (Table 3-10). This summary also includes the number of trail-stream crossings for each trail indicated in the GIS database, which was based on field assessments.

Three trails follow broad active floodplains that consist of boulder, cobble, and gravel substrate (Trail Creek, Lost Creek, and Soda Lake), and exact trail crossings were difficult to determine or changed from one year to the next. In these cases representative or random crossings were measured. Part of the result is that the number of crossings surveyed is much less than the number indicated by the GIS database for these three streams (Table 3-10). Also, because the Trail Creek, Lost Creek, and Soda Lake trails primarily use much of the broad floodplains as trail routes the portions of the trails that are within 18 meters of the stream are relatively high (25 to 48 percent of the trail length for these streams). While this may increase potential for elevated sediment runoff to the streams, because local substrate has limited fines, this is likely not an issue for these trails.

Trail Creek

No fish information is available for Trail Creek; however, it enters Jack Creek, which supports burbot, Arctic grayling, and slimy sculpin, and the low gradient would not impede fish movement into this stream. However, the stream crosses the Nabesna Road (there is no culvert) and at low flows water may be present only intermittently. As with all streams in the Nabesna River drainage, no anadromous fish are present. A total of nine crossings were examined compared to 17 indicated in the GIS database (as noted earlier, not all crossings were surveyed because of the wide active floodplain channel). Although only five of the nine streams had bank conditions that were considered functional, the lower quality bank conditions were considered a result of the naturally active channel movement. Overall, due to the naturally active channel and large substrate, no habitat alterations were considered to be occurring from trail activity on this stream.

Lost Creek

Again, no fish data are available for Lost Creek; however, similar fish habitat conditions to that of Trail Creek would be expected. The limited effort to catch fish during the survey was unsuccessful. A total of eight crossings were surveyed while 39 are noted in the GIS database. The reason for this difference is the same as those noted for Trail Creek (wide active floodplain channel and large substrate) and attempts were not made to survey all crossings because of their similarity. Bank conditions were functional on six of the eight crossings; those less functional were a result of natural channel conditions. Only the crossing at Nabesna Road had habitat problems relating to substrate, riparian vegetation, and potentially a passage barrier to local fish stocks.

Soda Creek

Again no fish data are available for Soda or Platinum Creeks, but Chalk Creek (Figure 3-12) supports round whitefish and grayling. Limited sampling effort found no fish. Similar to Lost and Trail creeks, the highly dynamic characteristics of the channel resulted in only seven crossings (considered to be representative of conditions) examined relative to 23 indicated in the GIS database. Most of the unsurveyed crossings, however, were well upstream in the system. Similar to the other active floodplain channels, bank conditions were not considered completely functional on most crossings (only two of seven examined), likely due to natural causes. Only one of seven crossings had affected habitat conditions (eroding bank), possibly adding increased sediment downstream. Overall trail conditions had minimal effect on aquatic habitat conditions along Soda Lake trail.

Jack Creek

While no fish data are available and no fish were captured during sampling, Jack Creek is known to support burbot, Arctic grayling, and slimy sculpin. Only three crossings were examined while eight are indicated by the GIS database. Most are substantial trail-stream crossings in width and bottom conditions are primarily gravel and cobble. Banks were considered functional and no adverse habitat conditions were noted at the three crossings. The Reeve Field trail generally does not remain near-stream along its route, as indicated by the limited channel length within 18 meters of streams (Table 3-10).

3.4.4 Wildlife

3.4.4.1 Wildlife Susceptibility to ORV Use

ORV impacts on wildlife include habitat alteration and loss, displacement from preferred habitat, and increased or altered distribution of hunting pressure (Sinnott 1990). The type, severity, and duration of ORV impacts on wildlife depend on which species is being impacted and during what season, and on ORV temporal and spatial use patterns.

ORVs destroy and alter wildlife habitat. As discussed in the soil and vegetation section of this document, ORVs in alpine and tundra areas churn soil, impacting vegetation and soil conditions resulting in changes to available forage and cover for wildlife species. One study on ORV trails within Wrangell-St. Elias (Allen et al. 2000) found a 20 percent loss of vegetative cover, an 80 percent increase in surface subsidence, and a 440 percent increase in ponding on active trails compared to adjacent undisturbed areas. Average active trail width was 10.5 meters (Allen et al. 2000). These effects vary by vegetation and soil types, with poorly-drained areas such as permafrost and wetlands being the most susceptible to damage (Happe et al. 1998, Allen et al. 2000, Loomis and Liebermann 2006) and also taking the longest to recover (Cook 1990). Moose are the primary game species within wetland areas, and in some cases, loss of foraging areas can be detrimental to population stability (Bowyer et al. 2003). During summer, loss of vegetation could negatively affect calf, fawn, and lamb survival (Krausman and Bowyer 2003, Cook et al. 2004). This could in turn affect predator species, such as wolves and bears, if there are fewer young ungulates to prey upon (Paquet and Carbyn 2003, Schwartz et al. 2003). If ORV use crosses streams or occurs adjacent to streams, increased sedimentation could negatively impact fish communities (ADF&G 1996 in Loomis and Liebermann 2006).

ORV use has been shown to have a negative impact on wildlife use of preferred habitat, specifically due to noise and human presence discouraging wildlife from using areas near ORV trails (ADF&G 1996 in Loomis and Liebermann 2006). Research in other states indicates that concentrations of large mammals are inversely proportional to road proximity or traffic intensity (Sinnott 1990). Increased hunting from the ORV trails reinforces the avoidance of the area by game species. Birds can be disturbed from nests, potentially causing nest abandonment (Sinnott 1990). Sinnott (1990) also found that in Alaska, increased ORV use in wetland areas decreases nesting and brood cover for avian species and can impact nesting success.

Increased ORV access and use increases the hunting pressure on game species. While hunting can be beneficial as a management tool, increases in hunting pressure can cause changes in the behavior and distribution of game species, and in some cases can be detrimental to overall population levels (Sinnott 1990). In southwestern Alaska, increased hunting pressure due to ORV use has made it difficult or impossible to locate game in areas that were previous successful hunting grounds (Sinnott 1990). The construction of new ORV trails has the potential to increase use in areas previously difficult to access which can increase mortality to game species in those areas, but can also disperse hunting pressure away from locations where hunting may have previously been concentrated (Sinnott 1990). Increased hunting pressure can increase wounding loss, as hunters become more competitive and take shots at game animals that are generally unlikely to be recoverable (Sinnott 1990). Increased hunting pressure can also occur in furbearing species. Snowmachine tracks have been found to be used by wolves, making them easier to find (NPS 2007a).

The principal wildlife concerns in the analysis area are game species; there are no federally listed species present in the analysis area. Sport hunting is allowed only in the National Preserve lands of the park, while subsistence hunting is allowed on both the National Park and Preserve lands, and both subsistence and sport hunters use the ORV trails. The main big game species sought are moose (*Alces alces*) and Dall's sheep (*Ovis dalli dalli*) (ADF&G 2008a, 2008b), although brown (*Ursus arctos middendorffi*) and black (*U. americanus*) bears are also taken, as are furbearers and small game. There are no bison (*Bison bison*) or mountain goats (*Oreamnos americanus*) known to occur in the analysis area (ADF&G 2008c, 2008d). Most of the analysis area (1,557.8 square miles total) for this Plan/EIS lies in GMUs 11 and 12 (59.1 and 38.6 percent, respectively), with a small portion (2.3 percent) in the northwestern part of GMU 13C. The analysis area makes up only a fraction of these three GMUs; 7.3 percent of GMU 11, 6.0 percent of GMU 12, and 1.7 percent of GMU 13C lie within the analysis area (Figure 3-13). Due to the very small amount of the analysis area that lies in GMU 13C, most of the discussion below will focus on GMUs 11 and 12. The analysis area experiences high hunting pressure due to the presence of the Nabesna Road and ORV trails that provide accessibility (Route and Dale no date). Other important wildlife species in the area are wolves (*Canis lupus*), waterfowl including trumpeter swans (*Cygnus buccinator*), and raptors including bald (*Haliaeetus leucocephalus*) and golden (*Aquila chryseatos*) eagles. Potential impacts to these wildlife species from ORV use in the analysis area include disturbance, habitat loss, and increased risk of mortality. Wildlife species have been grouped by taxonomy; however, potential impacts of each of the alternatives to individual species or populations are described below. The following discussion on wildlife is comprised of five sections: big game, furbearers and small game, waterfowl, raptors, and migratory birds.

3.4.4.2 Big Game

Moose

Moose are the largest member of the deer family, with males in Alaska averaging 1,400 pounds in weight and females averaging 1,000 pounds. Habitat for moose in Alaska commonly consists of recently burned areas containing young willow and birch, and riparian areas below approximately 4,500 feet elevation (Rausch and Gasaway 1994, Gross 2008). Cow moose generally breed in their second autumn, and calves are born between mid-May and early June (Rausch and Gasaway 1994).

It is largely unpredictable where cows will choose to give birth, so calving areas could conceivably occur anywhere within the analysis area (Bowyer et al. 2003). Usually a single calf is born, but twinning can be common in high quality habitat (Rausch and Gasaway 1994). The rut takes place in late September to early October.

A moose survey of most of GMU 11 and the northwestern part of GMU 12 was carried out by park personnel in November 2007 (Reid 2008). The survey targeted, in part, the Upper Copper River, a 524-square-mile area meant to represent moose hunted via access from the Nabesna Road. This area roughly corresponds with the western half of the analysis area for this EIS. The moose population estimate within the Upper Copper River area was 403 ±70, for a moose density of 0.77/square mile; this was the highest observed within the park and is typical for low density moose populations in Alaska (Reid 2008). The bull:cow:calf ratio from this survey was 39:100:16 (Reid 2008). The ADF&G management objective in GMU 12 is a posthunting ratio of at least 40 bulls:100 cows east of the Nabesna River and 20 bulls:100 cows in the remainder of the unit (Gross 2008). The calf:cow ratio was similar to those found in other areas surveyed in the park during the same year. In the Upper Copper River survey area, calf:cow ratios have ranged from 13 to 20 between 1991 and 2007. This is low; the ADF&G management objective to sustain a healthy population in GMU 13 is 25–30 calves:100 cows (Tobey 2008c). Predation studies have not been carried out in GMU 11, but predation is suspected to be the limiting factor for moose (Tobey 2008a). Habitat enhancement activities for moose are not presently taking place in this GMU (Tobey 2008a). However, most of the analysis area outside of the road corridors is managed under a limited fire suppression class, which allows naturally caused fire to burn, subject to monitoring. These wildfires can directly benefit moose by replacing beetle-kill spruce or older willow stands with early seral shrub-dominated plant communities.

More people hunt moose than any other big game species in Alaska (Rausch and Gasaway 1994). The season for both sport and subsistence moose hunting is August 20 to September 20. Only bull moose may be hunted in the analysis area, and bull to cow ratios are lower in the upper Copper River area (44.5:100, 1991–2007) than the rest of the park, presumably due to increased hunting pressure due to access via the Nabesna Road (Reid 2008). In 2008, a total of 188 moose were taken from GMUs 11 and 12, of which 7 percent of the two GMUs combined lie within the analysis area (ADF&G 2009a). The most common transportation methods used by moose hunters in GMU 11 in 2008 were ORV (30 percent), highway vehicle (28 percent), and airplane (25 percent; ADF&G 2009a). In GMU 12, the most common transportation methods used were highway vehicle (30 percent) and ORV (29 percent; ADFG&G 2009a). Within the analysis area, the Nabesna Road is a major point of access for hunters in both of these GMUs (Route and Dale no date). (For more information on harvest, see Section 3.5.3, Subsistence.)

Dall's Sheep

Dall's sheep are found in dry, *Dryas* spp.-dominated habitat above timberline in mountain ranges between 4,000 and 7,000 feet elevation (Heimer 1994, Bentzen 2008a). They depend upon access to very steep, rugged escape terrain for safety, as their predators are unable to use this type of habitat. Few of the maintained ORV trails in the analysis area are over 4,000 feet, but they are used as a major access point into sheep habitat by hunters. The rut takes place in late November and early December (Heimer 1994). Single lambs are born in late May or early June, in the most rugged terrain available (Heimer 1994).

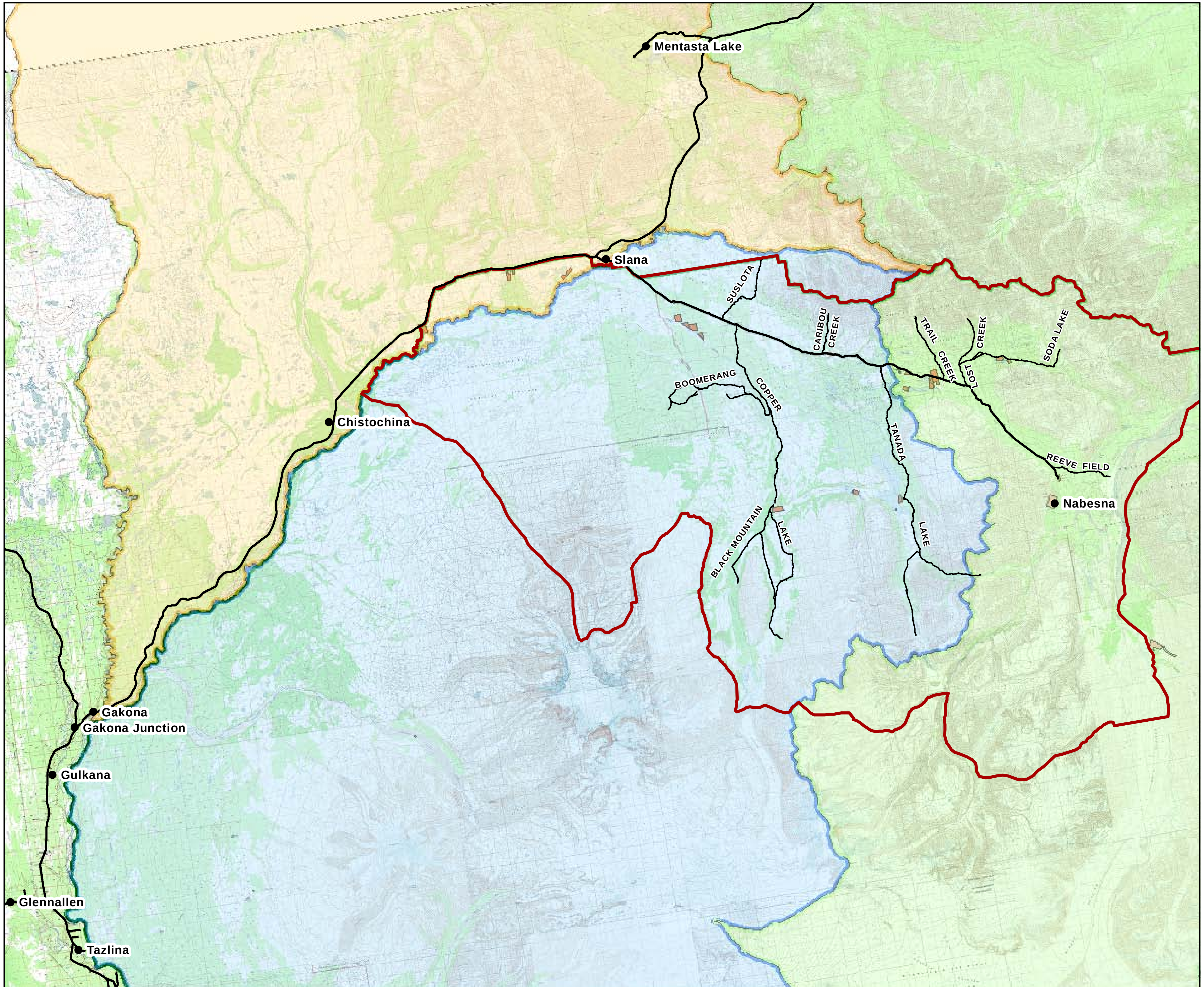

Figure 3-13
Game Management Units and Resident Zone Communities

- Towns
- Existing Roads
- Existing Motorized Trails
- Analysis Area

Game Management Units and Subunits
- 11
- 12
- 13C

NPS Land Status - Non-public Lands
- Mining
- Small Tract

N W E S

0 2.5 5 10
Miles

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Alaska Region
National Park Service
U. S. Department of the Interior

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During aerial surveys for Dall's sheep in an area roughly corresponding to, though slightly larger than, the analysis area for this EIS, 1,730 sheep were seen in 1998 and 2002 (Terwilliger 2005). Lamb:ewe:ram ratios in the three sampling sub-areas in the analysis area were 21:100:55, 36:100:61, and 33:100:26 (Terwilliger 2005). Ram:ewe ratios of 55 and 61 to 100 are rather high, suggesting that hunting pressure in this area may not be limiting. Lamb:ewe ratios of 21, 36, and 33 to 100 appear healthy (Schwanke 2008). Weather is the primary factor limiting lamb production and population growth (Bentzen 2008a). The role of predation in the Dall's sheep population present in the analysis area is unknown, but may be significant (Bentzen 2008a). Coyotes are often important predators on lambs and old sheep, and golden eagles may also take a significant number of lambs. Wolves, although present, are not known to be an important predator (Bentzen 2008a).

Dall's sheep hunting restrictions are based on hunter residency, sheep age and sex, and hunt type; for full details see the Alaska Hunting Regulations (ADF&G 2009b). Hunting of Dall's sheep takes place from August 10 to September 20, and is limited to mature rams for sport hunters. Sport hunting regulations depend on whether the hunter is an Alaska resident or a non resident. In GMU 11, residents can take one ram with ¾-curl horn or larger, while non residents can take only one ram with full-curl horn or larger. In GMU 12, the bag limit is one ram with full curl or larger for both residents and non residents. In GMU 11, subsistence hunters can take one sheep (no sex or age restriction); in GMU 12, subsistence hunters can take only a full-curl or larger ram (Schwanke 2008, ADF&G 2009b). In both GMUs 11 and 12, there is a late-season (September 21 to October 20) elder hunt for subsistence users. The subsistence harvest limit in GMU 11 is any sheep; the subsistence harvest limit in GMU 12 is a full-curl ram (ADF&G 2009b). In 2008, 58 Dall's sheep were taken in GMU 11 (only 7 percent of which lies in the analysis area), 54 of which were rams (ADF&G 2009a). In GMU 12 (only 6 percent of which lies in the analysis area), 118 Dall's sheep were taken in 2008, 117 of which were rams (ADF&G 2009a). The ADF&G management objective for Dall's sheep in GMU 11 is to maintain a sheep population that can sustain an annual harvest of 60 rams (Schwanke 2008). ADF&G management objectives for sheep in GMU 12 include maintaining the general hunt structure using a full-curl harvest strategy and harvesting most of the legal rams available throughout the area each year (Bentzen 2008a). In GMU 11, 24 percent of hunters reported an ORV as their mode of transportation, while 19 percent of hunters in GMU 12 used ORVs (ADF&G 2009a). (For more information on harvest, see Section 3.5.3, Subsistence.)

Caribou

There are three caribou herds in the park: Chisana, Nelchina, and the smaller Mentasta herd. The Chisana and Mentasta herds are declining. The Nelchina herd has ranged from 5,000 to 70,000 animals (NPS 1995). The Mentasta herd has numbered between 800 and 3,100, and in 2008, the fall population estimate was 337. The Chisana herd has declined since 1989, when the population numbered about 1,800, to a 2007 autumn population estimate of 766 (NPS 2009l). The Nelchina herd's range overlaps the western half of the analysis area and stretches west from there to Cantwell, Alaska (Stratton 1982). The Mentasta herd lives along the Copper River and on the slopes of Mounts Sanford and Drum, overlapping most of the analysis area (Barten 1998). The range of the Chisana herd reaches from Nabesna east into Canada to Wellesley Lake and the Donjek River, and so overlaps slightly with the eastern part of the analysis area (Farnell and Gardner 2002). Herds use unique calving areas but may mix during winter (Valkenburg 1999). Forage for caribou tends to consist of lichens, dry sedges, and small shrubs during the winter, and willow, sedges, flowering forbs, and mushrooms during the summer (Valkenburg 1999). Cows segregate from the herd and seek higher elevation sites to give birth, likely to avoid predators. Cows can breed at 2 years of age, and give birth to one calf in late May (Valkenburg 1999). Wolves are the most common cause of death of caribou in the park, followed by bears (Jenkins 1995). There has been no hunting season for caribou in the analysis area since 1994 (Farnell and Gardner 2002). ADF&G Management objectives for the Chisana herd in GMU 12 are to increase calf:cow ratios to 25:100 (Gross 2007b).

Black and Brown Bear

Black and brown bears are abundant throughout the analysis area with good productivity (Tobey 2007, Gross 2007). Harvest on black bears has increased since the 1980s, with most bears taken in GMU 11 in May and August (Tobey 2008b). During the 2005–2006 season, 17 brown bears were harvested in GMU 11 and 22 in GMU 12 (Tobey 2007, Gross 2007). During the 2006–2007 season, 14 black bears were taken in GMU 11 and 50 in GMU 12 (Tobey 2008b, Bentzen 2008b). Both of these bear species are omnivorous; main food sources include berries, sprouting plants, ungulate carcasses, neonatal moose, and salmon (Tobey 2007).

3.4.4.3 Furbearers and Small Game

Furbearing animals that can be trapped in the park are beaver (*Castor canadensis*); coyote (*Canis latrans*); wolf; wolverine (*Gulo gulo*); red fox (*Vulpes vulpes*); lynx (*Lynx canadensis*); marten (*Martes americana*); mink (*Mustela vison*); weasel (*Mustela erminea* and *M. nivalis*); muskrat (*Ondatra zibethicus*); river otter (*Lutra canadensis*); marmot (*Marmota flaviventris*); and red squirrel (*Tamiasciurus hudsonicus*), Arctic ground squirrel (*Spermophilus parryii*), and flying squirrel (*Glaucomys sabrinus*). Small game that can be taken on the park are grouse and ptarmigan (Phasianidae) and snowshoe hare (*Lepus americanus*).

Marten, followed by lynx, are the most economically important furbearers in GMUs 11 and 12 (Schwanke and Tobey 2007, Hollis 2007). Muskrats can also be important. Coyotes, red fox, mink, river otter, ermine, red squirrel, and wolverine are trapped less often. All furbearer and small game species are common to abundant in the analysis area except for otters (GMU 12), fox, and ptarmigan, which are scarce (Schwanke and Tobey 2007, Hollis 2007).

Wolves

Wolf density in the west side of the park for 1996 through 1998 was estimated at 16 wolves per 1,000 square miles (Mitchell 2000). Wolves can travel great distances and have been recorded moving up to 700 miles from original home areas (Stephenson 1994). Wolves breed in February and March, and litters averaging five pups, maximum 10, are born in May or early June. Their principal prey items in Alaska are moose and caribou, and Dall's sheep in certain areas (Stephenson 1994). For the past 20 years, approximately, wolf numbers in GMU 11 have been stable to increasing. In GMU 12, wolf numbers have fluctuated widely due to predator control programs; for the past three decades, wolves and moose have been at a low-density equilibrium in this GMU (Hollis 2006). The average wolf population estimate in spring for GMU 11 from 2001 through 2005 was 103 wolves (Kelleyhouse 2006). Densities are higher in the northern part of the GMU, around the analysis area, due to higher densities of caribou, moose, and sheep (Kelleyhouse 2006). In GMU 12, the autumn population estimate for 2002–2003 was 240 to 255 wolves (Hollis 2006). The wolf hunting season is from August 10 to April 30 in GMU 11 and from August 10 to May 31 in GMU 12, with a bag limit of five wolves (ADF&G 2009b). In GMU 13, the season runs August 10 through April 30, with a bag limit of 10 wolves per day (ADF&G 2009b). Nonrural resident wolf hunters can take 10 wolves from August 10 through April 30 in GMUs 11, 12, and 13 (ADF&G 2008e). The trapping season runs November 10 through March 31 in GMU 11 with no bag limit, and from October 15 through April 30 in GMUs 12 and 13C with no bag limit (ADF&G 2009c).

3.4.4.4 Waterfowl

In the park, diving ducks are the most common type of breeding waterfowl, with scaup (*Aythya* spp.) being the most common (Meixell 2007). Other common species of breeding waterfowl are trumpeter swan, green-winged teal (*Anas crecca*), American wigeon (*A. americana*), mallard (*A. platyrhynchos*), scoters (*Melanitta* spp.), bufflehead (*Bucephala albeola*), and Barrow's goldeneye (*B. islandica*) (Meixell 2007). All of these species are hunted within the park except the swan. The peak of waterfowl abundance in the park occurs around late May due to the presence of both birds breeding within the park and migrants passing through (Meixell 2007). The peak of breeding takes place shortly after this, likely in June.

The 2008–2009 hunting season for waterfowl in the park is September 1 through December 16; bag limits for GMUs 11 and 12 are shown in Table 3-11. In addition to the general hunting season, there is a subsistence migratory bird season, which is open to permanent residents of certain rural areas. Under these rules, there are 34 species of waterfowl that can be harvested or their eggs gathered (AMBCC 2009). The season for this subsistence migratory bird harvest in the Interior Region, which just barely touches the analysis area north of the Nabesna Road, is April 2 through June 14 and July 16 through August 31 (May 1 through June 14 only for egg gathering). The Upper Copper River Region, which encompasses the vast majority of the analysis area, has a general season from April 15 through May 26 and from June 27 through August 31 (AMBCC 2009).

Table 3-11. Waterfowl Hunting Bag Limits in GMUs 11 and 12, 2008–2009 Season

Birds	Per day	In Possession
Ducks[1]	10	30
Sea ducks[2]	10	20
Dark geese[3]	4	8
White geese[4]	4	8
Brant	3	6
Common snipe	8	16
Sandhill crane	3	6

[1] No more than one canvasback per day, three in possession, may be taken.

[2] Includes harlequin, long-tailed duck, eiders, scoters, and mergansers. Limit shown is for residents; non-resident limit is 10 per day, 20 per season. Residents may have no more than six per day, 12 in possession each of harlequin or long-tailed ducks. Non-residents may not take more than four each of harlequin, long-tailed duck, black scoter, surf scoter, white-winged scoter, common eider, or king eider per season.

[3] Includes cackling/Canada and white-fronted goose.

[4] Includes snow and Ross's goose.

3.4.4.5 Raptors

Raptors present in the park are bald eagle, northern harrier (*Circus cyaneus*), sharp-shinned hawk (*Accipiter striatus*), northern goshawk (*A. gentilis*), red-tailed hawk (*Buteo jamaicensis*), Swainson's hawk (*B. swainson*), rough-legged hawk (*B. lagopus*), golden eagle, American kestrel (*Falco sparverius*), merlin (*Falco columbarius*), peregrine falcon (*Falco peregrinus*), and gyrfalcon (*Falco rusticolus*) (NPS no date). All of these are known or probable breeders in central Alaska (Armstrong 2000). The northern goshawk has been a candidate for federal listing since 1991 (56 Federal Register (FR) 58804), but in 1998 it was found that listing was not warranted (63 FR 35183). The northern goshawk is uncommon in the park year-round. Rough-legged hawk, northern harrier, golden eagle, American kestrel, and merlin are federal species of concern. Arctic peregrine falcons (*F. p. tundrius*) were removed from the federal list in 1994 (59 FR 50796), and the American subspecies (*F. p. anatum*) was delisted in 1999 (64 FR 46541).

In addition to the Migratory Bird Treaty Act (MBTA), discussed in the next section, bald and golden eagles are also protected by the Bald and Golden Eagle Protection Act (Eagle Act). The Eagle Act prohibits "take" of either eagle species, including their parts, nests, and eggs. Under the Eagle Act, take includes pursuing, shooting at, poisoning, wounding, capturing, molesting, disturbing, and killing eagles (16 United States Code (USC) 668–668c). The bald eagle was taken off the federal list in 2007 (72 FR 37345), but is still being monitored by USFWS for the first 5 years following delisting. In Alaska, bald eagles build nests from February 1 through mid-May (this is the period when eagles are most sensitive to human activity) and lay and incubate eggs from April 1 through mid-June. Hatching and rearing of young occur from mid-May through mid-September, and chicks fledge from mid-May through mid-October (USFWS 2007a). Bald and golden eagles are both common breeders in the park; golden eagles are present year-round, while bald eagles are typically seen only during spring, summer, and fall (NPS 2009e). Surveys for bald eagle nests have been conducted annually at the park since the late 1980s to determine nest locations and productivity (Kozie 1996). Within the analysis area, there are 28 known bald eagle territories containing 39 known nest trees in this survey segment area that includes the upper Copper River, Tanada Creek, and Copper and Tanada lakes (USFWS 2007b; Putera 2009). Historically, the highest productivity is found in the Upper Copper River segment, which is a braided river, providing salmon as the primary food source. In 2009, 63.6 percent of bald eagle nests in the analysis area were successful, producing an average of 1.4 fledglings per nest (Putera 2009).

Guidelines recommended by the USFWS for activities taking place in areas where eagles breed in general specify that potentially disrupting activities should take place at least 660 feet from a nest if the activity would be visible from the nest, and 330 feet from the nest if not visible from the nest (USFWS 2007a). ORV use should not take place closer than 330 feet from a nest during the breeding season (660 feet in open areas); no buffer is necessary for ORV use outside the nesting season (USFWS 2007a). The majority of the known bald eagle nest trees are > 1,000 feet and no known nests are within 660 feet of any trail system; however, nest territory #257 contains three nest trees that are between 700 and 800 feet from the Tanada Spur trail.

3.4.4.6 Migratory Birds

Under the MBTA, it is unlawful to kill migratory birds. Executive Order 13186 further orders that federal agencies taking actions that may negatively affect migratory bird populations must develop a plan promoting their conservation. There are eight "Birds of Conservation Concern" that have been confirmed to occur within the park (Table 3-12) (USFWS 2008). These are birds that are likely to become candidates for federal listing (USFWS 2008). Partners in Flight also identifies "Priority Species" for different regions of the country. Those priority species confirmed to occur in the interior region of the park are also listed below (Table 3-12; Boreal Partners in Flight Working Group 1999).

Of the 140 migratory bird species confirmed to occur on the park (NPS 2009e), several are ground-nesters (e.g., short-eared owl [*Asio flammeus*], horned lark [*Eremophila alpestris*]).

Although it is generally unlawful to kill migratory birds, in Alaska there is a special subsistence migratory bird season that is open to permanent residents of certain rural areas. Under these rules, there are 34 species of waterfowl, 29 species of seabird, two species of owl, 18 species of shorebird, 4 species of loon, 2 species of grebe, and the sandhill crane that can be harvested or their eggs gathered (AMBCC 2009). Seasons for this harvest are listed above in Section 3.4.4.4, Waterfowl.

Table 3-12. Birds of Conservation Concern and Partners in Flight Priority Species Documented to Occur in Interior Portion of Wrangell-St. Elias National Park and Preserve

Common name	Scientific Name	Abundance[1]	Season[2]	Bird of Conservation Concern[3]	Priority Species[4]
horned grebe	*Podiceps auritus*	C	1,2,3	x	
Gyrfalcon	*Falco rusticolus*	U	1,2,3,4		x
peregrine falcon	*Falco peregrinus*	R	1,2,3	x	
white-tailed ptarmigan	*Lagopus leucura*	U	1,2,3,4		x
sharp-tailed grouse	*Tympanuchus phasianellus*	C	1,2,3,4		x
solitary sandpiper	*Tringa solitaria*	U	1,2,3	x	
lesser yellowlegs	*Tringa flavipes*	C	1,2,3	x	
upland sandpiper	*Bartramia longicauda*	C	1,2,3	x	
Whimbrel	*Numenius phaeopus*	U	1,2,3	x	
great gray owl	*Strix nebulosa*	R	1,2,3,4		x
boreal owl	*Aegolius funereus*	C	1,2,3,4		x
olive-sided flycatcher	*Contopus cooperi*	U	1,2,3	x	x
Hammond's flycatcher	*Empidonax hammondii*	U	1,2,3		x
northern shrike	*Lanius excubitor*	U	1,2,3		x
American dipper	*Cinclus mexicanus*	U	1,2,3,4		x
gray-cheeked thrush	*Catharus minimus*	C	1,2,3		x
varied thrush	*Ixoreus naevius*	C	1,2,3		x
Bohemian waxwing	*Bombycilla garrulus*	C	1,2,3		x
Townsend's warbler	*Dendroica townsendi*	R	1,2,3		x
blackpoll warbler	*Dendroica striata*	U	1,2,3		x
golden-crowned sparrow	*Zonotrichia atricapilla*	U	1,2,3		x
rusty blackbird	*Euphagus carolinus*	U	1,2,3	x	x
white-winged crossbill	*Loxia leucoptera*	U	1,2,3,4		x

[1] C = common, U = uncommon, R = rare, X = casual or accidental vagrant (NPS 2009e).
[2] 1 = spring, 2 = summer, 3 = fall, 4 = winter (NPS 2009e).
[3] Source: USFWS 2008.
[4] Source: Boreal Partners in Flight Working Group 1999.

3.5 Human Environment

3.5.1 Scenic Quality

Scenic quality measures the degree to which a view expresses the essence of the subject landscape, including landforms, native vegetation, water resources and human modifications of the natural landscape. Scenic quality relates to the intrinsic qualities of a landscape, so analysis of existing scenic quality is based on the inherent capacity of a landscape to evoke a perceptual response rather than on individual viewer preferences for landscape appearance.

The scenic quality of a selected scene from a corresponding viewpoint can be described in terms of the overall vividness, intactness, and unity of the view (Jones et al. 1975, Federal Highway Administration 1988). Vividness is the visual power or memorability of landscape components as they combine in striking and distinctive visual patterns. Intactness is the visual integrity of the natural and man-built landscape and its freedom from encroaching elements. Unity is the visual coherence and compositional harmony of the landscape considered as a whole.

Visitor surveys have indicated that the opportunities to view outstanding scenery and wildlife are among the main visitor attractions at Wrangell-St. Elias National Park and Preserve (Littlejohn 1996). As indicated in Section 1.3.1, scenic quality is one of the foundations of the park's enabling legislation. Additionally, the general purposes of the conservation system units established under ANILCA in Section 101(b) are "to preserve unrivaled scenic and geological values associated with natural landscapes." One of the purposes of the National Park units listed in the NPS Organic Act of 1916 is to "conserve the scenery… and to provide for the enjoyment of same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations." The existing scenic quality of the analysis area remains relatively undisturbed, except for the obvious road (Nabesna Road) through the analysis area as well as the multiple trails and trail braids and development (e.g., houses, outbuildings, vegetation clearing) associated with private inholdings. The surrounding scenery is remarkable with its tall peaks.

3.5.1.1 Visual Character

The largest National Park System unit, the Wrangell-St. Elias includes the largest collection of glaciers and the most peaks above 16,000 feet. Wrangell-St. Elias National Park and Preserve is a diverse park that sees a wide variety of visitor uses such as flight-seeing, scenic driving, backpacking, and subsistence hunting by users who access the park via ORV.

Wrangell-St. Elias extends over a large region and includes diverse environments representing Alaska's natural resources. Extensive high mountain terrain, glaciers and icefields, active thermal features, large canyons, wildlife populations, and major historic mining complexes represent a few of the more significant resources, as noted in the GMP (NPS 1986). Major ranges in the National Park and Preserve include the Wrangell, St. Elias, Chugach, Mentasta, and Nutzotin mountains. Together these ranges form one large mountain wilderness that is comparable to all other major mountain groups in the world. Mt. St. Elias is the second tallest peak in the United States at 18,008 feet elevation. Another unique feature of the National Park and Preserve is its vertical relief, with elevations ranging from sea level (e.g., at Icy Bay) to mountain peaks more than 16,000 feet high within a span of 15 miles (NPS 1986).

The landscape of the analysis area is described in detail in Section 3.2. The analysis area contains both peaks and valleys. The character of the terrain between the mountain ranges is general rolling landscape and encompasses a wide range of natural vegetation types, which have been largely unchanged by human development.

As discussed in detail in Section 3.4.2, the vegetative cover includes forest, shrub, and herbaceous communities. Forest communities within the analysis area include needleleaf and broadleaf communities, and mixes of these two forest types. Shrub communities within the analysis area include tall, low, and dwarf shrub types, as well as mixes of these three shrub types. The herbaceous communities within the analysis area are dominated by either graminoids (grasses or sedges), forbs (broad leaved herbs), or bryoids (bryophytes or lichens).

3.5.1.2 Visual Access and Viewer Groups

Potential viewers of the analysis area landscape can access the Nabesna District by several means of travel. These include vehicle travel on the 42-mile-long Nabesna Road and on the Tok Cut-off highway; aircraft travel, either on trips to landing strips or lakes by aircraft within the National Park and Preserve or as flight-seeing activity; snowmobile and/or ORV travel (the latter subject to permits for recreational use); and non-motorized travel on both trails and non-designated, off-trail routes.

Nabesna Road provides by far the predominant access route, both for visitors who remain within the road corridor and those who use the road to access trails and other routes into the backcountry.

The character of Nabesna Road and its relationship with the landscape is considered an integral part of the visitor experience. Nabesna Road is a two-lane dirt and gravel road through the analysis area that provides opportunities for visitors to pull off the road for viewing scenery and wildlife, picnicking, and camping, and to access various trails in the area. There are seven locations along the road where the NPS (2009d) has provided minimal facilities for this purpose (i.e., picnic tables, vault toilets). Distant views from the road are limited in some areas by dense tree and shrub cover along the road.

Visual access is also available by air travel. Within the analysis area, there are at least 10 undeveloped landing strips, four private airstrips, and eight locations commonly used to land float planes (Figure 3-2). Of those, seven landing strips and four locations used to land float planes are within the designated wilderness area. Some visitor groups fly into these locations to obtain ground access to certain areas of the National Park and Preserve. Under favorable weather conditions views from the air are much more expansive than are views from the ground, often including essentially the entire Nabesna District, the central core area of Wrangell-St. Elias, and areas outside the park.

Access to the analysis area beyond the Nabesna Road also occurs by ORV along the trails, and by snowmobile during the winter. Viewing conditions along the trails are often similar to those along the Nabesna Road, with limited viewing distance in some areas because of dense brush and forest cover along the trail. In other locations the trails pass through elevated terrain and/or open areas that provide longer-distance viewing opportunities. In these areas mountainous terrain within the Mentasta, Nutzotin, and/or Wrangell ranges often dominates the background or middleground views.

Groups of viewers who experience the Nabesna District landscape can be defined based on the types of visitor activities and access means. As discussed above, key viewer groups include:

1. Park visitors traveling and recreating along the Nabesna Road or traveling the Tok Cut-off highway.

2. Non-motorized recreationists (primarily day hikers, backpackers, and horse riders) using trails and off-trail routes in the Nabesna District

3. Recreational ORV and snowmobile riders using the Nabesna-area trails open to this activity

4. Subsistence ORV and snowmobile users traveling on the trails, primarily for hunting and trapping access

5. Residents using standard vehicles, aircraft, and/or ORVs/snowmobiles to access private inholdings

6. Park visitors traveling by aircraft for flight-seeing or for access to public-use cabins and/or backcountry activities

Total visitation to Wrangell-St. Elias National Park and Preserve was estimated at approximately 65,700 visitors in 2008 and 61,100 in 2007 (Fact Sheet NPS 2009f). Specific estimates of the total number of visitors to the Nabesna District of Wrangell-St. Elias are not available because of the difficulty of monitoring activity levels for all of the user groups. Based on the proportional distribution pattern demonstrated in a 1995 survey of Wrangell-St. Elias visitors (Littlejohn 1996), it appears that use of the Nabesna District may represent 5 to 10 percent of total park use, or roughly 3,500 to 6,500 visitors per year. Alaska Department of Transportation and Public Facilities (ADOT&PF 2007) traffic counter data indicate the traffic volume on the Nabesna Road was approximately 3,500 vehicle trips in 2007. This traffic volume would represent about 10,000 to 11,000 people per year, although this figure includes trips by local residents in addition to visitors.

As described in Section 3.3.2.3, Subsistence vs. Recreational ORV Trail Use, current ORV use (round trips) on the trails within the Nabesna District (viewer groups 3 and 4 above) is estimated at 877 per year, including 437 recreational ORVs and 440 subsistence ORVs. Trail monitoring data from 1995 (Happe et al. 1998) indicate that non-motorized trail users (viewer group 2 above) are approximately equal in number to total ORV users.

Small fixed-wing air traffic is common in the analysis area. Airplanes serve as a common means of access during the summer months and particularly during the months of August and September to access remote hunting camps. The outfitter/guides who have permits to operate within the analysis area all use airplanes to transport clients, either to hunting camps or for non-hunting season drop-offs or pick-ups. Other commercial use transporters also use airplanes for client pick-up and drop-offs within the analysis area. Frequency of flights is highly dependent on the season but visitors along the Nabesna Road or using the trail system could expect to hear small fixed-wing aircraft at least twice a day from mid-May to early August and 4 to 5 times per day from early August through September 20.

3.5.1.3 Visibility

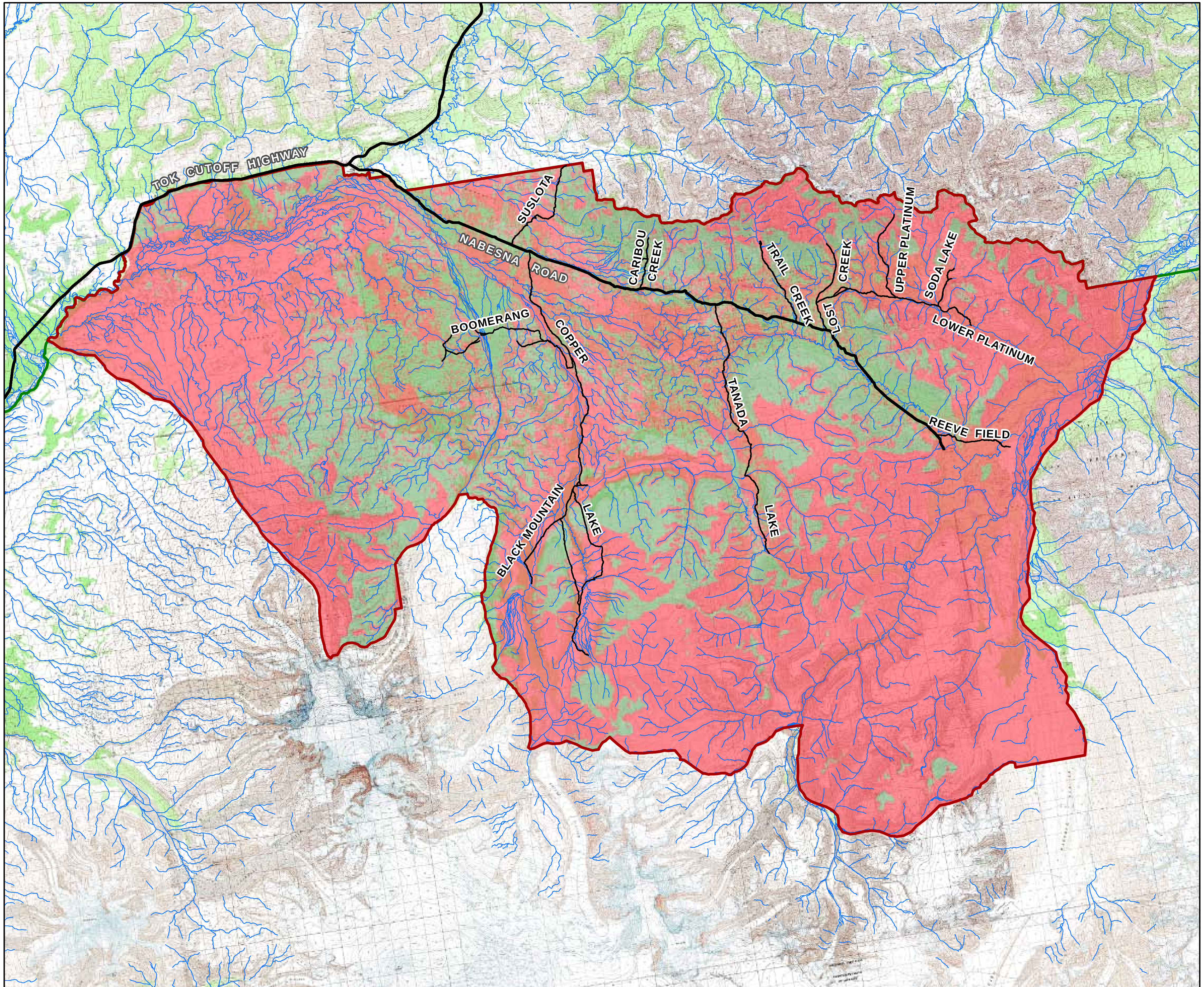
Figure 3-14 is a map of the generalized viewing opportunities from the Nabesna Road. Based on GIS analysis of terrain and vegetation (which can screen views that would otherwise be available), the map identifies areas that are visible from the Nabesna Road, as well as areas not visible from the road. This map also identifies the locations of two popular pullouts, Dead Dog Hill and the Twin Lakes campground, from which visitors can take in scenic views of the analysis area and beyond.

The baseline viewshed analysis indicates that views from the road corridor can be fairly expansive given the rolling terrain, the limited extent of tall forest vegetation, and the presence of tall mountains in the background. Nevertheless, at many locations along the road corridor the adjacent tree and shrub cover is sufficient to block or screen views of the lower-elevation lands near the road. Figure 3-15 illustrates a common viewing condition along the Nabesna Road, in which the mountains in the background are visible while the terrain in the foreground is obscured. Consequently, views of the existing trail features from the Nabesna Road are generally limited to just the trailhead areas adjacent to the road.

(Note that the green areas shown in Figure 3-14 represent landscape features visible from the road corridor, based on an unobstructed line of sight from the road to points on the landscape. While a structure or a road cut within those landscape features might well be visible, small features such as the cleared area occupied by a trail generally are not likely to be evident.)

Because a substantial number of visitors access Wrangell-St. Elias National Park and Preserve by aircraft, views from the air are also common. These views are typically quite expansive, unless they are limited by cloud cover, and aerial viewers often are able to distinguish features that are not evident in land-based views. Figure 3-16 illustrates a common viewing condition from the air within the analysis area; in this view of a degraded trail segment of the Tanada Lake trail, the presence of a linear feature is very distinct because of ponded water in areas of bare ground and multiple parallel linear tracks.

Figure 3-14
Viewing Opportunities
from Nabesna Road



Existing Roads
Existing Motorized Trails
Streams
Analysis Area
Twin Lakes Campground
Dead Dog Hill
Not Visible
Visible

N
W E
S

0 2.5 5 10
Miles

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Alaska Region
National Park Service
U. S. Department of the Interior

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Figure 3-15. Common Viewing Condition along Nabesna Road with Mountains Visible in Background and Obscured Foreground

Figure 3-16. Tanada Lake Trail Seen from the Air

Trail users are exposed to the visual impacts associated with the trail degradation that is evident in the landscape. The degree of this effect varies from trail to trail and among various segments of the same trail, as indicated in Figures 3-4 through 3-9. Along the more degraded trail segments, users experience views of mud/muck holes; rutting; bare ground that is often muddy; exposed roots; multiple tracks from trail braiding; gravel deposited for trail hardening; and changes in vegetation types, such as growth of cotton grass in disturbed areas. In other areas the visible presence of the trail is much less noticeable. The Soda Lake trail, for example, includes wet meadow areas where trail impacts are obvious and other locations where visible effects are limited to a single bare-ground track or tread marks evident in gravel.

Most of the landscape disturbance in the National Park and Preserve within the analysis area is due to the presence of the Nabesna Road and the trails that originate from this road. As a result, the scenic views available to park visitors in the analysis area typically show moderate modification of the natural landscape because they are views from developed features (the road and/or trails) looking out towards the undeveloped areas.

3.5.2 Cultural Resources

Cultural resources include archaeological sites, historic sites, architectural properties, traditional cultural properties, districts, and landscapes, structures, features, or objects resulting from human activity. Cultural resources are nonrenewable resources, which can be either prehistoric and hundreds to thousands of years old, or historic dating from the late 1700s for this part of Alaska. They are recognized as tangible cultural materials or sites resulting from human behavior that are at least 50 years old. Isolated cultural resources that extend back several thousand years are known from Wrangell-St. Elias National Park and Preserve. As one moves forward in time, the number, variety, and visibility of cultural resources increases potentially as a result of the increase in the size of Native American populations, but certainly, after the early to middle 1800s, Russian and American immigration and population increase and use of less perishable cultural items. Wrangell-St. Elias National Park and Preserve, along with Glacier Bay National Park and Preserve and Kluane National Park, were collectively designated as a World Heritage Site in December 1992 by the United Nations Educational, Scientific, and Cultural Organization (UNESCO), based on the special values of the natural and cultural features of the area (NPS 1998:1).

3.5.2.1 Cultural Landscapes

Although no cultural landscapes have been defined within the project area, Wrangell-St. Elias will evaluate the possibility they exist based on NPS review and responses received during the public comment period on the draft EIS and from consultation with the tribes. A preliminary assessment indicates that the trail system itself may constitute both a vernacular historical landscape and an ethnographic landscape. Whether or not any of the alternatives would impact the integrity of such a landscape will also be evaluated through consultation. If a significant impact is found, further study will be undertaken.

3.5.2.2 Cultural Overviews

Wrangell-St. Elias is located in the Western Subarctic Culture Area of North America. Prehistoric resources located in this region are further subdivided into broad time periods. The earliest cultural period in the Subarctic is referred to as the American Paleoarctic Tradition, which dates from 10,000 to 4,000 years ago and represents the earliest occupants along the upper Copper River. Included within this tradition is the Denali Complex with diagnostic artifacts of stone, such as chert or obsidian, wedge-shaped cores from which very small blades or microblades were removed, leafshaped knives of stone worked on both surfaces, and notched river cobbles (Clark 1981, NPS 1998, Proue et al. 2008). This tradition has not been documented in the analysis area or in the park.

The following cultural period is the Northern Archaic Tradition currently dated from 5,000 to 2,000 years ago in this part of the Subarctic. Diagnostic artifacts include side-notched projectile points, half-rounded lithic artifacts worked on both surfaces, and cobble choppers that differ from the preceding Denali Complex (Clark 1981). Occupation sites from this period, some of which are considered to be large camps, have been documented outside Wrangell-St. Elias (NPS 1998:30). Cultural resource reports indicate that a side-notched projectile point from this period was found in the park to the south and east of the analysis area (NPS 1998, Proue et al. 2008).

The Athabascan (also spelled Athapaskan and Athabaskan) Tradition, dated from 2,000 years ago to the present, is the cultural tradition following the Northern Archaic. The components of cultural material changed from abundant lithic artifacts, although stemmed projectile points are present in assemblages, to the predominance of organic materials, bone and antler for projectile points and tools, and native copper artifacts such as awls, projectile points, knives, and scrapers. Other cultural material items include stone slab and boulder flake tools, grooved adzes, and occasionally preserved birchbark tray baskets. With the introduction of European and American trade goods, the ingenuity of the Athabascans can be seen in the various ways metal weapons, tools, and containers were used and reused. Site types identified during the majority of this time period in the Subarctic consist of short duration camps, some of which were reoccupied a number of times. During the last 150 to 200 years log cabin villages began appearing at former seasonal camp locations (Clark 1981, Dixon 1985, NPS 1998, Proue et al. 2008).

Based on at least 2,000 years of cultural continuity at archaeological sites in central Alaska and adjacent areas, it is concluded that the people of the Athabascan Tradition are early ancestors of the historic and contemporary Northern Athabascan speakers (Clark 1981:114, 117-129; Proue et al. 2008:9; NPS 1998:30-32). Included in this language family subdivision are the Upper Tanana in the northern and eastern parts of the analysis area and the Upper Ahtna in the southwestern part of the analysis area. There was no overall tribal organization among the Tanana and Ahtna and local groups were generally autonomous and seasonally mobile (De Laguna and McClellan 1981, McKennan 1981, NPS 1998, Proue et al. 2008, Reckord 1983a).

The Upper Tanana includes the Upper Nabesna and Upper Chisana local bands who occupied the upper reaches and tributaries of the rivers of those names, north of the Wrangell Mountains, at the time of contact around 1880. As part of their annual subsistence round, in the late summer and fall, smaller bands of 20 to 75 people would snare or corral migrating caribou, especially at the forest edges, their major annual food supply. Late summer was also a time to go to the mountains where grizzly bear were more common and Dall's sheep were found exclusively. While in the mountains, they would also hunt or trap marmot, ground squirrel, wolverine, and marten; fish were also caught with nets or trapped in rivers and lakes. Women gathered edible roots, plants, and berries for food along with birch bark and spruce roots for baskets and implements during the growing season. The spring and summer subsistence started with moose, caribou, muskrat, and beaver, then focused on salmon and other fish at camps and villages, including Batzulnetas (Haynes and Simeone 2007, McKennan 1981, NPS 1998).

In the early 1980s, Dr. James Kari began working with elders and others with knowledge of places important to the Upper Tanana to develop a list of nearly 900 place names along with maps showing the locations of those places. The lists include almost 90 named geographic areas, topographic features, lakes, and creeks in or adjacent to this portion of Wrangell-St. Elias National Park and Preserve. In addition, cultural sites or features including villages, camps, and trails are also listed.

Because of the overlap with Upper Ahtna territory some of the named places are in their territory (Haynes and Simeone 2007, Kari 1983, 1997).

Many of the trails used by the Upper Tanana and Upper Ahtna were likely originally game trails, and even after roads were developed in the area, trails were used for hunting, fishing, trapping, berry picking, and wood gathering. Frequently the bands or groups in the area would cross paths along trails in the Wrangell Mountains with the Upper Ahtna known to go north to hunt and the Upper Tanana traveling to Batzulnetas to fish or trade with the Ahtna; each group knew and followed the trail use protocols of the other group. The trails were marked by the people who used them and often the markings would communicate information about the person making the mark or marks, such as destination of travel or hunting success (De Laguna and McClellan 1981, Haynes and Simeone 2007, Justin 2007, McKennan 1981, Reckord 1983a).

The Upper Ahtna occupied the Slana and Upper Copper River drainages at contact with the Russians in the middle 1800s and continued into the late 1800s following American contact. Batzulnetas and Suslota, Ahtna villages at either end of the Suslota trail in the analysis area, were occupied into the mid-1900s. Villages often consisted of log or plank houses with moss and bark insulation, while seasonal shelters were mostly brush and bark lean-tos. The major village of Batzulnetas was both an important summer fish camp and a permanent winter village. Local Ahtna resident, Wilson Justin, believes that Batzulnetas was best known as a military training camp for young Ahtna men (Justin 2007). Other Ahtna settlements and villages in the analysis area were at Lost Creek, Nabesna Bar, and Platinum Creek. The hunting of bears emerging from hibernation and migrating caribou in the spring was followed by later spring and early summer catching of salmon in the Copper River for drying and storage. The Upper Ahtna trapped and netted fish in lakes and streams in the analysis area. In the late summer they hunted sheep in the mountains and caribou again during the fall migration; they also hunted bears and trapped fattened ground squirrels along with muskrat and other furbearers in the fall. Berries, roots, and various plant parts were consumed by the Upper Ahtna, but were not an important part of their diet. Trails crossed the Ahtna territory, especially paralleling rivers to the uplands and mountains (De Laguna and McClellan 1981, Reckord 1983a).

Dr. James Kari has also worked with Upper Ahtna elders and others with knowledge of places important to the Upper Ahtna to prepare lists of place names and publish transcribed Ahtna narratives. The lists include over 200 named geographic areas, topographic features, lakes, and creeks in or adjacent to this portion of Wrangell-St. Elias. In addition, cultural sites or features including villages, camps, and trails are also listed. Because of the overlap with Upper Tanana territory some of the named places are in their territory (Kari 1983, 1986).

The historic period in the analysis area begins in the late 1700s when Russian explorers entered the upper Copper River area. After the Russians attempted dominating and trading with the Ahtna, the Russia-Aleut explorer Serebrennikov was reportedly killed near Batzulnetas along with his trading party following reported abuses at the village. The next significant event during the historic period was the true beginning of the American period in 1885 when the American explorer Lieutenant Henry T. Allen passed through the upper Copper River area using existing trails to visit the villages of Batzulnetas and Suslota and traveled on into Upper Tanana territory. Allen's travels through the area were immortalized in Native oral tradition. Following Allen's opening of the area, gold was discovered in the late 1890s in the Nabesna area and placer mining occurred during the 1910s, but the Nabesna Mine was not opened until the late 1920s at which time many miners swarmed to the area. The miners used existing Native trails and in the early 1930s the trail from Slana to Nabesna was upgraded to a road for cars and trucks traveling to the Nabesna Mine. The mine grew along with a large camp where the miners lived, until 1946 when the mine owner died during the winter closure; the mine never reopened (Haynes and Simeone 2007, Proue et al. 2008, Reckord 1983a).

"Revised Statute 2477 (RS2477) is part of the Mining Law of 1866, which granted states and territories unrestricted rights-of-way [ROW] over federal lands that had no existing reservations or private entries" (Proue et al. 2008). Proue et al. state that the ADNR maintains a database of hundreds of historic RS2477 ROWs, including 10 that are either in or adjacent to the analysis area.

3.5.2.3 Documented Cultural Resources along ORV Trails in the Analysis Area

In 2007 and 2008, field crews from Northern Land Use Research (NLUR) conducted Level II, Evaluation Phase, cultural resource surveys along either side of the nine trails where recreational ORV use has been authorized and along a proposed re-route defined as the area of potential effect (APE). Field crews sought to relocate previously recorded cultural resource sites in the vicinity of the trails to determine whether they were within the APE. Prehistoric sites in the APE may be exposed on the surface or found within undeveloped soils and/or covered by moss, grasses, forbs, shrubs, and/or trees. Therefore, before going to the field NLUR archaeologists reviewed various data sources to determine areas considered to have a high probability of containing archaeological sites, including those that might be buried. During initial field reconnaissance by ATV in 2007 and helicopter in 2008, the crews reviewed those potential high probability areas and returned to those areas to conduct pedestrian inventories and subsurface shovel tests. During early phases of shovel testing in 2007, some of the areas were as much as 100 meters from the trails. Following the location of the first few archaeological sites, the APE was restricted to 15 meters either side of the trails with potential high probability areas mapped for future testing. A total of five new prehistoric sites (NAB-392, NAB-393, NAB-394, NAB-395, and NAB-396) were located by shovel testing and recorded in 2007, while two new prehistoric sites (NAB-428 and NAB-429) were located and recorded in 2008. Only one previously recorded site (NAB-103), an historic ethnographic site, was revisited on the basis of proximity to a trail. The field crews found no evidence of, or remains associated with, any of the historic trails (Proue et al. 2008, 2009).

Suslota Trail

This was a main trail connecting the permanent Ahtna villages at Suslota Lake and at Batzulnetas (reportedly two villages) located south of the Nabesna Road. The trail was in place and well used prior to the arrival of Russians, who found it important to their travel through the area for exploration (Reckord 1983a:192, 203-204), and Euroamericans, who used it for exploration and during the 1898 gold rush (Haynes and Simeone 2007, Reckord 1983a). This trail is part of the trail listed as RST-83, one of the RS2477 historic ROWs in the ADNR database (Proue et al. 2008). Local Ahtna resident, Wilson Justin, indicates this was a clan trail, meaning a major trade route, which was the "gateway" for the Upper Tanana to enter Upper Ahtna territory. He also indicates that the trail, or a portion of it, ran along the foothills above brush line to Peggy Lake, where it became part of the current Trail Creek trail (Justin 2007).

As mentioned in the previous section (Section 3.5.2.2, Cultural Overviews), Suslota village is a site associated with the Suslota trail. Suslota village is located on the banks of Suslota Lake north of the park/preserve boundary. Commonly known as “Old Suslota,” the Native name for this site is Sasluuggu’. It was occupied as a permanent winter village by the Upper Ahtna from sometime prior to ca. 1794–1797 until ca. 1918. Sasluuggu’ holds an important place in the contact history of the Upper Copper River region (Pratt 1997).

Because of the cultural and historical importance of the Old Suslota village site, it was identified by Ahtna Native Corporation as an ANCSA 14(h)(1) selection. Field investigations conducted by Bureau of Indian Affairs archeologists in 1997 found the site to be eligible as a Native historical place. Field investigations also determined, “The site’s integrity is threatened by modern recreational use of the vicinity, mostly associated with outfitter/guide operations and ORV traffic. An ORV trail has severely impacted surface features at Sasluuggu' and has also exposed subsurface lithic remains."

The first mile of this trail was surveyed for cultural resources in 2007, with no shovel tests excavated due to the lack of high probability testing areas; no cultural resources were located within the APE (Proue et al. 2008).

The remaining approximately 6.4 miles of this trail were surveyed initially for cultural resources in 2008 by low-altitude helicopter flyover due to adverse ground conditions. Later in the season this portion of the trail was inventoried by ATV, with two shovel tests placed in one high probability testing area resulting in the location of a new prehistoric archaeological site, NAB-428. Both shovel tests at the site each produced a flake of chert and one of the shovel tests also contained charcoal below the flake that produced a date of over 2,100 years old, indicating that this site is no more than 2,000 years old. Based on the depths of the recovered cultural materials it appears there was more than one early historic or prehistoric occupation at the site, which is recommended eligible for the NRHP. This site is located within the APE defined as 15 meters either side of the trail. NLUR personnel did not observe any signs of the historic trail (Proue et al. 2009).

Caribou Creek Trail

The 3.6 miles of this trail were surveyed for cultural resources in 2007 by NLUR, with six shovel tests placed in three testing areas; no cultural resources were located within the APE (Proue et al. 2008).

Trail Creek Trail

In the early 1980s linguist James Kari interviewed Fred John, an Upper Ahtna, who talked about using this trail to travel north to Tetlin (Haynes and Simeone 2007). More recently local Ahtna resident, Wilson Justin indicates that the higher part of this trail was part of the Suslota trail that was the "gateway" for the Upper Tanana to enter Upper Ahtna territory (Justin 2007).

During the 2007 field season, the NLUR crew conducted a cultural resource inventory along the 6 miles of this trail, excavating a total of 17 subsurface shovel tests at eight high probability testing areas. As a result, the crew located new prehistoric archaeological sites NAB-392, NAB-393, and NAB-394. The sites contained from one to eight flakes of chert or obsidian and are recommended eligible for the National Register. Shovel tests at sites NAB-392 and NAB-393 also produced charcoal that is considered not related to the cultural material but of natural fire origin. These sites are located beyond the APE defined as 15 meters either side of the trail. This trail is part of the trail listed as RST-1562, one of the RS2477 historic ROWs in the ADNR database (Proue et al. 2008). NLUR personnel did not observe any signs of the historic trail (Proue et al. 2009).

Lost Creek Trail

An Ahtna family lived in a cabin along Lost Creek in the 1930s and 1940s and used it as a base from which they trapped (Reckord 1983a). This trail is part of the trail listed as RST-1562, one of the RS2477 historic ROWs in the ADNR database (Proue et al. 2008).

The 2007 NLUR cultural resource inventory relocated Site NAB-103, a previously recorded site containing the remains of an historic ethnographic occupation site or village with an associated cemetery. While only features of the cemetery were found, the site was determined to be sufficiently removed from the APE (McMahan 1994, Proue et al. 2008).

During the 2007 field season, 5.9 miles of this trail were surveyed, and a new prehistoric archaeological site, NAB-395, was located through two subsurface shovel tests at a high probability testing area. One shovel test at the site produced an obsidian flake and the site is recommended eligible for the National Register. This site is located beyond the APE defined as 15 meters either side of the trail (Proue et al. 2008). NLUR personnel did not observe any signs of the historic trail (Proue et al. 2009).

Soda Lake Trail

Local Ahtna resident, Wilson Justin, indicates that this was part of the Suslota trail, which was the "gateway" for the Upper Tanana to enter Upper Ahtna territory and to access Big Grayling Lake (Justin 2007). Sheep hunting camps from at least the early 1900s are reported at lakes along the Soda Lake trail. Game was attracted to the lakes, which were fed by a mineral spring. Grayling fishing also took place in the lakes. The trail was also used by Euroamerican prospectors and fur traders in the early 1900s (Reckord 1983a). This trail is part of the trail listed as RST-319, one of the RS2477 historic ROWs in the ADNR database (Proue et al. 2008).

The 12.7 miles of this trail was surveyed for cultural resources in 2007 by NLUR, with nine shovel tests placed in four high probability testing areas; no cultural resources were located within the APE (Proue et al. 2008). NLUR personnel did not observe any signs of the historic trail (Proue et al. 2009).

Reeve Field Trail (with Re-route)

The Upper Tanana had a village in this area and they are reported to have used the area from time immemorial for hunting sheep, snaring ground squirrels, and fishing for grayling in the small lakes. The U.S. Army built a large airfield on a sandbar of the Nabesna River early in World War II and abandoned it at the end of the war. Subsequently, a small group of Upper Tanana from Cooper Creek village occupied Nabesna Bar and hunted, fished, and trapped in the area until at least the late 1970s (Reckord 1983a). In the early 1980s linguist James Kari interviewed Fred John, an Upper Ahtna, who talked about using this trail to travel north to Tetlin (Haynes and Simeone 2007). More recently a local Ahtna resident, Wilson Justin, indicates that this was originally an Upper Ahtna trail to access sheep hunting areas (Justin 2007). This trail is part of the trail listed as RST-12, one of the RS2477 historic ROWs in the ADNR database (Proue et al. 2008).

The 6.5 miles of the Reeve Field Trail and re-route were surveyed for cultural resources in 2007. NLUR identified no high probability testing areas, no shovel tests were excavated, and no cultural resources were located within the APE (Proue et al. 2008:25). NLUR personnel observed grade segments of the historic trail along the re-route (Proue et al. 2008:25).

Tanada Lake Trail

There were three related locations reported at Tanada Lake used for generations as bases for hunting sheep, snaring ground squirrels, and fishing for grayling and some salmon by people from Batzulnetas. In the 1920s and 1930s, sites around the lake were again important as central locations for trapping by the Ahtna and Upper Tanana, where they also fished and hunted. During this latter period hunting sites further south were accessed using the trail (Reckord 1983a). Local Ahtna resident, Wilson Justin, indicates that part of this trail was used by the people of Batzulnetas to access Tanada Lake (Justin 2007). This trail is part of the trail listed as RST-162, one of the RS2477 historic ROWs in the ADNR database (Proue et al. 2008).

The first 1.5 miles of this trail were surveyed for cultural resources in 2007, with four shovel tests placed in two high probability testing areas; no cultural resources were located within the APE (Proue et al. 2008).

The remaining approximately 16.5 miles of this trail were surveyed initially for cultural resources in 2008 by low-altitude helicopter flyover due to adverse ground conditions. Pedestrian surveys focused on approximately 1.25 miles along the shore of Tanada Lake, with two shovel tests placed in one high probability testing area; no cultural resources were located within the APE. NLUR personnel did not observe any signs of the historic trail (Proue et al. 2009).

Copper Lake Trail

There was a settlement reported at Copper Lake and sheep, caribou, and moose were hunted in the area (Reckord 1983a). The Copper Lake trail is part of the trail listed as RST-1567, one of the RS2477 historic ROWs in the ADNR database (Proue et al. 2008).

The first 5 miles of this trail were surveyed for cultural resources in 2007, with five shovel tests placed in two high probability testing areas resulting in the location of a new prehistoric archaeological site, NAB-396. One shovel test at the site produced a chert flake and the site is recommended eligible for the National Register. This site is located beyond the APE defined as 15 meters either side of the trail (Proue et al. 2008).

The remaining approximately 6 miles of this trail were surveyed initially for cultural resources in 2008 by low-altitude helicopter flyover due to adverse ground conditions. Later in the season this portion of the trail was inventoried by ATV, with four shovel tests placed in two high probability testing areas resulting in the location of a new prehistoric archaeological site, NAB-429, within the APE. One shovel test at the site produced two core fragments and 91 flakes of material identified as chert, most of which fit back together, and the site is recommended eligible for the National Register. NLUR personnel did not observe any signs of the historic trail (Proue et al. 2009).

Boomerang Trail

The Boomerang trail was not part of the RS2477 system of historic ROWs listed in the ADNR database (Proue et al. 2008).

The first 2.1 miles of this trail were surveyed for cultural resources in 2007, with six shovel tests placed in three high probability testing areas; no cultural resources were located within the APE (Proue et al. 2008).

The remaining 8.1 miles of this trail were surveyed for cultural resources in 2008, with six shovel tests placed in two high probability testing areas. Pedestrian inventory covered approximately 4.7 miles of the area, with the remainder inventoried by low-altitude helicopter flyover due to adverse ground conditions. No cultural resources were located within the APE (Proue et al. 2009).

3.5.3 Subsistence

Federally qualified subsistence use is allowed within Wrangell-St. Elias National Park and Preserve in accordance with Titles II and VIII of ANILCA. Some lands within the park are designated as National Park; others are designated as National Preserve. Local residents depend upon the resources from the park for personal consumption, cultural identity, and to maintain a subsistence way of life.

The eligibility requirements for hunting on the lands designated as National Park are different from those for lands designated as National Preserve. The analysis area includes both National Park and National Preserve lands. Only qualified subsistence users may hunt or trap within the National Park (i.e., on lands within Wrangell-St. Elias designated as National Park). These requirements also apply to fishing in the National Park under federal subsistence regulations. However, sport fishing under state regulations is also allowed in the National Park.

To be an eligible subsistence user on NPS land, a person must (1) live within the boundary of the national park, (2) permanently reside within a designated resident zone community, or (3) obtain a subsistence eligibility permit (13.44 permit) from the NPS. A resident zone is defined as "the area within, and the communities and areas near, a national park or monument in which persons who have customarily and traditionally engaged in subsistence uses within the national park or monument permanently reside" (Title 36 CFR chapter 1, section 13, part 42). Designation as a resident zone community enables community members to harvest fish, wildlife, and plant resources from park lands for subsistence purposes, under provisions of applicable federal regulations, without first having to obtain a subsistence eligibility permit from the National Park Service. Wrangell-St. Elias has 23 resident zone communities. Resident zone communities in the vicinity of the analysis area include Chistochina, Mentasta Lake, Nabesna, and Slana (Figure 3-13). Other communities designated as resident zones for the National Park include Chisana, Chitina, Copper Center, Dot Lake, Gakona, Gakona Junction, Glennallen, Gulkana, Healy Lake, Kenny Lake, Lower Tonsina, McCarthy, Northway, Tanacross, Tazlina, Tetlin, Tok, Tonsina, and Yakutat (Title 36 CFR 13.1902). Individuals who reside outside of the park and the resident zone communities, but are rural Alaskans and have (or are members of a family that has) customarily and traditionally used park subsistence resources, may apply to the Park Superintendent for a subsistence eligibility permit (13.44 permit; Title 36 CFR 13.440).

In addition to meeting one of these three requirements, individuals must live in a community or are with a "customary and traditional use" determination for the area and species desired. These determinations are made by the Federal Subsistence Board for each species and geographic area and are listed in the federal subsistence management regulations booklet by GMU and Fishery Management Area (Federal Subsistence Management Program 2008).
Lands designated as National Preserve are open to both federal subsistence and state authorized general (sport) hunting and trapping activities, as well as both subsistence and state authorized sport fishing. To engage in subsistence activities under federal regulations within the National Preserve, individuals are not required to live in a resident zone community, but they must live in a rural Alaskan community or area that has a positive customary and traditional use determination for the species and the area where they wish to hunt, fish, or trap.

Eligible subsistence users within Wrangell St.-Elias National Park and Preserve must possess a State of Alaska-issued resident hunting or trapping license to hunt or trap under federal subsistence regulations (no state license is required for fishing) and must observe all season and harvest limit regulations. They must also possess harvest tickets, permits, or tags required by the state, unless superseded by federal regulations (i.e., if a federal registration permit is required for a species, no state permit or harvest ticket for that species is required). The federal subsistence management regulations (Federal Subsistence Management Program 2008) outline federal registration permit requirements.

Based on 2000 U.S. Census data compiled by the Alaska Department of Community and Economic Development (Alaska DCED), the NPS estimates that approximately 6,000 individuals are eligible to engage in subsistence activities in Wrangell-St. Elias National Park and Preserve. These activities include hunting, trapping, fishing, berry picking, gathering mushrooms and other plant materials, collecting firewood, and harvesting timber for house construction.

The landscape included within the park ranges from forests and tundra to the rock and ice of high mountains. The region's main subsistence resources are salmon, moose, caribou, Dall's sheep, mountain goat, ptarmigan, grouse, snowshoe hare, furbearing animals, berries, mushrooms, and dead and green logs for construction and firewood. Most subsistence hunting within Wrangell-St. Elias occurs off the Nabesna, McCarthy, and Kotsina roads. The Copper, Nabesna, Chisana, and Chitina rivers serve as popular riverine access routes for subsistence users. Most subsistence fishing in the park takes place along the Copper River.

Access granted under ANILCA Section 811 for subsistence uses includes snowmobiles, motorboats, and other means of surface transportation traditionally employed. Allowed means of access by federally qualified subsistence users in Wrangell-St. Elias include motorboat, snowmachine (subject to frozen ground conditions and adequate snow cover), ORVs, and airplane (National Preserve lands only), along with non-motorized means such as foot, horses, and dog teams. Under current regulations, the Park Superintendent may restrict or close a route or area if he or she determines that the means of access is causing or may cause an adverse impact, subject to notice and a public hearing (Title 36 CFR 13.460 (a) and (b)).

3.5.3.1 Subsistence Harvest

This section describes subsistence harvest within the GMUs encompassing the analysis area. Statistics on subsistence are provided where available. Information on sport harvest is also included where appropriate given that recreational hunters may compete with subsistence hunters for wildlife resources.

The Nabesna District is a popular moose and sheep hunting area, and these are the major subsistence wildlife resources commonly accessed via the trails addressed in this Plan/EIS. Other subsistence wildlife resources in the area include grizzly and black bear, furbearers, and waterfowl, and caribou were reportedly harvested in the area until the early 1990s. The fish species documented in the Nabesna District during the park's recent freshwater fish inventory included arctic grayling, burbot, lake trout, whitefish, and slimy sculpin (Markis et al. 2004); subsistence harvest of burbot occurs in Tanada and Copper lakes (Sarafin 2008). The only salmon fishery accessed via the Nabesna Road is at Batzulnetas and there is limited participation in that fishery (Cellarius 2009). Vegetation along the Nabesna Road consists of broadleaf and needle leaf forests, shrublands, and herbaceous communities. Ground cover vegetation includes tussock grasses, forbs, berry bushes, dwarf birch, willow shrubbery, feathermosses, and lichens. There are areas of sedge tussock tundra in wetter areas. Blueberries and low-bush cranberries (also known as lingonberries) are harvested in the late summer and fall.

The analysis area lies within Alaska GMUs 11, 12, and a very minor portion of GMU 14 (see Figure 3-13). Approximately 7.3 percent of GMU 11, 6.0 percent of GMU 12, and 1.7 percent of GMU 13 occur within the analysis area. Thus, the harvest statistics reported here, which focus on GMUs 11 and 12, include animals harvested outside of the analysis area. Federal subsistence registration permits are required for three hunts in GMU 11: moose, goat, and a late-season sheep hunt for people at least 60 years of age; because mountain goats do not occur within the analysis area, they are not addressed further here. Of these, the greatest numbers of permits are issued for moose, and in most cases people getting permits for other species in this unit also get a moose permit. Federal registration permits are not required for the regular season sheep hunt in GMU 11, though sheep harvest is reported to the ADF&G. In addition, some local residents may hunt in this unit under state sport regulations. Federal registration permits are not required for the major hunts in the portion of GMU 12 that falls within the analysis area, making it difficult to estimate the number of subsistence users who hunt in these areas. A federal registration permit is required in Unit 12 for the late season sheep hunt for people 60 years of age or older.

Moose

The federal subsistence moose hunting season in GMU 11 extends from August 20 to September 20, with a harvest limit of one bull (Federal Subsistence Management Program 2008). In 2008, 280 people obtained federal subsistence registration permits for moose in Unit 11, indicating a minimum number of hunters intending to hunt in this unit (Table 3-13). This was up from 162 federal moose permits in 2000, the first year federal registration permits were issued for moose in Unit 11. Based on a harvest report rate of 91 percent, in 2008, 173 individuals hunted moose and 28 animals were harvested. An average of 164 individuals with subsistence registration permits hunted moose in GMU 11 each year from 2003 to 2008, with an average annual harvest of 23 animals (Table 3-13). Bull to cow ratios in GMU 11 have been between 92 and 157 bulls to 100 cows since 1997, which exceeds the current ADF&G management goal of 30 total bulls to 100 cows and 15 adult bulls to 100 cows (Tobey 2008a). An aerial survey for moose covering of most of GMU 11 and the northwestern part of GMU 12 (from the Nabesna River, arcing southward around the Wrangell Mountains, to the Kennicott Glacier near McCarthy) was carried out by park personnel in November 2007 (Reid 2008; see Section 3.4.4, Wildlife, for additional information). The survey area roughly covers the western half of the analysis area and includes a large portion of the moose hunted within Wrangell-St. Elias Park and Preserve. Resulting bull to cow ratios was 39 bulls to 100 cows. This number is lower than elsewhere in GMU 11, likely due to the higher hunting pressure in this area from access to the Nabesna Road (Reid 2008).

Table 3-13. Federal Subsistence Registration Permit Data for Moose in GMU 11, 2003–2008

	2003	2004	2005	2006	2007	2008	2003 to 2008 Annual Average
Permits Issued	245	263	231	254	283	280	259
Harvest Report Rate (%)	82	84	88	95	96	91	89
Individuals Hunting	156	153	147	169	185	173	164
Animals Harvested	15	26	24	18	24	28	23

Source: NPS 2009d.

Allowable means of access by federally qualified subsistence users in the National Park and Preserve portions of GMU 11include motor boat, snowmachine (subject to frozen ground conditions and adequate snow cover), and ORVs, along with other non-motorized means including foot, horses, and dog teams. NPS regulations prohibit use of aircraft for hunter transportation to portions of GMU 11 designated as National Park. They do not need a park-issued permit to use these vehicles and are not limited to traveling on existing trails. Under current regulations, the Park Superintendent may restrict or close a route or area if it is determined that the means of access is causing or may cause an adverse impact, subject to notice and a public hearing (Title 36 CFR 13.460 (a) and (b)).

As noted above, federal subsistence registration permits are not required to hunt moose in GMU 12. The federal subsistence season in Unit 12 (that part at the end of the Nabesna Road/west of the Nabesna River) is August 15 to 28 and September 1 to 17. The state moose hunting season in the part of GMU 12 that includes the analysis area is from August 24 to August 28, and from September 8 to September 17 for residents and from September 8 to September 17 only for non-residents. Annual average resident (those living in Alaska, not just those federally qualified) harvest from 2003 to 2008 (unit wide) was 100 animals, with non-resident hunters harvesting an additional 33 animals (Table 3-14). Note that the resident hunter category includes both subsistence harvest, as well as harvest by urban Alaskans, and that only a portion of the average annual harvest presented here occurs within the analysis area.

Table 3-14. Moose Hunter Residency and Success in GMU 12, 2003–2008

	2003	2004	2005	2006	2007	2008	2003 to 2008 Annual Average
Resident Hunters	478	492	473	505	523	512	497
Animals Harvested	96	98	102	104	90	110	100
Nonresident Hunters	51	71	64	65	66	88	68
Animals Harvested	26	36	34	30	26	47	33
Total Hunters[1]	**531**	**567**	**538**	**574**	**594**	**603**	**568**
Animals Harvested[1]	**124**	**134**	**137**	**136**	**118**	**157**	**134**

[1] Total may exceed sum because some hunters fail to report residency.
Sources: Gross 2008, ADF&G 2009a.

Allowable means of access by subsistence users in GMU 12 is the same as that described above for GMU 11. No park-issued permit is required and subsistence hunters are not required to stay on existing trails. Airplanes may not be used for access to the National Park for subsistence purposes but may be utilized in the National Preserve. The most significant change in harvest patterns in GMU 12 over the past 5 years compared to a decade earlier has been the increase in the portion of the harvest by hunters (both subsistence and sport) using ORVs and specifically four-wheelers, which comprised 34 percent of the total from 2001 to 2007 versus 19 percent from 1990 to 2000 (Gross 2008).

The current ADF&G management goal in GMU 12 of 20 bulls to 100 cows west of the Nabesna River continues to be met (Gross 2008). Bull to cow ratios in the more accessible areas of the unit were 20 to 25 bulls per 100 cows in 2007, lower than elsewhere in the unit. Overall harvest rates are sustainable with bulls-only harvest (Gross 2008).

Dall's Sheep

The federal subsistence season for sheep in GMU 11 extends from August 10 to September 20, with a late season elder (over 60 years old) hunt from September 21 to October 20. The federal subsistence harvest limit is any sheep in GMU 11. Federal registration permits are required for the late-season elder hunt, but not for the federal hunt during the regular season. Annual average resident harvest (including both federally qualified subsistence and sport harvest) from 2003 to 2008 was 62 animals, with non-resident hunters harvesting an additional 15 animals (Table 3-15).

Table 3-15. Dall's Sheep Hunter Residency and Success in GMU 11, 2003–2008

	2003	2004	2005	2006	2007	2008	2003 to 2008 Annual Average
Resident Hunters	213	177	177	158	161	152	173
Animals Harvested	70	66	81	65	50	41	62
Nonresident Hunters	216	156	142	140	155	154	161
Animals Harvested	19	16	18	17	12	9	15
Total Hunters[1]	**381**	**304**	**322**	**287**	**269**	**247**	**302**
Animals Harvested[1]	**92**	**82**	**99**	**82**	**63**	**51**	**78**

[1] Total may exceed sum because some hunters fail to report residency.
Sources: Schwanke 2008, ADF&G 2009a.

In GMU 12, federal subsistence harvest timing and federal registration permit requirements are the same as in GMU 11; however, the harvest limit is one full curl ram. Annual average resident harvest (including both federally qualified subsistence and sport harvest) from 2003 to 2008 was 72 animals, with non-resident hunters harvesting an additional 63 animals (Table 3-16).

Table 3-16. Dall's Sheep Hunter Residency and Success in GMU 12, 2003–2008

	2003	2004	2005	2006	2007	2008	2003 to 2008 Annual Average
Resident Hunters	200	237	260	198	230	253	230
Animals Harvested	75	69	84	68	69	65	72
Nonresident Hunters	189	253	263	218	237	240	233
Animals Harvested	56	77	62	69	61	52	63
Total Hunters[1]	**395**	**468**	**505**	**425**	**438**	**422**	**442**
Animals Harvested[1]	**131**	**146**	**152**	**138**	**131**	**117**	**136**

[1] Total may exceed sum because some hunters fail to report residency.
Sources: Bentzen 2008a, ADF&G 2009a.

As explained in the Section 3.4.4, Wildlife, few of the maintained ORV trails in the analysis area are above 4,000 feet elevation and, as a result, sheep are not likely to be present near them. However, the trails are used to gain access to areas close to sheep habitat, where hunters can pursue sheep on foot.

3.5.3.2 Subsistence Trail Use in the Analysis Area

Subsistence trail use data are summarized for 1986 through 1997 in Table 3-17. Permits are not required for subsistence use and, therefore, subsistence use is underrepresented in this Table. Overall, Wrangell-St. Elias staff estimate that approximately 25 percent of subsistence ORV users get permits. Subsistence ORV users are not required to stay on existing trails and many local users (particularly those living along the Nabesna Road) do not. Subsistence use is likely underestimated on the Copper Lake, Black Mountain, and Tanada Lake trails by anywhere from 10 to 40 percent. Further, these data indicate the number of ORVs permitted to use the trail, not the number of passes (i.e., not the number of times each permitted ORV uses the trail). These data indicate that estimated ORV use by trail increased from the 1980s to the 1990s on most trails.

Table 3-17. Subsistence ORV Use by Trail, 1986–1997

Trail[1]	1986–1989 (annual average)	1990–1993 (annual average)	1994	1995	1996	1997
Soda Lake[2]	19	29	39	32	31	37
Boomerang	18	24	13	21	25	34
Caribou Creek	16	34	38	27	33	37
Copper Lake	51	57	45	32	39	42
Black Mountain[3]	Na	15	31	23	31	32
Lost Creek	24	34	44	30	34	37
Reeve Field	13	25	37	27	28	30
Suslota	32	38	40	28	35	31
Tanada Lake	36	43	41	41	41	34
Trail Creek	23	31	44	30	30	37
Total permits issued	**59**	**65**	**71**	**62**	**53**	**56**

na – not available
[1] These data indicate the number of ORVs using the trail, not the number of passes.
[2] Soda Lake trail was formerly named Big Grayling Lake trail.
[3] No data are available for the Black Mountain trail from 1986 to 1989.

Trail-by-trail data are not available for 1998 through 2004. As a result, only the total numbers of permits issued are identified for these years in Table 3-18. Data are, however, presented by trail for 2005. These data are a best representation of individual trail use in recent years prior to the 2007 lawsuit settlement (see Section 1.1.1). These data were estimated based on 2008 trail counter data and user group percentages from past trail and harvest data. Estimates of post-settlement trail use are also presented by trail in this table. These numbers suggest that subsistence ORV use on most of the trails has increased since the settlement, but subsistence use as a share of total ORV use has declined in most cases, as recreational ORV use has increased at a faster rate. This is not, however, the case with three of the trails (the Suslota, Tanada Lake, and Copper Lake trails) and the trail systems in the designated wilderness where recreational use is prohibited.

Table 3-18. Subsistence ORV Use, 1998 to Present

	1998 to 2004		2005 (Pre-Settlement)[3]		Post-Settlement	
Trail[1]	**Annual Average[2]**	**Share of Total Permits (%)[2]**	**Number of Permits**	**Share of Total Permits (%)**	**Number of Permits**	**Share of Total Permits (%)**
Black Mountain			45	100	55	100
Boomerang			3	50	5	50
Caribou Creek			30	30	30	25
Copper Lake			136	78	105	84
Lost Creek			37	29	40	26
Reeve Field			20	56	20	44
Soda Lake[4]			17	30	25	28
Suslota			52	45	60	100
Tanada Lake			63	45	65	100
Trail Creek			31	30	35	23
Total Permits Issued	**76**	**28**	**66**	**22**	**na**	**na**

na – not available

1 These data indicate the number of ORVs using the trail, not the number of passes.

2 No trail-by-trail data are available for 1998 through 2004.

3 These data are a best representation of individual trail use in recent years prior to the 2007 lawsuit settlement (see Section 1.1.1) and were estimated based on 2008 trail-counter data and user group percentages from past trail and harvest data.

4 Soda Lake trail was formerly named Big Grayling Lake trail.

3.5.4 Wilderness

Wrangell-St. Elias National Park and Preserve is the largest unit of the National Park System and includes the largest unit of the national wilderness preservation system. As described in Section 1.7, the wilderness was designated by ANILCA in 1980, and its size and scope give this wilderness national and international recognition. ANILCA established eight wilderness areas comprising approximately 32 million acres within the National Park System in Alaska. The Wrangell-St. Elias Wilderness, which is approximately 9,677,000 acres, is the largest of those eight areas.

ANILCA also provided for the use of motorized vehicles and construction of cabins, fisheries, aquaculture facilities, and other structures in these wilderness areas, in recognition of the unique conditions in Alaska. ANILCA provides for adequate and feasible access to private land. Depending on the access requirement of the land owner, motorized or mechanical means may be authorized on trails, roads, or airstrips where use would otherwise be prohibited.

3.5.4.1 Wrangell-St. Elias Wilderness

The Wrangell-St. Elias Wilderness encompasses a wide variety of terrain, including mountains, ice fields, beaches, boreal forest, and alpine tundra. Wilderness areas are affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable, keeping them largely untrammeled and natural. Human use and occupancy have occurred for a long period in this conservation system unit; therefore, some facilities and historic features predate the wilderness designation. The park's designated and eligible wilderness areas contain many existing anthropogenic features, which affect its undeveloped character. These include roads, trails, airstrips, mines, communities, remote cabins and camps, seismic and climate monitoring stations, and radio repeaters. Nevertheless, the Wrangell-St. Elias Wilderness provides outstanding opportunities for solitude or a primitive and unconfined type of recreation. Visitors to the National Park and Preserve's remote backcountry areas rarely encounter other people or signs of human presence except at their access portal or in areas proximal to roads or communities.

3.5.4.2 Eligible Wilderness

ANILCA Section 1317(a) directs the Secretary of Interior to review the wilderness eligibility of all NPS lands in Alaska not already designated as wilderness. Wilderness review criteria specific to Wrangell-St. Elias National Park and Preserve were developed to accomplish that task. The park completed its review in the mid-1980s and included its findings in its GMP. The GMP concluded that of the 3,498,000 acres within the park not designated as wilderness, 2,243,800 acres were considered eligible for future wilderness designation. The GMP also identified seven general areas that do not meet wilderness criteria. These areas within this analysis area are listed below:

- An area between the Nabesna Road and Tanada Lake, and the Suslota trail north of the Nabesna Road, are ineligible because of the impacts from regularly used access routes for subsistence, recreation, and nonfederal interests. This area includes most portions of the Suslota, Tanada Lake, and Copper Lake trails.
- The main road corridors, including the Nabesna Road.

The full wilderness review process required under ANILCA section 1317(b) has not yet been completed. An EIS was drafted for Wrangell-St. Elias National Park and Preserve Wilderness Review (NPS 1988). However, no final action was taken and no record of decision was completed.

As noted in Sections 1.7.5 (Wilderness Management) and 2.3 (Actions Common to all Action Alternatives), this Plan/EIS proposes a revision of the 1986 wilderness eligibility assessment. However, the Chapter 3 discussion presented here is based on the 1986 wilderness eligibility assessment and mapping as it stands and the existing conditions within designated and eligible wilderness. These conditions have resulted in part from the continued ORV use on lands classified as eligible in 1986.

Based on the 1986 GMP, the existing Suslota, Tanada Lake, and Copper Lake trails are in areas ineligible for wilderness designation. The Caribou, Lost Creek, Trail Creek, Soda Lake, Reeve Field, and Boomerang trails are in areas eligible for wilderness designation. The Black Mountain trail system and the trail system south of Tanada Lake are in designated wilderness.

As noted in Section 1.7.5 of this Plan/EIS, it is NPS policy to manage eligible wilderness as if it were wilderness.

3.5.4.3 Analysis Area Wilderness

There are approximately 9,677,000 acres that comprise the Wrangell-St. Elias Wilderness, of which approximately 365,000 acres are within the analysis area. These wilderness lands form an irregular band occupying roughly the southern one-third of the analysis area, and are located in both the National Park and Preserve portions of the analysis area (see Figure 3-2).

Unpublished NPS management planning documents (NPS 2001) classify wilderness lands within the analysis area into various zones, based upon level of use. These zone descriptions have not been formally adopted by the NPS but provide a useful frame of reference for addressing wilderness character and visitor use level. They also provide a snapshot of existing encounter levels in the wilderness.

There are two backcountry wilderness zones within the Nabesna ORV analysis area: Zone C and Zone C/D (see Figure 3-17). Zone C is the designation applied to wilderness lands in the National Preserve; because of the irregular configuration of the National Park and Preserve boundaries, Zone C lands are in two discontinuous blocks located on the southwestern and southeastern portions of the analysis area, with the Zone C/D lands located in the middle between the two Zone C areas. For Zone C, backcountry visitors can anticipate encountering an average of two to three other parties per week. For Zone C/D, backcountry visitors can anticipate encounters averaging two to three parties per week during most of the year, but averaging one to two parties per day during the heavy-use season (mid-August to mid-September).

With respect to the trail system, the eastern Zone C area includes the trails south of Tanada Lake. The existing Copper Lake trail becomes the Black Mountain trail where it reaches the wilderness boundary; the Black Mountain trail system is within the Zone C/D area. The Black Mountain trail is closed to recreational ORV use at the wilderness boundary; however, it is open for subsistence ORV use.

3.5.4.4 Wilderness Quality Classification

Wilderness character is broadly defined in the Wilderness Act of 1964, Section 2(c), but is not further defined in NPS Management Policies. To date, the NPS has not prepared a formal wilderness quality classification for wilderness in Wrangell-St. Elias National Park and Preserve. In the absence of such a formal system, a recent federal interagency strategy prepared as a framework for monitoring trends in wilderness character throughout the National Wilderness Preservation System (Landres et. al., 2008) has been adapted for use in this Plan/EIS to provide applicable indicators and measures specifically related to the designated wilderness within the analysis area. This system classifies wilderness lands based on the four qualities of wilderness character, as defined below:

- Untrammeled—Wilderness is essentially unhindered and free from modern human control or manipulation.
- Natural—Wilderness ecological systems are substantially free from the effects of modern civilization.
- Undeveloped—Wilderness retains its primeval character and influence, and is essentially without permanent improvement or modern human occupation.
- Solitude or Primitive and Unconfined Recreation—Wilderness provides outstanding opportunities for solitude or primitive and unconfined recreation.

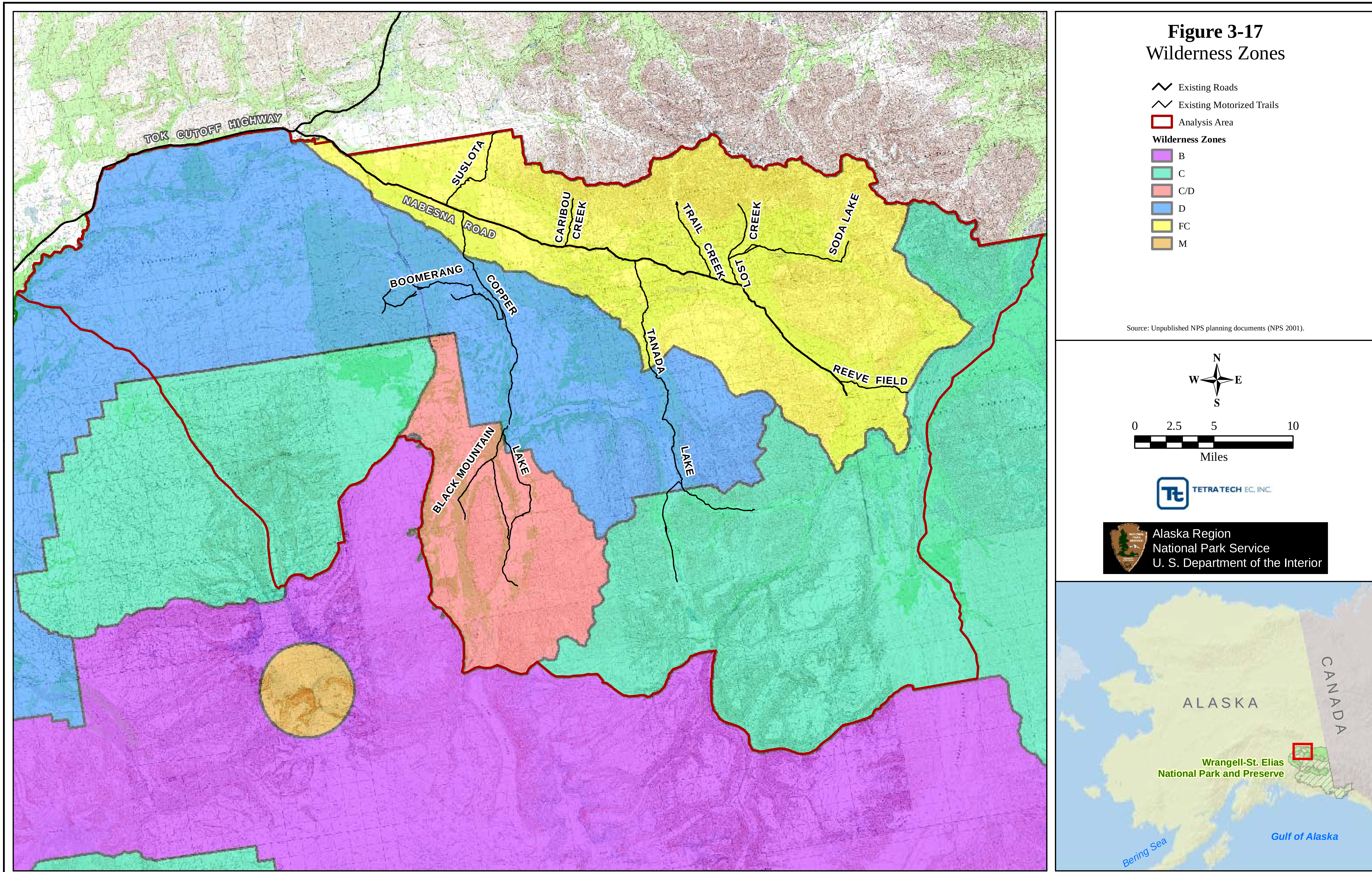

Figure 3-17
Wilderness Zones

Last Saved: Monday, March 22, 2010 11:05 AM Analyst: J MacLachlan File: R:\projects_2009\Nabesna_ORV_EIS\maps\Draft_EIS_rev1\Figure 3-17_Wilderness_Zones.mxd

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Using this framework, the qualities of wilderness character are summarized below for the analysis-area designated and eligible wilderness lands. This information is summarized from NPS (2009h) file material.

Untrammeled Quality

Designated Wilderness

Section 2(c) of the Wilderness Act states that wilderness is "hereby recognized as an area where the earth and its community of life are untrammeled by man." Untrammeled" means "allowed to run free" (American Heritage Dictionary 1992, from Landres et al. 2008]). According to the referenced interagency wilderness strategy (Landres et. al. 2008), "Actions that intentionally manipulate or control ecological systems inside wilderness degrade the untrammeled quality of wilderness character, even though they may be taken to restore natural conditions or for other purposes. For example, wilderness is manipulated and the untrammeled quality of wilderness character is diminished when naturally ignited fires are suppressed inside wilderness, dams are built that impede natural water flow, selected animals or plants are removed, or trails are improved with manmade items such as GeoBlocks. Wilderness is also manipulated when restoration actions remove trees and fuels that have accumulated because of fire suppression, herbicides are used to control certain plants, or wildlife populations are manipulated by actions that provide food or water. This concept of trammeling applies to all manipulation since the time of wilderness designation but does not apply to manipulations that occurred prior to wilderness designation, such as the use of fire by native people to promote game habitat, because the mandates of the Wilderness Act don't apply prior to designation."

Under the above approach, indicators relative to the "untrammeled" quality include the extent of actions by federal land managers and actions not authorized by federal land managers. Few known management activities affect the designated wilderness lands within the analysis area. The NPS has documented a very low level of management activity within designated wilderness; there have been no specific actions to manage animal populations, no fuel suppression, and no stocking of fish in the wilderness lakes. Based on those measures, the untrammeled quality of designated wilderness lands in the analysis area appears to be high.

Eligible Wilderness

Indicators relative to the "untrammeled" quality include the extent of actions by federal land managers and actions not authorized by federal land managers. On six existing trails classified as being on eligible lands (Caribou Creek, Lost Creek, Trail Creek, Soda Lake, Reeve Field, and Boomerang), the NPS has continued to permit the recreational use of ORVs, primarily as a means to access sport hunting in the preserve. There is also a lesser component of subsistence ORV use on these trails, and the Soda Lake and Reeve Field trails are used for accessing private inholdings. There has been very little trail maintenance associated with these trails. Some (less than 0.25 mile total) trail hardening materials were applied to the Reeve Field trail as part of an NPS research project in the mid-1990s. In 2008, gravel was applied to the first 0.5 mile of the Caribou Creek trail. Trailheads are within the Nabesna road corridor, classified as ineligible. There has been limited fire suppression, and no stocking of fish in eligible wilderness lakes. Based on the continued authorization of recreational ORV use and limited improvements associated with it, there has been minor diminishment of the untrammeled quality of eligible wilderness lands in the analysis area.

Natural Quality

Designated Wilderness

Landres et al. (2008) indicate that "wilderness should be free from the effects of 'an increasing population, accompanied by expanding settlement and growing mechanization' and that the 'earth and its community of life…is protected and managed so as to preserve its natural conditions' (Section 2(a) and 2(c), respectively)." Ecological systems inside wilderness are directly affected by things that happen inside as well as outside of the wilderness, and by actions taken by agencies or citizens inside wilderness. For example, non-indigenous fish are intentionally introduced for recreational fishing, yet have far-reaching unanticipated negative effects on native biological diversity and nutrient cycling in wilderness lakes; livestock grazing may be allowed in wilderness, yet may contribute to soil disturbance and the spread of non-indigenous plants; biological control agents may be used to eradicate invasive non-indigenous plants, yet may have unintended effects on indigenous plants; dams outside wilderness alter hydrological flow regimes, adversely affecting the riparian plant communities within wilderness; and air pollutants from sources outside wilderness disperse long distances, affecting wilderness vegetation, soils, and aquatic systems (Landres et al. 1998).

Indicators relative to the natural quality include plant and animal communities, physical resources, and biophysical processes. Specific measures indicate that plant and animal communities within the analysis area designated wilderness largely remain in their natural state. The NPS has not documented any non-indigenous species in the designated wilderness in the analysis area (Terwilliger and Gilmore 2010); no indigenous species are extinct or listed as threatened, endangered, sensitive or of concern in the analysis area; and there is no permitted grazing in the designated wilderness in the analysis area. The only known change in plant community composition associated with NPS management would involve alterations to vegetation from ORV use along the trails used for that purpose.

Measures identified for the physical resources indicator show that the natural quality of air, water, and soil resources remains high, in general. Visibility is generally excellent within the designated wilderness. NPS does not have data on other air quality measures, which relate to ozone air pollution and acid deposition. Baseline water quality monitoring was conducted in 2004 and did not indicate issues for water bodies in the analysis area designated wilderness (Veach et al. 2004; see Section 3.4.3 for specific discussion). There is some evidence of human-caused stream bank erosion present at unimproved fords within the designated wilderness. Total disturbance to soil resources along trails in the designated wilderness is estimated at approximately 90 acres, suggesting impacts to soils are small and highly localized.

Measures related to the biophysical processes indicator involve the fire regime, climate change, pathways for movement of non-indigenous species, and the potential for loss of connectivity with the surrounding landscape. Fire suppression has not been practiced in the analysis area and the fire regime remains natural. The extent and magnitude of global climate change in the wilderness area is unknown. While applicable data are limited, the NPS assumes that the 35 miles of ORV trails and 7 remote landing strips within the designated wilderness could serve as pathways for movement of non-indigenous species, but no evidence of such movement has been documented to date. Based on the limited sources of potential interference with natural biophysical processes, it is assumed that loss of connectivity with the surrounding landscape is minimal.

In summary, the available measures for the three indicators discussed above show no change or minimal influence on the natural quality of the designated wilderness. Therefore, the natural quality of the designated wilderness within the analysis area is considered to be high.

Eligible Wilderness

Indicators relative to the natural quality include plant and animal communities, physical resources, and biophysical processes. Specific measures indicate that plant and animal communities within the analysis area eligible wilderness largely remain in their natural state. The NPS has not documented any non-indigenous species in the eligible wilderness in the analysis area. Exotic species have been documented within the Nabesna road corridor (classified as ineligible), and not all trails have been surveyed for exotic species. No indigenous species are extinct or listed as threatened, endangered, sensitive or of concern in the analysis area; and there is no permitted grazing in the eligible wilderness in the analysis area. The only known change in plant community composition associated with NPS management would involve alterations to vegetation from ORV use along the trails used for that purpose. Within eligible wilderness, segments of the Boomerang, Reeve Field, and Soda Lake trails have experienced plant community changes in braided portions.

Measures identified for the physical resources indicator show that the natural quality of air, water, and soil resources remains high, in general. Visibility is generally excellent within the eligible wilderness. The NPS does not have data on other air quality measures, which relate to ozone air pollution and acid deposition. Baseline water quality monitoring was conducted in 2004 and did not indicate issues for waterbodies in the analysis area eligible wilderness (Veach et al. 2004; see Section 3.4.3 for specific discussion). There is some evidence of human-caused stream bank erosion present at unimproved fords within the eligible wilderness on the Caribou Creek, Lost Creek, Trail Creek, Soda Lake, Reeve Field, and Boomerang trails. Total disturbance to soil resources along trails in the eligible wilderness is estimated at approximately 59 acres, suggesting that impacts to soils are occurring.

Measures related to the biophysical processes indicator involve the fire regime, climate change, pathways for movement of non-indigenous species, and the potential for loss of connectivity with the surrounding landscape. Fire suppression has not been practiced in the analysis area, and the fire regime remains natural. While applicable data are limited, the NPS assumes that the 44 miles of ORV trails within the eligible wilderness could serve as pathways for movement of non-indigenous species, but no evidence of such movement has been documented to date. Based on the limited sources of potential interference with natural biophysical processes, it is assumed that loss of connectivity with the surrounding landscape is minimal.

In summary, the available measures for the three indicators discussed above show some influence on the natural quality of the eligible wilderness. Therefore, the natural quality of the eligible wilderness within the analysis area is considered to be moderately diminished.

Undeveloped Quality

Designated Wilderness

Wilderness is defined in Section 2(c) of the 1964 Wilderness Act as “an area of undeveloped Federal land retaining its primeval character and influence, without permanent improvements or human habitation,” with “the imprint of man’s work substantially unnoticeable.” Indicators relative to the undeveloped quality include non-recreational structures, installations, and developments; inholdings; use of motorized vehicles, motorized equipment, or mechanical transport; and loss of statutorily protected cultural resources.

Measures for the non-recreational structures indicator apply to authorized and unauthorized developments. The NPS has documented a number of authorized physical developments in the designated wilderness area including 13 remote airstrips or landing spots (7 of which are within the analysis area) and four cabins (two support subsistence use and two are permitted for use by outfitter/guides). There are no known unauthorized (user-created) developments. There are no existing or potential inholdings in the designated wilderness within the analysis area.

The NPS has documented a number of motorized use types in the designated wilderness including subsistence ORV use, aircraft use, and limited administrative use of ORVs and aircraft. ORV use in support of subsistence activity in the wilderness is estimated at 55 round trips per year in the Black Mountain area and less than 40 round trips per year on trails in the wilderness south of Tanada Lake. ORV use has resulted in degraded conditions in some locations within the wilderness, particularly along the South Copper Lake trail. Such visible evidence of mechanized use diminishes the undeveloped quality of the wilderness in these specific locations.

Airplanes are used to access the 13 remote landing strips and several larger lakes used by float planes. This motorized use is primarily associated with hunting activity and transport for hikers and climbers, although the level of activity is not known. Administrative use is limited to occasional ranger patrols on ORVs (estimated at one trip per year in the wilderness, aircraft overflights, and rare use of helicopters [hunting patrols in the past 2 years and emergency use to access an injured hunter are the only known use of helicopters in the past 5 years]). Additionally, some unauthorized recreational ORV use occurs in the designated wilderness.

There are no known disturbances to cultural resources within the designated wilderness in the analysis area. Consequently, measures for two of the indicators for undeveloped quality of the wilderness within the analysis area are negative (i.e., there has been no change). By contrast, as discussed above there are multiple occurrences of non-recreational developments and motorized uses within the wilderness. Based on these indicators, there has been moderate diminishment of the undeveloped quality of the designated wilderness within the analysis area.

Eligible Wilderness

For eligible wilderness within the analysis area, the NPS has documented a number of authorized physical developments in the area, including two remote airstrips, one cabin permitted to an outfitter/guide concession, and one public use cabin that replaced an existing shack. There are no known unauthorized (user-created) developments. As shown on map 2-1, there are several private inholdings within the eligible wilderness in the analysis area.

The NPS has documented a number of motorized use types in the eligible wilderness including subsistence and recreational ORV use, aircraft use, chainsaw use, and administrative use of ORVs and aircraft. ORV use on 43.7 miles of trail in support of subsistence activity in the eligible wilderness is estimated at 155 round trips per year for the Trail Creek, Lost Creek, Soda Lake, Reeve Field, Caribou, and Boomerang trails combined. Recreational ORV use is estimated at 417 round trips per year on the same trails. ORV use has resulted in degraded conditions in some locations within the eligible wilderness, particularly along the Reeve Field, Soda Lake, and Boomerang trails. Such visible evidence of mechanized use diminishes the undeveloped quality of the eligible wilderness in these specific locations.

Within eligible wilderness, aircraft are used to access the two remote landing strips and several larger lakes used by float planes. This motorized use is primarily associated with hunting activity and transport for hikers and climbers, although the level of activity is not known. Administrative use includes occasional ranger patrols on ORVs and support for various field crews (estimated at 30 round trips per year over the six trails). Aircraft, including fixed wing and helicopter, are frequently used for ranger patrols, field crew support, or maintenance.

There are no known disturbances to cultural resources within the eligible wilderness in the analysis area. Consequently, measures for two of the indicators for undeveloped quality of the eligible wilderness within the analysis area are negative (i.e., there has been no change). By contrast, as discussed above there are occurrences of non-recreational developments and motorized uses within the eligible wilderness, as well as resource impacts associated with motorized trails. Based on these indicators, there has been moderate diminishment of the undeveloped quality of the eligible wilderness within the analysis area.

Solitude or Primitive and Unconfined Recreation Quality

Designated Wilderness

The Wilderness Act states in Section 2(c) that wilderness has "outstanding opportunities for solitude or a primitive and unconfined type of recreation…Given the complexity of human interactions with their environment and other people, the intent of monitoring this quality is not to understand people's experiences, perceptions, or motivations in wilderness. Instead, this monitoring strategy focuses on the mandate in the Wilderness Act to provide outstanding opportunities and to monitor how these opportunities are changing over time" (Cole 2004, Dawson 2004).

Landres et al. (2008) identify four indicators relative to the solitude or primitive and unconfined quality. They include remoteness from sights and sounds of people inside the wilderness, remoteness from occupied and modified areas outside of wilderness, presence of facilities that decrease self-reliant recreation, and management restrictions on visitor behavior. The amount of visitor use is a key measure for the remoteness from sights and sounds of people indicator. Based on trail counts, ORV permits, and transporter/outfitter guide information, the NPS estimates visitors to the designated wilderness are few in number, at approximately 1,280 visitor days of use per year. The number of trail contacts is estimated at 20 per year. Campsites in the backcountry are highly dispersed and their number is not known. The NPS estimates that 40 percent of the wilderness acreage in the analysis area is within sight or sound of motorized travel routes.

With respect to remoteness from influences from outside of the wilderness, the analysis area wilderness is sufficiently remote that there are no impacts to night sky visibility. Approximately 20 percent of the wilderness acreage is affected by motorized travel routes in adjacent non-wilderness areas. The soundscapes within the wilderness are affected by ORV use in adjacent areas and by aircraft activity. Both of these sound sources are most likely to occur during the hunting season, which is generally the period of highest visitor use. Sound from ORV use is generally limited to areas close to the trails open to such use.

While there are no agency-provided facilities that decrease self-reliant recreation, there are a number of remote airstrips that support sport and subsistence hunting in the National Preserve or fly-in wilderness recreation trips in the National Park or Preserve. With respect to management restrictions, there are very few regulations applicable to visitors accessing the wilderness. The lack of required backcountry permits, registration, or pre-departure educational programs makes the experience more primitive.

Based on the indicators and measures discussed above, there has been minor to moderate overall diminishment of the quality for solitude or primitive and unconfined recreation within the designated wilderness. This characterization is based primarily on the influences from access and travel activity originating outside of the wilderness and the presence of user-created facilities that support fly-in use of the wilderness.

Eligible Wilderness

For the eligible wilderness within the analysis area, the NPS estimates visitors at approximately 8,000 visitor days of use per year (excluding the Nabesna road corridor, which is not eligible). The number of trail contacts is estimated at 25 per year. Campsites are highly dispersed and their number is not known. The NPS estimates that 40 percent of the eligible wilderness acreage within the analysis area is within sight or sound of motorized travel routes.

With respect to remoteness from influences from outside of the eligible wilderness, the analysis area eligible wilderness could receive minor impacts to night sky visibility, primarily from vehicle traffic or lights associated with development along the Nabesna road or Tok Cut-off highway. Approximately 30 percent of the eligible wilderness acreage is affected by motorized travel routes in adjacent non-eligible areas. The soundscapes within the eligible wilderness are affected by ORV use and by aircraft activity. Both of these sound sources are most likely to occur during the hunting season, which is generally the period of highest visitor use.

With respect to management restrictions, there are very few regulations applicable to visitors accessing the eligible wilderness. The lack of required backcountry permits, registration, or pre-departure educational programs makes the experience more primitive.

Based on the indicators and measures discussed above, there has been moderate overall diminishment of the quality for solitude or primitive and unconfined recreation within the eligible wilderness. This characterization is based primarily on the influences from access provided by the Nabesna Road and the six motorized trails within the eligible wilderness.

3.5.5 Visitor Opportunities/Access

3.5.5.1 Overview of Visitor Opportunities

The Wrangell St. Elias National Park and Preserve sees a wide variety of visitor uses ranging from sightseeing, hiking, and flight touring to recreational and subsistence ORV use to access the park. The park has limited infrastructure, lacks established NPS campgrounds, and has few maintained trails (Scott 2009). The main park visitor center, located in Copper Center, Alaska, received 29,363 visitors in 2008 (Scott 2009). From the main visitor center, visitors must drive about 83 road miles northeast to access the park in the analysis area, although some fly directly to the area by floatplane

The Nabesna District is accessed mainly by the approximately 42- mile–long, dirt and gravel Nabesna Road. The Nabesna Road begins in Slana, a small community and location of the Slana Ranger Station (just outside the park), and ends in Nabesna (Figure 3-13). The Nabesna Road provides access to the greatest number of road-accessible trails in Wrangell-St. Elias National Park and Preserve. Some of these trails may be used by recreational ORV users. All of these trails may be used by subsistence ORV users to access the park (Scott 2009).

3.5.5.2 Visitor Facilities and Activities

Recreational opportunities abound in Wrangell-St. Elias National Park and Preserve. Although the majority of opportunities could be considered backcountry activities, frontcountry activities do exist, such as stopping at visitor centers, driving the scenic roads, enjoying a picnic, or fishing along the road corridor.

Frontcountry and Backcountry Zones

In general terms, frontcountry recreation settings are areas that are easily accessible by vehicle and are served by developed recreation facilities, while backcountry areas are accessed by travel away from roads and have primitive or no recreation facilities. Frontcountry areas in the analysis area include the Park periphery along the Tok Cutoff and the Nabesna Road corridor. Activities such as stopping at the Slana Ranger Station, driving the Nabesna road, and picnicking or camping at a road-accessible site can all be considered frontcountry activities. By acreage, the vast majority of Wrangell-St. Elias is considered backcountry.

Visitor Facilities

The NPS operates a limited number of developed recreation facilities for visitors to Wrangell-St. Elias. Within the analysis area, these include the Slana Ranger Station and the Viking Lodge public-use cabin. The Slana Ranger Station provides services similar to those available at the visitor centers and is the entry portal for the Nabesna Road, where visitors can check road and weather conditions, get information on park recreation opportunities, and obtain permits for ORV use. There are no developed campgrounds, picnic areas, or similar facilities, although there are primitive camp and/or picnic sites at several locations along the Nabesna Road.

The primitive recreation sites located along the Nabesna Road are summarized as follows (NPS, 2009b):

- Slana River access and primitive campsites, MP 1.7 (managed by the BLM and often used as a starting point for trips down the Copper River)
- Rufus Creek primitive campsite, MP 6.1
- Copper Lake trailhead and primitive campsite, MP 12.2
- Kettle Lake primitive campsite, MP 16.6
- Dead Dog Hill rest area and primitive campsites, MP 17.8
- Rock Lake primitive campsite and rest area, MP 21.8 (also access to Viking Lodge public use cabin, for which reservations are required)
- Twin Lakes camp area, MP 27.8
- Jack Creek rest area and primitive campsites, MP 35.3

Collectively, these locations provide approximately 20 individual camp or picnic sites. Outhouses are provided at four locations (Dead Dog Hill, Rock Lake, Twin Lakes and Jack Creek).

The analysis area includes 43 private inholdings, ranging from less than 1 acre to 330 acres at the Nabesna Mine site. Many of these at one time were hunting cabins, mining claims, or native allotments. Commercial facilities serving visitors have been developed on some of the private parcels. For example, there are two lodges and two bed-and-breakfast operations in the Nabesna

Road corridor. A number of private entities also operate guide services and air-taxi or flightseeing services within the park.

Camping

Because Wrangell-St. Elias has no developed campgrounds, camping opportunities consist of a small number of primitive campsites adjacent to park roads and numerous locations for backcountry camping. Pullouts along the Nabesna Road can be used for informal camping. There are seven locations along the road where the NPS (2009b) has provided minimal facilities for this purpose; four of these sites have a single picnic table (one of which also has a vault toilet), while three locations have multiple tables or campsites and a vault toilet. One of the latter sites (Twin Lakes at mile 27.8 along the Nabesna Road) has several tables and a vault toilet and 10 informal campsites. Dead Dog Hill Rest Area (at mile 17.8 along the Nabesna Road) offers primitive campsites, a picnic table, and outhouse. In the backcountry areas of the park, camping occurs essentially wherever visitors are able to transport their equipment and find a suitable site. A study conducted in the mid-1990s indicated that 14 percent of park visitors had stayed at least one night in the backcountry (Littlejohn 1996).

Public Use Cabins

In addition to other backcountry camping opportunities, the Viking Lodge Cabin, one of the 13 public-use cabins in the Wrangell-St. Elias, is located within the analysis area about 0.25 mile north of the Nabesna Road (NPS 2009g; Figure 3-2). This structure was built in the early 1970s and has two plywood bunks, a small kitchen table and chairs, a barrel wood stove, a large loft area, and an outhouse. Water is usually available from a nearby stream. Reservations are required.

ORV Use

The park's founding legislation specifically recognizes the values associated with preserving opportunities for subsistence and recreational hunting and fishing (Glaspell and Watson 2003), and allows traditional means of access for subsistence use. Consequently, ORVs are commonly used to access customary subsistence hunting and fishing areas. ORV use is also allowed for recreational purposes on established ORV trails. Recreational ORV use is very utility-oriented; approximately 85 percent of the current recreational ORV use is related to sport hunting. ORVs are also used to access backcountry dispersed camping or fishing areas or as a means to access non-motorized activities. All existing motorized trails are "destination" trails that are used to access certain places or areas; consequently, there is very little driving up and down trails simply for the sake of four-wheeling. Within the analysis area, ORV access for subsistence purposes is allowed throughout the Nabesna area (although subsistence ORV users are encouraged to use established trails and dry stream beds), while recreational ORV access is allowed on six of the nine trails (the Suslota, a portion of Copper Lake, and Tanada Lake Trails are closed seasonally to recreational ORV use). Permits are required for recreational ORV use, and are encouraged but not required for subsistence ORV use. More information about ORV use is presented in Section 3.3.2.3.

Wildlife Viewing

In a survey of park visitors conducted during a 1-week period in 1995, 57 percent of all visitors indicated they were in the Wrangell-St. Elias to view wildlife (Littlejohn 1996). Because visitors were allowed to report all recreational activities they engaged in during their visit, this could mean that although visitors documented viewing wildlife as an activity, their primary reason for visiting the park could have been a different activity. According the park's guide (NPS 2009a), while there is a vast amount of wildlife in Wrangell-St. Elias, wildlife viewing from a vehicle along the Nabesna Road or ORV trails in the analysis area could be limited in many places by adjacent vegetation.

Hiking

Hiking is a popular activity that occurs on trails and as well as off trail, and as either day use or overnight backpacking. Two previous studies of park use indicated that around 50 percent of Wrangell-St. Elias visitors reported some form of hiking activity (Littlejohn 1996, Glaspell and Watson 2003). Recommended hikes in the Nabesna area include the Skookum Volcano trail, a loop using the Trail Creek and Lost Creek trails, Soda Lake, Caribou Creek, and the Rambler Mine. Hiking in the Nabesna area can be problematic because of the physical condition of the trails, and the NPS recommends that hikers avoid trails such as the Tanada Lake and Reeve Field trails.

Snowmobile Use

Snowmobiles are a primary means of transportation during the winter months, as they provide easier access into the backcountry when bogs and tussocks freeze. As with ORV use, snowmobiles are used for subsistence and recreational purposes and to access private inholdings. A permit is not required for snowmobile use and machines are not restricted to specified routes, but must be used in areas with adequate snow cover. Snowmachine use in the area is light and is described for each trail in Section 3.3.2.1, Summary of Existing Trails in the Analysis Area.

Hunting

During the months of August and September, hunting is the dominant visitor activity in the analysis area. Hunters, both sport and subsistence, access remote campsites via the Nabesna Road, trails, and fixed-wing aircraft. Prior to establishment of the park, the area had a reputation as a Dall's sheep hunting destination and numerous outfitter/guides utilized the area. The area still provides a relatively accessible Dall's sheep hunt. It is possible to park along the Nabesna Road, backpack in, and get a good quality Dall's sheep hunt. This is a rare quality in Alaska, where many sheep hunts are only accessed via fixed-wing aircraft at considerable expense. Consequently, the higher-elevation, non-motorized portions of the analysis area provide a very specific niche for the hunter with limited means of access.

3.5.5.3 Visitor Use Statistics

Total visitation to Wrangell-St. Elias National Park and Preserve was estimated at approximately 65,700 people in 2008 and 61,100 in 2007 (NPS 2009f). Current and comprehensive visitor use estimates for specific regions of the Park or for key types of recreational user groups are limited. The main Park visitor center at Copper Center has been identified as receiving the greatest amount of visitors, with use reported at 29,363 visitors for 2008 (Scott, 2009). From prior studies, the NPS (2007) has determined that the Kennecott/McCarthy area is the most popular visitor destination in the interior of the Park, with annual visitation of 8,000 to 12,000 people.

Overall visitor use levels for the Nabesna analysis area have not been estimated. Traffic on the Nabesna Road represents one potential indicator of the amount of visitor use. Data from counters installed by the ADOTPF provided a recent annual total of 3,500 vehicle trips for the Nabesna Road (NPS, 2007a; the specific location for the counter was not identified in the source). If an average of 3 people per vehicle is assumed, the traffic counts would equate to 10,500 people for that year. The traffic counter data would include all types of traffic, however, and subtotals for recreational use, administrative travel, local resident and private inholder traffic have not been developed.

Visitation to the Slana Ranger Station was estimated at 4,180 visitors in 2005 and 4,242 in 2008 (NPS 2009f). Local residents account for approximately one-quarter of visitation in the analysis area. Of the non-local visitors, approximately half stop by the Slana Ranger Station and do not proceed into the National Park or Preserve (NPS 2009f). ORV users account for less than 20 percent of visitors in the analysis area (NPS 2009f). Other visitors drive the Nabesna Road, camp at dispersed sites, fish in adjacent waters, or undertake day hikes.

Data on ORV permits issued from 1995 through 2005 are provided in Section 3.3.2. In summary, the total number of permits issued has averaged 261 per year during that period, and recreational users accounted for 74 percent of the permits compared to 26 percent for subsistence users. As noted previously, the NPS estimates that approximately 25 percent of subsistence users comply with the request to voluntarily obtain a permit. If that compliance rate remains applicable to current use conditions, the actual number of users would likely be in the range of about 465 per year. The permit data do not necessarily correspond closely to actual ORV use, however; when users complete the permit forms they may identify trails that they do not actually use, or they may use trails identified on the forms multiple times.

The NPS attempted to quantify ORV and other types of use on the Nabesna area trails in 1994 and 1995 through use of a mixture of trail counters employing seismic and infrared camera equipment (Happe et al., 1998). While the trail counters did not provide reliable figures on the amount of trail use, the camera imagery was sufficient to estimate the relative distribution by type of use, as follows:

- ORVs/ATVs 51 percent
- Day hikers 31 percent
- Backpackers 7 percent
- Horse users 5 percent
- Other users 6 percent

3.5.5.4 Access

Access to the analysis area is achieved primarily via the Nabesna Road. The Nabesna Road extends 42 miles eastward from Slana near the northern edge of the park to Nabesna. The road has a gravel surface and is generally usable by standard passenger vehicles. Away from the road corridor, most access is by airplane, snowmobile, and/or ORV (the latter subject to permits for recreational use). Numerous landing strips and lakes in the area allow visitors the opportunity to get further into the backcountry with relative ease but at considerable cost. Most access to designated wilderness occurs via small planes. Figure 3-2 shows the locations of landing strips that provide access to the analysis area.

3.5.6 Socioeconomics

3.5.6.1 Regional Overview

Alaska is divided into 18 boroughs and 11 census areas (CAs). The 18 boroughs are similar to county governments found elsewhere in the United States, but do not cover the entire land area of the state. The remaining unorganized areas are allocated to 11 CAs. While CAs are only statistical units, they are widely recognized for data reporting purposes as county equivalents by federal and most state agencies. The majority of Wrangell-St. Elias and the entire analysis area are located within the Valdez-Cordova CA.

3.5.6.2 Demographic Trends and Overview

The Valdez-Cordova CA encompasses approximately 34,319 square miles and had a total population of 9,513 in 2008 (Table 3-19). Population within the Valdez-Cordova CA is primarily concentrated in communities located along the coast and along transportation corridors in the area (Logsdon et al. nd, U.S. Census 2000a). Valdez and Cordova, the two largest cities in the CA, are both located on the coast and together accounted for 61 percent of the total CA population in 2008. Twenty-five communities were identified within the Valdez-Cordova CA during the census, including Valdez and Cordova. These communities together accounted for about 98 percent of the total population in the CA in 2000. Three of the coastal communities (Cordova, Valdez, and Whittier) are incorporated; the remaining 22 are identified as Census Designated Places (CDPs). CDPs are densely settled concentrations of population that are not within an incorporated place, but are locally identified by name.

Table 3-19. Population, 1960 to 2008

Community/CA	1960	1970	1980	1990	2000	2008
Chistochina	28	33	55	60	93	100
Mentasta Lake	40	68	59	96	142	112
Slana[1]	0	0	49	63	124	107
Copper Valley[2]	503	971	1,339	2,259	3,410	3,231
Valdez-Cordova CA	2,844	3,098	8,348	9,952	10,195	9,513
Tok[3]	129	214	589	935	1,393	1,382

[1] Population data are not available for Slana prior to 1980. Population in Slana increased rapidly in the 1980s when homesteads were offered for settlement (Alaska DCRA 2009)

[2] The Copper Valley Resource Conservation and Development area encompasses approximately 20,649 square miles or 60 percent of the Valdez-Cordova CA, and includes 20 of the 25 identified communities in the Valdez-Cordova CA. Major population centers include Glennallen, Copper Center, and Kenny Lake. This area is identified as the Copper River census subarea in the 2000 Census.

[3] Tok is located north of the analysis area in the Southeast Fairbanks CA.

Sources: Copper Valley EDC 2003, Alaska Department of Labor 2009a, U.S. Census Bureau 1960, 1973, 1981, 1992

The Copper Valley Resource Conservation and Development area encompasses approximately 20,649 square miles or 60 percent of the Valdez-Cordova CA, including the Wrangell and St. Elias Mountain Ranges, the headwaters of the Copper River, much of the park, and the entire analysis area, as well as 20 of the 25 communities in the CA (Copper Valley Economic Development Council [EDC] 2003). The area had an estimated population of 3,231 in 2008, approximately 34 percent of the total population within Valdez-Cordova CA (Table 3-19). Located at highway junctions or with access to recreational resources, Glennallen, Copper Center, and Kenny Lake are the major population centers in the Copper Valley area and also serve as major regional shopping and resource centers.

The population in the Valdez-Cordova CA more than doubled in the 1970s and continued to increase in the 1980s and 1990s. The population in the Valdez-Cordova CA was, however, 7 percent lower in 2008 than in 2000 (Table 3-19). Population also increased in the Copper Valley in the decades preceding 2000, but was 5 percent lower in 2008 compared with 2000 (Table 3-19).

The upper Copper River basin is the traditional home of the Ahtna, an Athabascan speaking people. "Ahtna" is the Athabascan name for the Copper River. Most Ahtna settlements in the upper Copper Valley were historically either fish camps or winter “villages” along the river, or upland hunting and trapping camps. Native residents were divided into clans with separate hunting, fishing, and berry picking areas (Copper Valley EDC 2003).

Gold was discovered in the Klondike in 1898 and 1899 and led to the development of the Valdez-Eagle trail that extended approximately 400 miles northeast from Valdez to Eagle on the Yukon River and served as an alternate route for gold miners traveling to and from the Klondike. The Copper Valley area served as a staging area for thousands of prospectors with many wintering at Copper Center. Development of the Trans-Alaska pipeline in the early 1970s had a significant impact on the area, with many small settlements built throughout the Copper Valley to house pipeline workers and their families (Copper Valley EDC 2003).

Three-quarters of the population in the Valdez-Cordova CA identified as White in the 2000 Census, with 13 percent identifying as American Indian or Alaska Native (Table 3-20). The share of the population identifying as American Indian or Alaska Native was higher in the Copper Valley area, 20 percent versus 13 percent.

Table 3-20. Race and Ethnicity, 2000

Geographic Area	Total	Percent of Total Population				
		White[1]	American Indian and Alaska Native[1]	Two or more races[1]	Hispanic or Latino	Other Race[1,2]
Chistochina	93	35	57	6	1	0
Mentasta Lake	142	29	63	8	0	0
Slana	124	81	14	2	0	3
Copper Valley	3,108	71	20	6	1	1
Valdez-Cordova CA	10,195	75	13	5	3	4
Tok[3]	1,393	77	13	7	2	1

[1] Non-Hispanic only. The federal government considers race and Hispanic/Latino origin to be two separate and distinct concepts. People identifying Hispanic or Latino origin may be of any race. The data summarized in this Table present Hispanic/Latino as a separate category.

[2] The “Other” category presented here includes census respondents identifying as Black or African American, Asian, Native Hawaiian and Other Pacific Islander, or Some Other Race.

[3] Tok is located north of the analysis area in the Southeast Fairbanks CA.

Source: U.S. Census Bureau 2000b.

3.5.6.3 Economic Conditions

Employment data are summarized for the Valdez-Cordova CA and the state of Alaska for 2008 in Table 3-21. These data are not available for the Census sub-area or communities in the analysis area. The data summarized in Table 3-21 indicate that the Government; Transportation, Warehousing, and Utilities; and Manufacturing sectors are the main employers in the Valdez-Cordova CA. The location quotient analysis indicates that compared to the state as a whole, the Valdez-Cordova CA is relatively specialized in the manufacturing sector and the transportation, warehousing, and utilities sector. These patterns reflect the dominant employers in Valdez, the southern terminus and off-loading point for the Trans-Alaska pipeline, and Cordova, which supports a large commercial fishing fleet and several fish processing plants.

Data compiled as part of the 2000 Census indicated that Alaska and the Valdez-Cordova CA had higher and slightly higher labor participation rates than the U.S average, respectively, with 71 percent and 65 percent of the population 16 years and over identified as part of the labor force, compared to a national average of 64 percent (Table 3-22). Unemployment rates in 2000 were more than 50 percent higher than the national average, 9.0 percent in Alaska and 9.6 percent in the Valdez-Cordova CA compared to a national rate of 5.8 percent (Table 3-22). Despite higher unemployment rates, median household income in 1999 was higher in Alaska and the Valdez-Cordova CA than in the U.S. as a whole and the share of the population below the poverty level was lower (Table 3-23).

Table 3-21. Employment by Economic Sector, 2008

Economic Sector	Valdez-Cordova CA 2008 Employment	Valdez-Cordova CA Percent of Total	Alaska 2008 Employment	Alaska Percent of Total	Location Quotient[1]
Government	1,272	26.5	80,932	25.2	1.1
Goods-Producing	943	19.7	46,184	14.4	1.4
Natural Resources and Mining	115	2.4	15,936	5.0	0.5
Construction	221	4.6	17,262	5.4	0.9
Manufacturing	607	12.7	12,986	4.0	3.1
Service-Providing	2,576	53.8	194,608	60.5	0.9
Wholesale and Retail Trade	408	8.5	42,765	13.3	0.6
Transportation, Warehousing, and Utilities	725	15.1	22,068	6.9	2.2
Information	100	2.1	6,996	2.2	1.0
Financial Activities	147	3.1	14,839	4.6	0.7
Professional and Business Services	189	3.9	26,221	8.2	0.5
Educational and Health Services	269	5.6	37,585	11.7	0.5
Leisure and Hospitality	469	9.8	32,183	10.0	1.0
Other Services	268	5.6	11,950	3.7	1.5
Total	**4,791**	**100.0**	**321,724**	**100.0**	**1.0**

[1] Location quotients are a relative measure of industry specialization that compares the percentage of employment concentrated in each sector in the study region with a benchmark region, in this case the state of Alaska. A location quotient of 1.0 indicates that the study region has the same percentage of employment in this sector as the benchmark region does. Location quotients above or below 1.0 indicate that the study region is over or under represented in this sector, respectively.

Source: Alaska Department of Labor 2009b.

Table 3-22. Labor Force Participation and Unemployment Rates, 2000

Geographic Area	Population 16 Years and Over	Percent in Labor Force	Percent Unemployed
Chistochina	83	61.4	21.0
Mentasta Lake	91	54.9	28.0
Slana	99	49.5	49.6
Valdez-Cordova CA	7,567	66.6	9.6
Tok	995	63.2	18.0
Alaska	458,054	71.3	9.0
United States	217,168,077	63.9	5.8

Source: U.S. Census 2000c.

Table 3-23. Median Household Income and Poverty Rates, 1999

Geographic Area	Median Household Income 1999: 2008 Dollars[1]	Median Household Income 1999: Percent of CA Total	Poverty Rate 1999[2]
Chistochina	31,153	49%	29%
Mentasta Lake	22,414	36%	36%
Slana	25,307	40%	23%
Valdez-Cordova CA	62,979	100%	10%
Tok	49,031	78%	11%
Alaska	66,645	106%	9%
United States	54,269	86%	12%

[1] Median household income is presented here in 2008 dollars. Original estimates in nominal (1999) dollars were adjusted using the Consumer Price Index for Anchorage-All Urban Consumers (Alaska Department of Labor 2009c).

[2] Poverty status in 1999 all ages.

Source: U.S. Census Bureau 2000d.

Year-round employment in the Copper Valley is provided by service industries, federal and state government agencies, the local school district, Alyeska Pipeline, and Ahtna, Inc., the Copper River Native Association, and other tribal governments. Seasonal employment in the area is mainly provided by tourism and construction, but federal and state agencies also hire seasonal employees for fire protection, maintenance, and visitor services. Some residents work outside the region, primarily in Valdez and the North Slope, and many residents supplement their income with subsistence activities and permanent fund dividends (Copper Valley EDC 2003).

3.5.6.4 Communities

Today, most people in the Copper Valley region live in small communities located along the Richardson and Tok Cutoff Highways that follow the west bank of the Copper River, which in turn forms the west boundary of the park. The park is not easily accessible to residents in most of these communities because the river serves as a barrier in the summer and is only easily crossed when it freezes in the winter. A bridge crosses the Slana River, a tributary to the Copper River, at Slana and provides access to the park. The closest bridge across the Copper River providing access to the park is 135 miles south at Chitina. Access to the analysis area is via the bridge at Slana and the Nabesna Road, which extends approximately 40 miles to the old Nabesna Mine (see Figure 3-13).

The NPS has identified five communities that could potentially be affected by the project. These communities all have relatively easy access to the analysis area. Three of these communities, Chistochina, Slana, and Mentasta Lake, are located along or off the Tok Cut-off and recognized by the Census as CDPs (Figure 3-13). The fourth community, Nabesna, is located at the end of Nabesna Road. This community is not incorporated or recognized as a CDP and the Census and state do not specifically compile data for this area. The fifth community, Tok, located north of the analysis area at the junction of the Tok Cut-off and the Alaska Highway, is located about 65 miles north of Slana, outside the Copper Valley region and the Valdez-Cordova CA. Tok, located within the Southeast Fairbanks CA and recognized as a CDP by the Census, is included here because the affected trails receive a lot of use by qualified hunters from Tok.

Residents of these communities depend upon their proximity to the park in a number of ways. The local economies of Chistochina and Mentasta Lake, in particular, may be described as “mixed, subsistence-market” economies (Alaska DCRA 2009, Wolfe 2000). These types of communities are characterized by a combination of income from paid employment and subsistence food harvest. In this type of economic system, households combine jobs with subsistence activities and invest a portion of their income in small-scale subsistence technologies to harvest wild foods for their own consumption and to share with other households. Typical small-scale subsistence technologies include fishwheels and snowmachines (Wolfe 2000). Subsistence resources are harvested on the Wrangell-St. Elias National Park and Preserve as discussed further in Section 3.5.3, Subsistence.

Recreation and tourism are important sources of paid employment and income to local residents and many of the local businesses directly or indirectly related to visitors to the park. Visitors may use local outfitter/guide services and stay at local motels and bed and breakfast inns. They also spend money on gas, food, and other supplies in the vicinity of the park.

Visitation at Slana accounted for just 9 percent of total estimated visitation to the park in 2008, with an estimated 4,242 visitors at Slana and 47,212 park-wide. 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 and sport hunting accounts for about 85 percent of current recreational ORV use. Other visitors drive on Nabesna Road, camp at dispersed sites, or undertake day hikes. Visitor use is discussed in more detail in Section 3.5.5, Visitor Opportunities/Access.

The following sections provide an overview of the social and economic conditions in the four potentially affected communities.

Chistochina

Chistochina is located on the Tok Cutoff highway on the west bank of the Copper River, approximately 27 miles southwest of Slana and roaded access to the analysis area (Figure 3-13). The community began as an Ahtna fish camp and was used as a stopover place for trappers and traders. The village access road later became part of the Valdez-Eagle Trail. Gold was mined along the upper Chistochina River and tributaries and the Chistochina Lodge was built as a roadhouse for prospectors. The area was later settled by homesteaders, but remains a traditional Native village (Alaska DCRA 2009).

Chistochina had an estimated population of 100 in 2008 (Table 3-19). Approximately 57 percent of the population identified as American Indian or Alaskan Native in 2000, compared to 20 percent and 13 percent in the Copper Valley area and the Valdez-Cordova CA, respectively (Table 3-20).

The village's economy is primarily based on subsistence hunting, fishing, trapping, and gathering, and most cash employment is seasonal. Business licenses currently on file with the Alaska Department of Community and Economic Development (Alaska DCED) identify six businesses in Chistochina. These businesses include visitor accommodation, outfitter/guide services, and kennels (Alaska DCRA 2009).

Chistochina had a lower labor participation rate than the state and Valdez-Cordova CA averages in 2000 (61 percent versus 71 percent and 64 percent, respectively), and a much higher unemployment rate (21 percent compared to 9 percent for the State and 9.6 percent for the CA) (Table 3-22). Median household income in 1999 was approximately half (49 percent) the regional average, and 29 percent of the population had incomes below the poverty level (Table 3-23).

Mentasta Lake

Mentasta Lake is located approximately 6 miles west of the Tok Cutoff highway, approximately 28 highway miles north of Slana. At Slana, the highway trends north, away from the WRST and the Copper River, toward Tok. The community of Mentasta Lake is located on the west side of the lake of the same name (Figure 3-13). The Mentasta Lake area was reportedly part of the best-known Native immigration route across the Alaska Range and early village settlements have been located at various sites around the lake. The families that presently reside in Mentasta Lake come from Nabesna, Suslota, Slana and other villages in the surrounding area (Alaska DCRA 2009).

Mentasta Lake had an estimated population of 112 in 2008, a net reduction of 21 percent from 2000 (Table 3-19). The population in the community is primarily Ahtna. Approximately 63 percent of the population in 2000 identified as Native American or Alaska Native, compared to 20 percent and 13 percent in the Copper Valley area and the Valdez-Cordova CA, respectively (Table 3-20).

The local economy primarily revolves around subsistence hunting, fishing, trapping, and gathering, with cash employment limited and seasonal (Alaska DCRA 2009). There are no business licenses for Mentasta Lake currently on file with the Alaska DCED (Alaska DCRA 2009). Mentasta Lake had a lower labor participation rate than the state and Valdez-Cordova CA averages in 2000 (55 percent versus 71 percent and 64 percent, respectively), and a much higher unemployment rate (28 percent compared to 9 percent for the state and 9.6 percent for the CA) (Table 3-22). Median household income in 1999 was slightly more 36 percent of the regional average, and 36 percent of the population had incomes below the poverty level (Table 3-23).

Slana

Slana is located near the confluence of the Slana and Copper rivers and the intersection of Nabesna Road with the Tok Cutoff. Access to the analysis area from the Tok Cutoff highway is via the bridge at Slana. Prior to the 1980s, Slana consisted of a few homesteaders and prospectors. Today the community has an estimated population of 107, primarily homesteaders (Table 3-19). Approximately 81 percent of the population in 2000 identified as White, with 14 percent identifying as Native American or Alaska Native (Table 3-20).

The community may be loosely defined as beginning at about mile 55 to mile 75 along the Tok Cut-off and extending along the first 4 miles of the Nabesna Road. Local businesses include a convenience store, post office, bed and breakfast inns, RV parks, and a K-12 school, as well as the NPS ranger station and a Department of Transportation maintenance yard (NPS 2009b). Local incomes are supplemented by subsistence (Alaska DCRA 2009).

Slana had a much lower labor participation rate than the state and Valdez-Cordova CA averages in 2000 (50 percent versus 71 percent and 64 percent, respectively), and a much higher unemployment rate, with 49.6 percent of the participating labor force unemployed, compared to 9 percent for the state and 9.6 percent for the CA (Table 3-22). Median household income in 1999 was approximately 40 percent of the regional average, and 23 percent of the population had incomes below the poverty level (Table 3-23).

Nabesna

A number of families live along the Nabesna Road, with residents located at Nabesna at the end of the road, Twin Lakes near mile 28, and “4-Mile” Road, near Slana (NPS 2009b, Reckord 1983b). Some are seasonal residents, but most live in the area year-round and are involved in recreation-related businesses. Businesses include Huck Hobbits Hostel at “4-Mile” Road; Sportsman’s Paradise Lodge near Twin Lakes; and End of the Road B&B, K-Air Flight Services, Ellis Big Game Guides, and Devil’s Mountain Lodge at Nabesna (NPS 2009b).

Tok

Tok is located north of the analysis area at the junction of the Tok Cut-off and the Alaska Highway, approximately 65 miles north of Slana. Tok was established in 1942 as an Alaska Road Commission camp and served as the location for the U.S. Customs Office from 1947 to 1971. In 1976 the U.S. Coastguard established a LORAN (Long Range Aid to Navigation) Station at Tok. Tok is now known as the “Sled Dog Capital of Alaska (Alaska DCRA 2009).

Tok had an estimated population of 1,382 in 2008 (Table 3-19). Approximately 13 percent of the population identified as American Indian or Alaskan Native in 2000 (Table 3-20). Tok serves as the business, service, and government center for the Upper Tanana region. Employment and business revenues peak during the summer fueled by RV travelers on the Alaska Highway. Subsistence and recreational are important aspects of the local community (Alaska DCRA 2009).

Tok had a lower labor participation rate than the state average in 2000 (63 percent versus 71 percent), and an unemployment rate twice the state average (18 percent compared to 9 percent) (Table 3-22). Median household income in 1999 was approximately 78 percent of the regional average for the analysis area (Valdez-Cordova CA), and 11 percent of the population had incomes below the poverty level (Table 3-23).

3.5.6.5 Land Use and Inholdings

The analysis area includes approximately 997,000 acres. The majority of these lands are divided between the National Park (273,000 acres, 27 percent of the total) and National Preserve (724,000 acres, 73 percent of the total). Approximately 364,716 acres or 37 percent of these lands are part of the 9,677,000- acre Wrangell-St. Elias Wilderness, which extends south from the analysis area.

The analysis area also includes 43 private inholdings that together comprise 2,486 acres and range in size from less than 1 acre to 330 acres. The largest private inholding (330 acres) is the former Nabesna Mine site at the end of Nabesna Road, which is owned by the Nabesna Mining Corporation. Private inholdings are concentrated at Batzulnetas and Twin Lakes, as well as along the Tok Cut-off outside the park. Inholdings are also located at Big Grayling Lake, Copper Lake, and Tanada Lake.

ORV use for access to inholdings in Alaska National Park units is authorized in both National Parks and Preserves under ANILCA Section 1110(b) and Title 43 CFR 36.10. Four trails in the analysis area (the Soda Lake trail, Reeve Field trail, Tanada Lake trail, and Copper Lake trail) serve as ORV access routes to private inholdings.

3.5.6.6 Outfitter/Guide Businesses

The NPS has set up outfitter/guide areas in the National Preserve portion of Wrangell-St. Elias. To prevent overcrowding and to maintain a quality hunting/guiding experience, each area is used by only one outfitter/guide concession for sport hunting purposes. Outfitter/guides must obtain a concessions permit from the park. The permit gives each outfitter/guide exclusive use for a given area for guiding purposes. However, the areas may still be used by the general public for recreating or sport hunting purposes in the preserve, and may be used by transporters bringing sport hunters and others in. Transporters must obtain a commercial use authorization from Wrangell-St. Elias.

Four outfitter guide areas are partially or fully contained within the analysis area. The outfitter/guides permitted to use these areas primarily use wheeled and float planes to access remote airstrips and lakes in their respective areas. Guided hunting is for moose, spring bear, and/or Dall's sheep, depending on the location.

3.5.7 Natural Soundscapes

Except for the occasional non-natural sources of noise (e.g., vehicle traffic along roads through the Wrangell-St. Elias, recreational and subsistence ORVs on designated trails, aircraft), the park has a relatively natural soundscape. Managing noise is complicated by the varied character and number of sources present in a particular area.

3.5.7.1 Sound Characteristics

The ambient sound pressure level in a particular region is comprised of a variety of natural and non-natural sources. Sound levels are determined by small variations in air pressure and these pressures are referenced to a logarithmic scale in the units of decibels (dB). Human response to sound is a function of the magnitude of pressure variations and the frequency distribution of the sound energy.

The A-weighting scale was developed to approximate the human ear's sensitivity to certain frequencies by emphasizing the middle frequencies and de-emphasizing the lower and higher frequencies. This scale, expressed as decibel level (dBA), best correlates with the human response to sound and is commonly used as a descriptor for ambient sound levels.

The threshold of human hearing is about 10 dBA, while the loudest sounds that humans hear are about 120 dBA. Table 3-24 presents typical sound levels for common conditions or activities referenced to the dBA scale.

Table 3-24. Typical Sound Levels

Type of Noise	Sound Level (dBA)
Normal breathing	10 dBA
Quiet forest, no wind	40 dBA
Rainfall	50 dBA
Normal conversation	60 dBA at 3 feet
Private car	70 dBA
EPA legal street bike, going 35 mph	73 dBA at 50 feet
EPA legal street bike, wide open throttle	80 dBA at 50 feet
Truck, shouted conversation	90 dBA
Racing motorcycle	95+ dBA at 50 feet
Snowmobiles	100 dBA
Modified exhaust street bike	100+ dBA at 50 feet
Rock concert	110+ dBA
Thunder	120 dBA
Propeller plane	130 dBA
Rifle	163 dBA

Sources:

Sound Off, Science of Noise, Typical Sound Levels 2009; League for the Hard of Hearing 2003; Listserv 15.5 Safety Archive 2000.

Based on Table 3-24, noise from a street-legal motorbike usually ranges between 75 and 80 dBA at a distance of 50 feet. Typical ORV noise is usually louder, around 95 dBA or higher. The state of Alaska and NPS have not established standards for maximum ORV noise levels (National Off-Highway Vehicle Conservation Council 2009). A number of states have adopted standards for allowable ORV sound levels; those standards are generally based on the sound level as measured at 20 inches from the tailpipe of the vehicle, and the limits generally range from 96 dBA to 105 dBA (ESA Adolfson 2006).

Noise from ORVs and other sources can carry a considerable distance depending on local terrain, land cover and atmospheric conditions. Under ideal conditions, noise from a stationary or point source will decrease (attenuate) at a rate of 6 dB per doubled distance, while noise from a line source (such as a stream of traffic) will decrease at approximately 3 dB per doubled distance (Michael Minor & Associates, Inc. 2008). (In other words, if the sound level is 80 dBA at 50 feet from a point source, it would be about 74 dBA at 100 feet from the source under ideal conditions.)

Local terrain conditions can either reduce or increase the rate of attenuation (Michael Minor & Associates, Inc. 2008). A ridge or berm between the source and the receiver can block or diminish the received sound level, while terrain can also reflect or channel sound. Sound travels well across water, pavement and other smooth surfaces, but surface roughness created by vegetation can increase the attenuation of sound. For example, a noise reduction of 5 dBA is typically applied if there is an area of dense foliage at least 100 feet wide between the source and receiver. Wind and temperature, especially, and other atmospheric conditions can affect attenuation of sound, although these influences can vary considerably with rather small changes in location and time.

Available studies on the characteristics of ORV noise in field settings do not establish a firm or precise distance limit at which ORV noise can be heard by humans. A recent analysis prepared for a proposed ORV park near Juneau, Alaska predicted that sound levels from 30 ORVs operating simultaneously would be approximately 55 dBA at 450 feet from the source, 30 dBA at 900 feet, and 15 dBA at 1,200 feet from the source (Michael Minor & Associates, Inc. 2008). A 1993 test of multiple off-road motorcycles operating at an ORV park in the El Dorado National Forest in California indicated that the ORVs could occasionally be heard at distances greater than 1,100 feet, and could not be detected at distances greater than 1,900 feet (Harrison et al. 1993). A different study conducted at the same area concluded that, if the effects of terrain, vegetation and wind were excluded, the sound levels from off-road motorcycles would equal the background sound level within 3,200 feet of the source (Schilling and Harrison 1994). Considering the distance ranges cited in these studies and the extensive tree and shrub cover within the analysis area, it is reasonable to assume that ORV sound could be heard within approximately 0.5 mile (2,640 feet) of an active motorized trail, and would not likely be detectable beyond that range.

In general, because of the rough operating conditions on most of the area trails, ORVs are operated at low speeds and low revolutions per minute (RPMs) and do not produce the high-pitched sounds associated with two-stroke engines (such as snowmachines or trail bikes). This has the tendency to decrease the distance over which an ORV can be heard. On an average, a non-motorized hiker on a motorized trail in the area could expect to hear motorized noise (encounter motorized parties) 2–3 times per day on non-hunting season weekends and 0–2 times per day on non-hunting season weekdays. During hunting season (August and September) this number could be expected to increase to 5–10 times per day.

In addition to ORVs, other non-natural sounds in the analysis area include aircraft and vehicle traffic.

3.5.7.2 Analysis Area Natural Soundscape

NPS personnel logged noise types at four locations in the analysis area in 2009 (NPS 2009i). The sites included two trails (Tanada Lake and Caribou Creek trails) and two locations along the Nabesna Road (Copper Lake Trailhead and Dead Dog Hill wayside). The Tanada Lake trail was logged once in August 2009, the Caribou Creek trail was logged twice, in May and August 2009, and the Copper Lake Trailhead and Dead Dog Hill wayside areas were logged once in September 2009. Based on this very limited sampling data, it was found that the natural soundscape of the analysis area varies depending on the acoustical attributes of the location, such as animal life, proximity to water, and proximity to airstrips, all of which influence the production and propagation of sounds. The two trails have similar acoustic characteristics, except one area was closer to water. The two locations along the Nabesna Road also had similar acoustic characteristics yet were dominated by opposite features (natural and non-natural sources).

Though the natural soundscape on the Caribou Creek trail is dominated by wind and flowing water, birds, amphibians, insects, and mammals are often audible during non-winter months. Aircraft and road/trail traffic were not audible during May and August 2009 logging sessions at this location. There is intermittent vehicle traffic along Nabesna Road during the summer months, however, as well as recreational and subsistence ORV traffic on designated trails.

The natural soundscape on the Tanada Lake trail appears to be less dominated by wind, and birds, insects, and mammals are often audible. Compared to the Caribou Creek trail results, other sounds such as propeller aircraft and vehicles driving along Nabesna Road were more frequently audible given the close proximity to the road. With the exception of aircraft and vehicle sounds, audible sounds were usually generated by nearby sources rather than carried from far distances. Infrequently, aircraft and vehicles were heard along this trail. Again, the natural soundscape would be different during the winter months, when flowing water sounds either have stopped or are muffled by snowcover and animal sounds are reduced in diversity and number.

The natural soundscape at the Copper Lake trailhead is dominated by natural sources including wind, and birds, insects, and mammals are often audible during non-winter months. Aircraft and vehicle traffic were audible during the September 2009 logging session, but were not the dominant features.

The natural soundscape at the Dead Dog Hill wayside is dominated by non-natural sources. The last 10 minutes of the 2-hour session were dominated by the sounds of the outhouse being pumped. Other non-natural sounds included recreation user voices and footsteps. Natural sources included wind, and birds, insects, and mammals. No aircraft and vehicle sounds (other than the pump truck) were audible from this location. The natural soundscape would be different during the winter months, when vehicle traffic is limited and primarily by local residents.

ORV use is a small component of the total motorized use in the analysis area. The ADOT&PF has periodically placed traffic counters on Nabesna Road to estimate traffic volumes. Results reported for 2007 indicated a total count of 3,500 trips (both residents and visitors) for the year. ADOT&PF counts for 2008 showed an average daily traffic count of 185 vehicles at mile 0.0 (67,525 vehicles per year) and 30 vehicles (10,950 per year) at mile 1.5 (ADOT&PF 2008). The lower traffic levels reported in 2008 than in 2007 may be related to higher gas prices (Sherwonit 2009). The different traffic levels reported in 2008 are related to the locations of the ADOT&PF traffic counters. The higher 2008 data are greater because they capture traffic related to numerous private residences and the NPS ranger station before the 1.5-mile point along the Nabesna Road. The lower 2008 data are recorded at the 1.5-mile point along the Nabesna Road and, therefore, provide a better indication of the non-local traffic.

In addition, aircraft activity related to the 10 landing strips, four private airstrips, and eight float lakes in the analysis area represents another source of human noise within the soundscape. Small fixed-wing air traffic is common in the analysis area. Airplanes serve as a common means of access during the summer months and particularly during the months of August and September to access remote hunting camps. The outfitter/guides who have permits to operate within the analysis area all use airplanes to transport clients, either to hunting camps or for non-hunting season drop-offs or pick-ups. Other commercial use transporters also use airplanes for client pick-up and drop-offs within the analysis area. Frequency of flights is highly dependent on the season but visitors along the Nabesna Road or using the trail system could expect to hear small fixed-wing aircraft at least twice a day from mid-May to early August and 4 to 5 times per day from early August through September 20.