

APPENDIX 1

ANILCA SECTION 810(A)

SUMMARY OF EVALUATIONS AND FINDINGS

I. Introduction

This evaluation and finding was prepared to comply with Title VIII, Section 810 of the Alaska National Interest Lands Conservation Act (ANILCA). It evaluates the potential restrictions to subsistence uses and needs that could result from proposed actions within the Cantwell Subsistence Off-Road Vehicle Management Environmental Assessment.

II. The Evaluation Process

Section 810(a) of ANILCA states:

"In determining whether to withdraw, reserve, lease, or otherwise permit the use, occupancy, or disposition of public lands . . . the head of the Federal agency . . . over such lands . . . shall evaluate the effect of such use, occupancy, or disposition on subsistence uses and needs, the availability of other lands for the purposes sought to be achieved, and other alternatives which would reduce or eliminate the use, occupancy, or disposition of public lands needed for subsistence purposes. No such withdrawal, reservation, lease, permit, or other use, occupancy or disposition of such lands which would significantly restrict subsistence uses shall be affected until the head of such Federal agency:

1. gives notice to the appropriate State agency and the appropriate local committees and regional councils established pursuant to Section 805;
2. gives notice of, and holds, a hearing in the vicinity of the area involved; and
3. determines that (A) such a significant restriction of subsistence uses is necessary, consistent with sound management principles for the utilization of the public lands, (B) the proposed activity would involve the minimal amount of public lands necessary to accomplish the purposes of such use, occupancy, or other disposition, and (C) reasonable steps would be taken to minimize adverse impacts upon subsistence uses and resources resulting from such actions."

ANILCA created new units and additions to existing units of the national park system in Alaska. In reference to the Denali National Park and Preserve additions, ANILCA Section 202(3)(a) states:

"The park additions and preserve shall be managed for the following purposes, among others: To protect and interpret the entire mountain massif, and additional scenic mountain peaks and formations; and to protect habitat for, and populations of fish and wildlife, including but not limited to, brown/grizzly bears, moose, caribou, Dall sheep, wolves, swans and other waterfowl; and to provide continued opportunities including reasonable access, for mountain climbing, mountaineering, and other wilderness recreational activities."

Subsistence is an allowed use in the ANILCA additions to Denali National Park and Preserve (Sec. 202(3)(a)). The potential for significant restriction must be evaluated for the proposed action's effect upon ". . . subsistence uses and needs, the availability of other lands for the purposes sought to be achieved and other alternatives which would reduce or eliminate the use" (Sec. 810(a)).

III. Proposed Action on Federal Lands

This document evaluates four possible alternatives that address the future management of subsistence off-road vehicle use within the TUA. The "Description of Alternatives" section of the environmental assessment describes in detail the alternatives for consideration. Following is a brief summary of each.

Alternative 1: No Action

The NPS would not undertake any new actions to manage subsistence ORV use (see Figure 2.1). NPS qualified subsistence users would continue to employ ORVs for subsistence purposes throughout the TUA. This alternative provides a baseline for evaluating the changes and impacts of the action alternatives.

Use of ORVs off-trail and on existing trails would be allowed for all subsistence purposes by NPS qualified subsistence users throughout the Cantwell Traditional Use Area (TUA). There would be no limits on the types of ORVs that could be used.

No closures are predicted to occur under this alternative.

The NPS would not seek to establish subsistence harvest limits for moose and caribou.

Alternative 2

The only off-trail ORV use permitted by NPS qualified subsistence users would be to retrieve harvested moose and caribou. In addition, use of ORVs by NPS qualified subsistence users engaged in subsistence activities would continue to be allowed on NPS-managed trails and routes (See Figures 2.2 and 2.3).

Subsistence users would be required to obtain a permit in advance from the NPS to use an ORV for off-trail retrieval of harvested moose or caribou. To aid the NPS in monitoring impacts of this off-trail use, the ORV user would be required to provide the NPS with a detailed map, a GPS-tracking log, or similar record identifying the travel path used for retrieval.

The following trails would be managed by the NPS for continued ORV use by NPS qualified subsistence users for all subsistence purposes:

- Windy Creek Access Trail;
- Windy Creek Bowl Trail;
- Cantwell Airstrip Trail;
- Pyramid Peak Trail; and
- Bull River Access Trail (new construction).

The NPS would implement management prescriptions to improve the existing Windy Creek Access Trail, Windy Creek Bowl Trail, Cantwell Airstrip Trail, and Pyramid Peak Trail (see

Appendix 5 for details about the management prescriptions). Both the Bull River and Upper Cantwell Creek floodplains would be managed by the NPS for continued ORV use by NPS qualified subsistence users for all subsistence purposes.

To prevent new adverse impacts from being created, the following areas would be permanently closed to ORVs traveling off NPS-managed existing trails or routes:

1. Open water (i.e., areas with equal to or greater than one inch of permanent standing water).
2. Slopes greater than 20%
3. Areas with saturated soils

The NPS would work with the Federal Subsistence Board, the Denali Subsistence Resource Commission, and the Regional Advisory Councils to establish subsistence harvest limits for moose and caribou as necessary to maintain natural and healthy moose and caribou populations on park lands. The National Park Service would monitor wolf harvest records from the TUA. If there were any indication of a substantial increase that would affect segments of the population, the NPS would take appropriate management action, which could include proposing a harvest limit.

Alternative 3

The Cantwell Traditional Use Area (TUA) would remain open to use of ORVs by NPS qualified subsistence users for all subsistence purposes only on NPS-managed existing trails and routes. In addition, the NPS would work with the Federal Subsistence Board and others to implement a winter subsistence moose hunt (See Alternative 3 Map).

The following trails would be managed by the NPS for continued ORV use by NPS qualified subsistence users for all subsistence purposes:

- Windy Creek Access Trail;
- Windy Creek Bowl Trail;
- Cantwell Airstrip Trail;
- Pyramid Peak Trail; and
- Bull River Access Trail (new construction).

Both the Bull River and Upper Cantwell Creek floodplains would be managed by the NPS for continued ORV use by NPS qualified subsistence users for all subsistence purposes.

Areas off of NPS-managed existing trails and routes would be closed by regulation to ORV use, including the “recovery closures” as described under Alternative 2.

The NPS would work with the Federal Subsistence Board, the Denali Subsistence Resource Commission, and the Regional Advisory Councils to establish subsistence harvest limits for moose and caribou as necessary to maintain natural and healthy moose and caribou populations on park lands. The National Park Service would monitor wolf harvest records from the TUA. If there were any indication of a substantial increase that would affect segments of the population, the NPS would take appropriate management action, which could include proposing a harvest limit.

Alternative 4

Alternative 4 would be similar to Alternative 3, except for the following differences:

1. The NPS would not construct the new Bull River Access Trail.
2. ORVs would not be authorized on either the Bull River or Upper Cantwell Creek Floodplains.
3. The NPS would authorize ORV use for subsistence purposes only on the
 - a. Windy Creek Access Trail,
 - b. Windy Creek Bowl Trail,
 - c. Cantwell Airstrip Trail, and the
 - d. Pyramid Peak Trail.
4. ORV use for subsistence purposes would be authorized on these four trails *only* from one week before the beginning of the fall moose and caribou hunting seasons until the end of these hunting seasons.

IV. Affected Environment

Moose

Moose are abundant throughout the year within and near the drainages in the Traditional Use Area (TUA). They inhabit the entire vegetated TUA except tall alder shrubs, forest, and slopes greater than 20%. Typically, moose occur in the headwaters of the draws in the TUA in August and early part of September and occur closer to the lower corridors later in September and October. Moose concentrations vary seasonally and, during winter, correlate with snow depth and timing (ADFG 1992b). Most calving takes place from late May through June. During calving, cows tend to seek areas within their home range that provide low predator densities (islands in rivers) or improved visibility (open muskeg areas) (ADFG 1996a). Post-calving moose generally move to higher elevations. Fall rutting and post-rutting concentrations occur in subalpine habitats, with moose moving down from these areas in winter as snow depths increase (ADFG 1992a). Riparian willow stands provide a large part of winter forage and upland coniferous forests provide thermal cover and shallower snow depths (ADNR 1991).

Concentrations of moose are often seen mid and late winter in the Windy Creek area above Cantwell and where Ohio Creek emerges from the mountains (NPS unpublished data). Mean density of moose during late winter (late March) ranged from 0.7 to 3.2 moose per square mile on the south side of the Alaska Range (ADFG 1990b). In the most recent NPS survey in November 2005, the entire TUA was surveyed, and 102 moose were seen. Moose were seen throughout the TUA with most of the moose seen near Cantwell Creek and 21 near Windy. This represents a mean density of 1.9 moose per square mile in the area surveyed. The bull/cow ratios show signs of stress to the population. In 2005 there were 65 cows and 29 bulls, a 45:100 ratio, with 8 calves (NPS 2005b). NPS wildlife biologists have concluded that these numbers generally do not show an excess population that can be harvested.

A large rutting concentration roughly coincides with caribou calving grounds in the higher country north of Broad Pass between Windy Creek and the Bull River (ADNR 1985; ADFG 1985a). The drainages in the area of the old Dunkle Mine – the upper Bull River, Costello and Cantwell creeks, and the West Fork of the Chulitna – are identified as prime early-winter moose range (NPS 1984; ADNR 1985).

Since 1992 the National Park Service conducted four moose surveys that encompassed the TUA. The following table shows estimates of moose per square mile, and calf/cow and bull/cow ratios.

These surveys covered a 215 square mile area from Windy Creek to the West Fork of the Chulitna River.

Year	Calves per 100 Cows	Bulls per 100 Cows	Density per Square Mile
1992	29.5	29.5	1.4
1993	28.1	31.3	0.7
1995	23.6	27.6	0.9
2005	19.5	47.4	1.2

A more comprehensive description of existing conditions can be found in the affected environment section of the environmental analysis.

V. Subsistence Uses and Needs Evaluation

One of the purposes of ANILCA is to provide the opportunity for local, rural residents engaged in a subsistence way of life to continue to do so. Accordingly, Congress provided for traditional subsistence uses by qualified local rural residents within the ANILCA additions to Denali National Park and Preserve, including the TUA. Local rural residents engage in, and depend upon, resources from the park and preserve for personal consumption, cultural identity, and to maintain a subsistence way of life.

In addition to describing the specific purposes for which Denali National Park and Preserve is to be managed, Section 202(3)(a) of ANILCA provided that “subsistence uses by local residents shall be permitted in the additions to the park where such uses are traditional in accordance with the provisions in title VIII.” Under Title VIII of ANILCA, Section 811(a) states that “rural residents engaged in subsistence uses shall have reasonable access to subsistence resources on public lands.” Subsistence access is further addressed in section 811(b) where it states that “the Secretary [of the Interior] shall permit on the public lands appropriate use for subsistence purposes of snowmobiles, motorboats and other means of surface transportation traditionally employed for such purposes by local residents, subject to reasonable regulation.”

In authorizing subsistence uses within Denali National Park and Preserve additions, Congress intended that traditional National Park Service management policies be maintained which strive to maintain the natural abundance, behavior, diversity, and ecological integrity of native animals as part of their ecosystem, while recognizing that subsistence use by local rural residents have been, and are now, a natural part of the ecosystem serving as a primary consumer in the food chain. In addition to providing for traditional subsistence opportunities, Congress directed the NPS to take appropriate steps when necessary to insure that consumptive uses of resources within the park and preserve not be allowed to adversely disrupt the natural balance which has been maintained for thousands of years (Senate Report p. 171, top para.).

The continuation of traditional subsistence activities depends directly on the availability of healthy and diverse wildlife, plant and fish populations. The natural diversity and abundance of resources important to subsistence activities is, in turn, directly dependent upon intact and healthy ecosystems.

On July 1, 1990 the Federal Government assumed responsibility for the management of subsistence taking of fish and wildlife on Federal public lands in Alaska. The Federal Subsistence

Board (FSB) was established to oversee the Federal Subsistence Program and is the decision making body that makes rural/non-rural determinations, customary and traditional use determinations which define what communities and areas have subsistence use of wildlife populations, which species and populations are subject to harvest, when seasons open and close, how many animals may be harvested, and the method and means by which an animal may be taken. The subsistence harvest of wildlife in Denali National Park and Preserve by NPS qualified subsistence users is subject to Federal subsistence management regulations. Annually any person, agency or group may submit proposals to change Federal subsistence regulations. The Federal Subsistence Board uses the Emergency Action process if immediate action is needed to resolve fish and wildlife issues. Emergency Actions are authorized and in accordance with 50 CFR 100.19(d) and 36 CFR 242.19(d).

The purpose of the Denali Subsistence Resource Commission (SRC) is to devise and recommend to the Secretary of the Interior and the Governor of Alaska a program for subsistence hunting within Denali National Park, and to annually recommend changes to the program. The Regional Advisory Councils review and make recommendations to the Federal Subsistence Board on proposals for regulations, policies, management plans, and other subsistence related issues on Federal public lands within the region; develop proposals pertaining to the subsistence harvest of fish and wildlife; review proposals others submit; encourage and promote local participation in the decision making process affecting subsistence harvests on Federal public lands; make recommendations on customary and traditional use determinations of subsistence resources; and appoint members to national park subsistence resource commissions.

The NPS determines eligible local rural subsistence users through the use of resident zone communities and issuance of subsistence use permits. The community of Cantwell is identified as a subsistence resident zone community containing a significant concentration of residents who have customarily and traditionally used Denali National Park lands for subsistence purposes. In 1981 after consultation with Denali's Subsistence Resource Commission (SRC), boundaries for this resident zone community were established. Resident zones authorize all permanent residents within these zones to participate in subsistence activities on NPS lands without a subsistence use permit. Individuals who reside outside of the resident zone communities, who have customarily and traditionally used park subsistence resources, may apply to the Superintendent for a subsistence use permit. Approximately 100 households qualify for subsistence use activities within the Cantwell TUA.

The number of federal registration permits issued in Cantwell in recent years (NPS 2005c):

Year	2003	2004	2005	2006
Caribou (two per applicant)	47x2	77x2	68x2	38x2
Moose (one per household)	78	88	82	36

In 1991, a decision was made that Native select lands were not federal public lands and were, therefore, closed to federal subsistence use. This closed significant portions of Cantwell Creek and Windy Creek. In 1999, fisheries regulations passed and these lands again were open to federal subsistence use. ANILCA Section 811(b) states that "...the Secretary shall permit on the public lands..." Section 102(3) defines "public lands" as Federal Lands in Alaska, to exclude validly selected State and Native Corporation lands. Thus, Section 811 did not authorize the use of ORVs on selected lands, even where found to be "traditionally employed," for subsistence

purposes. It also appears that 811(a) did not authorize subsistence uses at all on those selected lands (Title II authorizations always refer to the "provisions of Title VIII"). The 1991 changeover from State to Federal management of subsistence hunting on Conservation System Units should not have changed anything. When subsistence fishing was added to federal management in 1999, the new regulations setting up the Federal Subsistence Board amended the ANILCA definition of "Public Lands" under the authority of ANILCA Section 906(o)(2), and made the change in 50 CFR 100.4 Definition of Public Lands (2).

The State and AHTNA selected lands comprise about 70% of the TUA between Cantwell Creek and the northeast border of the TUA and less than 3% of the TUA between Cantwell Creek and the Bull River. State and Native Corporation selected lands have not been surveyed, patented or interim conveyed, and because of over-selections, they may never get transferred out of federal ownership.

The NPS determined in the 1986 Denali General Management Plan (GMP) that ORVs had not been regularly used for subsistence purposes and were not considered a traditional means of subsistence access. However, in the 1990's, eight Cantwell subsistence users and the Denali Subsistence Resource Commission (SRC) requested that the Superintendent review and reconsider the 1986 GMP determination in light of new information provided by Cantwell residents regarding their traditional use of ORVs for access to subsistence resources. In response to these requests, and in compliance with ANILCA and NPS regulations and policies, the NPS undertook a project to compile and review traditional access information for the Cantwell area. The scope of this review and report was limited to the Cantwell area because the request was specific to that community and adjacent Denali National Park lands regarding traditional subsistence ORV access for the Cantwell area.

Based on the information in the review, the National Park Service made its final Cantwell Subsistence Traditionally Employed ORV Determination (hereby incorporated by reference), in July 2005, which opened the entire Cantwell traditional ORV use area to the use of ORVs for subsistence purposes. On August 1, 2005 the National Park Service implemented a temporary 120-day closure to protect park resources in the area where Cantwell residents traditionally employed ORVs for subsistence purposes that was identified in the Determination. Three existing trails (Windy Creek Access Trail, Cantwell Airstrip Trail, Upper Cantwell Creek Floodplain Route) were exempted from this closure. The closure allowed reasonable access to subsistence resources for residents of Cantwell while protecting park resources and providing time for the National Park Service to complete the necessary field work and environmental documentation evaluating ORV effects on park resources and values. In 2006, the National Park Service implemented an identical closure.

Subsistence activities are dynamic and diverse with moose and caribou hunting usually occurring in August and September. Cantwell subsistence hunters typically look closest to home first, using Windy Creek, Cantwell Creek, then farther south in the TUA. If unsuccessful, they hunt along the Denali Highway and then Kantishna (NPS 2006c). Stricter state regulations for moose hunts on state lands, decreased moose populations on state lands, and increased competition with other hunters encourage subsistence hunters to use park lands.

Federal subsistence moose season is open August 1 – September 20, and caribou season is open August 10- September 30 and October 21 – March 31. Both hunts require a Federal registration permit. One moose permit will be issued per household. The harvest limit for moose is one antlered bull moose, and the harvest limit for caribou is two bulls. There are currently no quotas for annual unit-wide harvests of moose or caribou.

Retrieval of game occurs on foot or by ORVs used on trails that are open for such use. Most harvests are likely supported by ORV use (NPS 2005). The 2005 Cantwell Subsistence Traditionally Employed ORV Determination indicates there were a variety of corridors and routes available for mechanized access by businesses as well as local residents for subsistence into areas that are now included within the ANILCA park additions. Information contained in the 1992 affidavits, 1993 ATV interviews and mapping, and the 2005 oral history project demonstrates there has been evolution of mechanized equipment used over time by Cantwell NPS qualified subsistence users along the primary routes along Windy and Cantwell Creek corridors, and into adjacent areas for subsistence harvests. Sections of intermittent ORV trails leading from the southwest side of Cantwell Creek into the Bull River drainage were also observed on park additions during the 1981 aerial survey.

In 2000, about 50% of the nearly 100 subsistence-eligible households in Cantwell attempted to harvest moose, with about 25% successful. Because there are so many factors involved with a successful hunt, it would be difficult to correlate ORV use with harvest levels. There is little evidence that horses have been used to retrieve game from the TUA.

Winter hunting opportunities exist for caribou and many other furbearers and small game species. However, in recent formal and informal public meetings, eligible Cantwell residents have generally not talked about winter hunting, particularly for moose and caribou, as an important part of traditional ways.

There are traditions, among Natives and other hunters, that meat is not good in some seasons, e.g. caribou during the rut. Caribou and moose on poorer range lose fat and meat quality in late winter. But based on the widespread acceptance of the state's winter hunts for both species, and personal experience, McNay (ADFG 2006d) believes that winter meat quality is not a problem. The customary hunting practices of the late 20th century were based in part on the state's fall hunting seasons, which were in turn based on the ease of water access, ease of hunting animals during the rut, and general hunting traditions. Prehistorically, McNay (ADFG 2006d) suspects that there was a pulse of hunting activity in the fall based on water access and another in the winter based on snow travel. The state's December-January moose and caribou hunts, which are scattered around the state, are widely popular, including a winter subsistence hunt within the north side of Denali National Park in Unit 20C. In remote areas without electricity, people have often asked for hunting seasons to be moved later in the year to solve the problem of keeping meat cold (ADFG 2006d).

Figure 3.8 shows moose harvests in the Cantwell TUA from 1991 – 2006 (NPS 2006c, USFW 2007b, ADFG 2007). This information comes from NPS records maintained by the Subsistence Program Manager for Denali National Park and Preserve as well as Federal Subsistence Registration data provided by the Office of Subsistence Management at the U.S. Fish and Wildlife Service. Although Cantwell residents generally comply with reporting requirements, harvest counts could be off by as much as 15% due to underreporting or other sources of error (NPS 2006c).

Figure 3.8. Subsistence Moose Harvests in Denali National Park: 1991 – 2006.

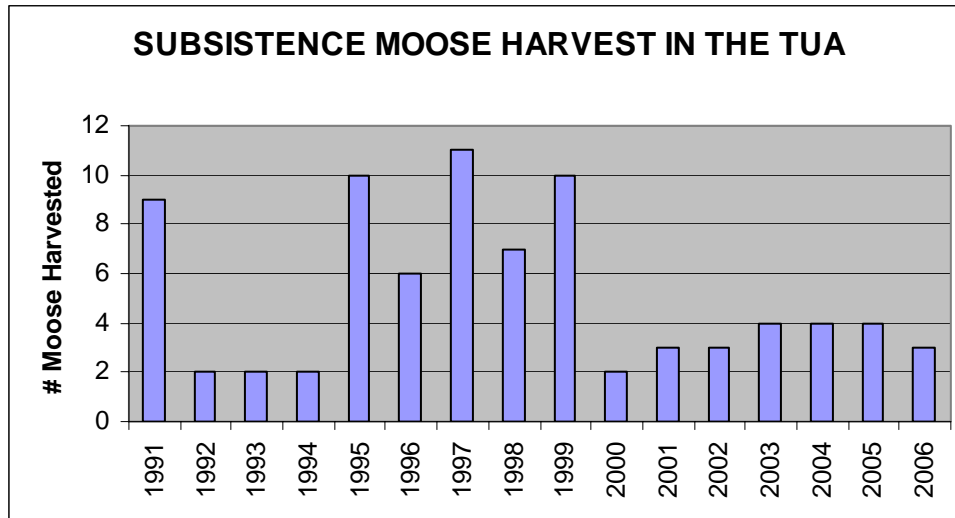


Figure 3.8 shows that there has been an average of 5.1 moose harvested per year in the TUA. Harvest levels in current years have been near, or slightly above or below, sustainable levels. This can be seen by looking at total moose population in the area and bull/cow ratios. The bull/cow ratios show signs of stress to the population. In 2005 there were 65 cows and 29 bulls, a 45:100 ratio, with 8 calves (NPS 2005b). NPS wildlife biologists have concluded that these numbers generally do not show an excess population that can be harvested.

The ADF&G does not provide a caribou hunting season in GMU 20C, which includes most of the range of the Denali herd. However, a variable percentage of the Denali herd crosses back and forth over the Alaska Range. This means some of the Denali herd winters in GMU 13E, where they can be legally harvested on state and private lands by all hunters, and on ANILCA park lands -- including the TUA -- by qualified subsistence hunters.

Another subsistence activity is trapping, but this is conducted during winter by snowmachine and therefore would not be affected by the different ORV management provisions being proposed.

Potential Impacts to Subsistence Users

Impacts to subsistence include restricting access to subsistence resources, limiting the availability of subsistence resources, and increasing competition for subsistence resources. Availability of resources can vary under different management options. Different types of access options can affect the level of effort required, time involved, and the effectiveness of the hunt. Competition will increase or decrease depending on the management action. These items can negatively affect the subsistence user by making subsistence activities more difficult and time-consuming, limiting the amount of food or supplies the subsistence user can obtain, and altering the subsistence user's traditional way of life and quality of life.

Evaluation Criteria

To determine the potential impacts of the alternatives on existing subsistence activities, three evaluation criteria were analyzed relative to existing subsistence resources:

1. The potential to reduce important subsistence fish and wildlife populations by (a) reductions in number, (b) redistribution of subsistence resources, or (c) habitat losses;
2. What effect the action might have on subsistence fisher or hunter access;
3. The potential for the action to increase fisher or hunter competition for subsistence resources.

1. The potential to reduce populations

(a) Reduction in Numbers:

Alternative 1

Levels of moose harvest would increase dramatically over the current average of 5 moose per year. Moose harvests would initially increase; then the population may become depleted as there is not a large enough bull moose population to sustain an annual taking of 10 moose. While the initial increased moose harvest would benefit subsistence hunters, within a few years the hunting pressure would likely remove or displace moose in important hunting areas, reducing the number of moose that could be harvested from the TUA in general. This lower harvest level would mean that NPS qualified subsistence users would have to expend more time and effort hunting outside the TUA. Because of increased pressure on resources and increased competition outside the TUA, hunting outside the TUA would not guarantee success for subsistence hunters.

Alternative 2

The number of moose harvested each year could increase above the current average of 5 moose/year. However, this alternative proposes that the NPS work with the Federal Subsistence Board, the Denali Subsistence Resource Commission, and the Regional Advisory Council to establish subsistence harvest limits for moose to maintain natural and healthy populations on park land within the TUA. The harvest limit would counteract the potential threat of over-harvest and decreased resource availability, thus providing a benefit to subsistence hunters.

Alternative 3

Moose harvests in the TUA would at least continue to average 5 moose harvested/year (based on past 15-year average) or could increase up to set harvest limit levels. This alternative proposes that the NPS work with the Federal Subsistence Board, the Denali Subsistence Resource Commission, and the Regional Advisory Council to establish subsistence harvest limits for moose to maintain natural and healthy populations on park land within the TUA. This alternative also proposes that the NPS monitor the number of wolf harvests and, if necessary, a limit would be proposed to maintain natural and healthy wolf populations.

Since ORVs would be restricted to NPS-managed trails for scouting game, it is likely that more moose would be harvested closer to trails, assuming moose have come down from the headwaters. Greater numbers of moose harvested near trails could affect local moose populations along the Cantwell Creek, Windy Creek, and Bull River Access Trails and routes, though local populations may be replenished with moose from other places that would move into this available habitat.

Alternative 4

Moose harvests in the TUA would remain close to the current average of 5 moose harvested/year (based on past 15-year average). Wolves would be negatively impacted with the addition of a winter hunt. These factors would result in some adverse impacts to the availability of subsistence resources (particularly moose and wolves). However, this alternative proposes that the NPS work

with the Federal Subsistence Board, the Denali Subsistence Resource Commission, and the Regional Advisory Council to establish subsistence harvest limits for moose to maintain natural and healthy populations on park land within the TUA. This alternative also proposes that the NPS monitor the number of wolf harvests and, if necessary, a limit would be proposed to maintain natural and healthy wolf populations.

Since ORVs would be restricted to NPS-managed trails for scouting game, it is likely that more moose would be harvested closer to trails, assuming moose have come down from the headwaters. Greater numbers of moose harvested near trails could affect local moose populations along the Cantwell Creek and Windy Creek, though local populations may be replenished with moose from other places that would move into this available habitat.

(b) Redistribution of Resources:

Alternative 1

This alternative assumes administrative helicopter, airplane, and ORV use for monitoring purposes, and a high level of ORV use for subsistence purposes during hunting season and prior to hunting season. It is assumed that this alternative would have the highest amount of administrative helicopter and ORV use. The amount of aircraft use for monitoring for any given place would usually be minimal, in that this would mostly be reconnaissance-level work over the area for periodic mapping, and then point-to-point shuttles to get crews out to do monitoring measurements, where needed. Generally, helicopters and airplanes would cross back and forth over the TUA several times a day for several days a week during this time period. Administrative helicopter use generally won't occur in the fall to avoid impacting hunters. Law enforcement use of airplanes would occur throughout the summer and fall seasons. For the monitoring effort, the park would try to avoid using ORVs. However, when ORVs were necessary, they would not be used off of NPS-managed ORV trails and routes. Wildlife would be expected to return to areas of disturbance once the disturbance is removed. Some individuals would be temporarily displaced but the duration and frequency of noise events is not expected to cause any population-level impacts.

Alternative 2

The effect of this alternative on the redistribution of resources would be the same as for alternative 1.

Alternative 3

In addition to the impacts on the redistribution of resources described under alternative 1, under this alternative a winter hunt would introduce additional snowmachine use in the area. Noise from snowmachines would disturb wildlife throughout the winter, though it is not likely that the duration and frequency of snowmachine use that would occur for subsistence purposes would have any lasting impact on any wildlife population in the TUA because of the dispersed and temporary nature of the disturbance and the amount of snowmachine use that the hunt would produce, in comparison to existing levels of snowmachine use that occurs in the area for non-subsistence purposes.

Alternative 4

Impacts from this alternative would be the same as for alternative 3 except that ORV use for subsistence purposes would not be allowed until one week before hunting season opens, so noise impacts and associated disturbance to wildlife, would be less during most of the summer.

(c) Habitat Loss:

None of the alternatives would result in significant habitat loss.

2. Restriction of Access:

Access for subsistence uses on the ANILCA park and preserve additions is granted pursuant to Sections 811(a)(b) and 1110(a). Section 811(b) of ANILCA states that "rural residents engaged in subsistence uses shall have reasonable access to subsistence resources on the public lands." Section 1110(a) of ANILCA authorizes the use of snowmachines for traditional activities during periods of adequate snow cover.

Alternative 1

Both on-trail and off-trail ORV use would be allowed for all subsistence purposes by NPS qualified subsistence users throughout the TUA. People would use ORVs primarily in August and September, anywhere in the TUA, with any type of machine. NPS qualified subsistence users would continue to drive ORVs throughout the TUA in search of moose and caribou both during the pre-season scoping period and during hunting season. Moose are typically in the headwaters of the draws in August and the early part of September and nearer the lower corridors later in September and October. Alternative 1 would provide complete access to both the lower drainages and the head waters because of the lack of restrictions on ORVs. The effect is that under this alternative a subsistence hunter could travel throughout the TUA by ORV for scouting, hunting, and game retrieval, improving their chances of a successful hunt. However, the number of moose harvested would continue to depend on where the moose were in any given year.

Improvements to existing ORV trails would not be made, so while access would be very open, the condition of the ORV trails would continue to deteriorate.

Alternative 2

Off-trail ORV use would be permitted by NPS qualified subsistence users only for retrieval of harvested moose and caribou. In addition, use of ORVs for all subsistence purposes would continue to be allowed on NPS-managed trails and routes: Windy Creek Access Trail, Windy Creek Bowl Trail, Cantwell Airstrip Trail, Pyramid Peak Trail, and Bull River Access Trail (new construction). Both the Bull River and Upper Cantwell Creek floodplains would be managed by the NPS for continued ORV use by NPS qualified subsistence users for all subsistence purposes.

Construction of the Bull River Access Trail would open more territory (the Bull River floodplain) to subsistence hunters and the NPS-managed trails would attract more subsistence hunters because they would be in better condition and easier to drive on.

Access patterns under Alternative 2 would include use of ORVs primarily in August and September along the NPS-managed trails and routes. NPS qualified subsistence users would drive ORVs in search of moose and caribou both during the pre-season scoping period and during hunting season. Moose are typically in the headwaters of the draws in August and the early part of September and nearer the lower corridors later in September and October. Alternative 2 would provide access to all of the important lower drainages. The number of moose harvested would continue to depend on where the moose were in any given year.

Alternative 2 would also provide the option of using ORVs for retrieval of harvested moose and caribou, although closures within the TUA may limit any large-scale benefits of this. Management actions would make it more difficult to use an ORV to retrieve a moose far from an

NPS-managed trail or route than is currently the case. As a result, subsistence hunters would likely spend more time looking for moose closer to the trails, and off-trail areas could get very little use. However, some hunters would still harvest these animals off-trail even if they could not use an ORV to retrieve them.

The overall effect would be that under this alternative a hunter would realize some limiting factors on access to subsistence hunting while benefiting from improved trails, a new Bull River Access Trail, and improved access to the Bull River and Upper Cantwell Creek floodplains.

Alternative 3

There would be no off-trail use of ORVs for subsistence, or any other, purposes within the TUA. Instead, the NPS would work with Federal Subsistence Board, the Denali Subsistence Resource Commission, and the Regional Advisory Council to implement a winter subsistence moose hunt, primarily in the area southwest of Cantwell Creek and into the Bull River area. The following trails would be managed by the NPS for continued ORV use by NPS qualified subsistence users for all subsistence purposes: Windy Creek Access Trail, Windy Creek Bowl Trail, Cantwell Airstrip Trail, Pyramid Peak Trail, and Bull River Access Trail (new construction). The Bull River and Upper Cantwell Creek floodplains would be managed by the NPS for continued ORV use by NPS qualified subsistence users for all subsistence purposes.

NPS qualified subsistence users would drive ORVs in search of moose and caribou both during the pre-season scoping period and during hunting season. Moose are typically in the headwaters of the draws in August and the early part of September and nearer the lower corridors later in September and October. Alternative 3 would provide access to all of the important lower drainages. The number of moose harvested would continue to depend on where the moose were in any given year.

Construction of the Bull River Access Trail would open more territory (the Bull River floodplain) to subsistence hunters and the NPS-managed trails would attract more subsistence hunters because they would be in better condition and easier to drive on. While greater use would be expected on NPS-managed trails and routes, off-trail areas would be difficult to access during the fall hunting season due to the restrictions proposed in this alternative (no off-trail use of ORVs for any purpose).

An expanded winter subsistence moose hunt would provide additional opportunities to hunt moose. Snowmachine travel during winter would provide much broader access in less time throughout the TUA than is possible during late summer and fall either by ORV or on foot. In addition, cold weather would make it easier to prevent meat spoilage, snow cover would provide an ideal substrate for clean handling of meat, and snowmobiles and sleds would provide an easier way to transport meat. A winter hunt is an important component of the overall long-term beneficial impacts resulting from the management actions in Alternative 3.

The overall effect would be that under this alternative a hunter would realize some limiting factors (no off-trail use allowed) on access to subsistence hunting while benefiting from improved trails (especially being able to count on NPS-managed trails and routes from one season to the next), a new Bull River Access Trail, improved access to the Bull River and Upper Cantwell Creek floodplains, and additional access to hunting opportunities in winter.

Alternative 4

There would be no off-trail use of ORVs for subsistence, or any other, purposes within the TUA. The following trails would be managed by the NPS for continued ORV use by NPS qualified

subsistence users for all subsistence purposes *only* from one week before the beginning of the fall moose and caribou hunting seasons through to the end of these hunting seasons: Windy Creek Access Trail, Windy Creek Bowl Trail, Cantwell Airstrip Trail, and Pyramid Peak Trail. NPS-managed trails would be maintained and would attract more subsistence hunters because they would be in better condition and easier to drive on. However, it would be difficult for NPS qualified subsistence users to access the Bull River and Upper Cantwell Creek floodplains during fall hunting season. Alternative 4 would provide access to some, but not all, of the important lower drainages.

The NPS would work with Federal Subsistence Board, the Denali Subsistence Resource Commission, and the Regional Advisory Council to implement a winter subsistence moose hunt, primarily in the area southwest of Cantwell Creek and into the Bull River area. An expanded winter subsistence moose hunt would provide additional opportunities to hunt moose. Snowmachine travel during winter would provide much broader access in less time throughout the TUA than is possible during late summer and fall either by ORV or on foot. In addition, cold weather would make it easier to prevent meat spoilage, snow cover would provide an ideal substrate for clean handling of meat, and snowmobiles and sleds would provide an easier way to transport meat.

The overall effect would be that under this alternative a hunter would realize a number of limiting factors on access to subsistence hunting while benefiting from improved trails (especially being able to count on NPS-managed trails and routes from one season to the next), and additional access to hunting opportunities in winter.

3. Increase in Competition:

Alternative 1

Alternative 1 would result in increased competition among NPS qualified subsistence users because more subsistence moose hunters would be expected to use the TUA, greater access, and subsequent decrease in availability of moose. In 2000, about 50% of the nearly 100 households attempted to harvest moose, with about 25% successful. It is likely that Cantwell hunters would continue to try hunting in the TUA first because it is closest to them. This means as many as 50 households could use ORVs to scope for moose throughout the TUA (except recovery areas) before and during hunting season. The effect of these factors is that there would be an immediate increase in competition for limited numbers of moose.

Alternative 2

As under Alternative 1, Alternative 2 would result in increased competition among NPS qualified subsistence users because more subsistence hunters would be expected to use the TUA than in the past, and because use would be focused on a finite number of NPS-managed trails and routes.

In 2000, about 50% of the nearly 100 households attempted to harvest moose, with about 25% successful. It is likely that Cantwell hunters would continue to try hunting in the TUA first because it is closest to them. This means as many as 50 households could use ORVs to scope for moose throughout the TUA (except recovery areas) before and during hunting season.

These factors would result in increased competition for subsistence resources. Increased competition is likely to continue over the long term because the NPS-managed trails and routes are in the most important subsistence hunting areas and because of management actions to provide for sustainable harvests (subsistence harvest limits). This could result in a return to state

lands by a small minority of the hunters. Those hunters who harvest game farther from identified trails and routes would benefit from less competition.

Alternative 3

Alternative 3 would result in increased competition among NPS qualified subsistence users because more subsistence hunters would be expected to use the TUA than in the past, and because use would tend to be concentrated along the NPS-managed trails and routes. ORV use would also increase because the NPS-managed trails would be maintained/improved in better condition, and the Bull River Access Trail would be constructed, making access of the Bull River Floodplain possible/easier. Construction of the Bull River Access Trail would open more territory to subsistence hunters and the maintained identified trails would attract more subsistence hunters because they would be in better condition and easier to drive on.

In 2000, about 50% of the nearly 100 households attempted to harvest moose, with about 25% successful. It is likely that Cantwell hunters would continue to try hunting in the TUA first because it is closest to them. This means as many as 50 households could use ORVs to scope for moose throughout the TUA (except recovery areas) before and during hunting season.

There would be an immediate increase in competition along NPS-managed trails and routes. This increased competition would likely continue over the long term because NPS-managed trails and routes are in important subsistence hunting areas and because of management actions to provide for sustainable harvests (subsistence harvest limits).

The advantages of hunting by snowmobile (extended season, broader access, easier loading, cleaner conditions, and easier storage of meat) would likely result in greater hunter participation, especially over the long term.

These factors could result in a return to state lands by a small minority of the hunters. However, those hunters who harvest game farther from identified trails and routes and who are willing to use non-motorized means of retrieval would benefit from less competition. Over the long term, there would likely be an increase in subsistence activity off trail as more hunters became willing to use alternative methods of game retrieval, including horsepacking.

Alternative 4

Alternative 4 would result in increased competition among NPS qualified subsistence users along NPS-managed trails and routes because use would increase and tend to be concentrated in these locations. This increased competition would likely continue over the long term because NPS-managed trails and routes are in important subsistence hunting areas and because of management actions to provide for sustainable harvests (subsistence harvest limits).

In 2000, about 50% of the nearly 100 households attempted to harvest moose, with about 25% successful. It is likely that Cantwell hunters would continue to try hunting in the TUA first because it is closest to them. This means as many as 50 households could use ORVs to scope for moose throughout the TUA (except recovery areas) before and during hunting season.

The advantages of hunting by snowmobile (extended season, broader access, easier loading, cleaner conditions, and easier storage of meat) would likely result in greater hunter participation, especially over the long term.

These factors could result in a return to state lands by a small minority of the hunters. However, those hunters who harvest game farther from identified trails and routes and who are willing to

use non-motorized means of retrieval would benefit from less competition. Over the long term, there would likely be an increase in subsistence activity off trail as more hunters became willing to use alternative methods of game retrieval, including horsepacking.

VI. Availability of Other Lands and Alternatives to the Proposed Action

This plan addresses management of ORV use for subsistence purposes in the Cantwell TUA. There are no other lands that can be substituted in the proposed action.

VII. Alternatives Considered

This plan includes a full range of alternatives that address ORV use for subsistence purposes in the Cantwell TUA. The range of alternatives includes a no action alternative that represents the status quo for subsistence uses.

VIII. Findings

The above evaluations demonstrate that there would be a significant restriction of subsistence resources under Alternative 1 and no significant restriction of subsistence resources or opportunities under any of the action alternatives in this plan.

Actions in Alternative 1 (No Action) would have major negative impacts because subsistence moose hunting, facilitated by unrestricted ORV access, would be above a sustainable level in the TUA. Over the long term subsistence users would have to expend more time and effort hunting on non-park lands and could be affected by increasing restrictions as well as declining wildlife populations on those lands. The level of impacts to subsistence anticipated from this alternative would eventually result in a significant restriction to subsistence resources (primarily moose).

Alternative 2 would maintain natural healthy wildlife populations, but access would be somewhat restricted, wildlife would be temporarily displaced, and competition would increase. Alternative 2 would result in minor beneficial effects to subsistence resources and opportunities because of extensive ORV access and proactive wildlife management that would provide for sustainable harvest over the next 10-15 years. Enhanced access to subsistence resources and opportunities would result from identifying trails and routes for ORV use, new access to the Bull River floodplain, and the provision for ORV access for moose and caribou retrieval. The monitoring provisions and recommended management actions in the alternative, including subsistence harvest limits for moose and caribou, would make it possible to have a sustainable harvest level over the long term. The identified ORV trails and routes would be in good moose habitat, so for much of the subsistence hunting season (the last half of August and the month of September) there would be more opportunities to hunt moose near trails. Counteracting these benefits, however, would be the restrictions on ORV use for retrieval and increased competition among hunters in the TUA, especially in and near the access corridors. On balance the beneficial impacts to subsistence use would be minor over the long term.

Alternative 3 would maintain natural healthy wildlife populations, wildlife would be temporarily displaced, and access would increase during winter; however access would be somewhat restricted during summer and fall, and competition would increase. Alternative 3 would result in minor beneficial impacts to subsistence resources and opportunities because of improved access

and proactive wildlife management that would provide for sustainable harvest over the next 10-15 years. Greater access to subsistence resources and opportunities would result from improvements to NPS-managed trails and routes, and new access to the Bull River floodplain. The monitoring provisions and recommended management actions in the alternative, including subsistence harvest limits for moose and caribou, would make it possible to have a sustainable harvest level over the long term and remove uncertainty for subsistence users. The identified ORV trails and routes would be in good moose habitat, so for much of the subsistence hunting season (the last half of August and the month of September) there would be more moose near trails and harvests would increase. There would also be a winter hunt extending as long as possible, which if established would provide additional subsistence opportunities. Counteracting these benefits, however, would be restrictions on ORV use and increased competition among hunters in the TUA, especially in and near the access corridors. On balance the beneficial impacts to subsistence use would be minor over the long term. For subsistence purposes Alternative 3 is recommended as the preferred management option considered in the environmental assessment because it would have the least overall negative impacts to subsistence resources and subsistence users over the long term (the next 10-15 years).

Alternative 4 would maintain natural healthy wildlife populations, competition for resources would increase, and access would increase during winter; however, access would be restricted during summer and fall, and wildlife would be temporarily displaced. Alternative 4 would result in minor adverse impacts to subsistence resources and opportunities. Access would be more difficult since ORV use would be allowed only on NPS-managed trails, and only beginning one week before the opening of hunting season. Competition among hunters in the TUA would increase, especially in and near the access corridors. However, a winter hunt would provide additional subsistence opportunities, and subsistence users would have the option of using other hunting and retrieval methods such as travel by horseback or on foot. Monitoring and proactive management, including subsistence harvest limits for moose and caribou, would provide for sustainable harvest over the next 10-15 years.

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APPENDIX 2

Monitoring Strategies for Management Alternatives

ALTERNATIVE 1 (NO ACTION)

Monitoring Impacts to Soils and Vegetation

Because the entire TUA would be open to use under this alternative, the entire existing network of trails that was mapped during 2005 would be included in the monitoring plan. Much of the rest of the accessible terrain in the TUA would also be monitored to some degree.

A three-tiered approach to monitoring would be needed under this alternative that would include periodic extensive aerial GPS-mapping surveys of the entire study area every three years, ground-based GPS mapping of the tracks in the TUA (to be done annually to a subset of the existing tracks) and in-depth annual comparisons of paired index and control impact sites. Specifically, the monitoring program should contain the following components:

1. Periodic helicopter-assisted aerial survey of the entire TUA to map the extent of ORV tracks (as was done in the spring of 2005). This would provide successive “snapshots” of the overall footprint of ORV tracks on the landscape of the TUA. These snapshots would provide the coarsest level of coverage of the area, and would be required because under this alternative the footprint of ORV impacts would be expected to potentially increase through time.
2. Annual repeat of the ground-based GPS-mapping and visual inspection activities using a data dictionary similar to the one developed for the ORV impact inventory project in 2005. (A data dictionary is the list of standardized terminology and values that may be entered into a database.) This would allow for comparisons to be made of the overall condition of trails (on a percentage basis) as well as the identification of specific track segments that are above the impact threshold levels. Only a subset of all trails could be measured each year.
3. Measurement of a set of specific “index” sites along designated routes where the actual amount of ongoing ORV use (using pressure-sensitive vehicle counters buried in the track) could be quantified in combination with detailed and time-intensive field measurements of impacts at these sites to include cover of ground surface by plant taxa using point-intercept transects, species composition measurements using quadrats, measuring soil traits including track depth, soil compaction and soil temperature.
4. Measurement of a set of high-impact “control” sites where use would be eliminated and the same set of measurements described above for the index sites would be made. The control sites (if possible) should be selected in a manner that “pairs” them with the index sites that will be subject to continued ORV traffic. This design would thus allow comparisons of multiple sets of paired impact sites, one under treatment effects (ORV traffic) and one control. The paired sites should therefore be located near each other, have similar slope, aspect, vegetation, soils, and initial impact levels.
5. Because motor vehicles would be traversing open soil areas on floodplains that are susceptible to invasion by exotic species, such as sweet clover (*Melilotus* spp.) annual visual

reconnaissance of these areas for spreading of weeds would be an important component of the monitoring program.

Monitoring Impacts to Subsistence Harvest of Moose and Caribou

To track the number of moose and caribou harvested by subsistence hunters in the TUA, the NPS would provide hunters with a reporting form when they obtain their hunting permits. Subsistence hunters will be asked to voluntarily complete the form if they kill a moose or caribou, and deposit the form in a lock-box located in Cantwell. Among other things, this form would ask for information on the harvest location of any moose or caribou a subsistence hunter killed within the TUA. In addition, the NPS would continue to periodically monitor moose and caribou populations within the TUA.

ALTERNATIVE 2

2.4.5 Monitoring Strategies

Monitoring Impacts to Soils and Vegetation

The actual spatial extent of the monitoring program under this alternative cannot be known in advance, and will be variable from year-to-year depending upon the success rate and spatial distribution of success (and consequent retrieval trips). Because of this fact, there is uncertainty regarding the amount of track outside of the designated trails and routes that would need to be monitored each year. The

A two-tiered approach to monitoring would be needed under this alternative that would include ground-based GPS mapping and visual inspection of the tracks in the TUA outside of the designated routes (to be done annually to a subset of the existing tracks) and in-depth annual comparisons of paired index and control impact sites. Specifically, the monitoring program should contain the following components:

1. A periodic repeat of the ground-based GPS-mapping activities using a data dictionary similar to the one developed for the ORV impact inventory project in 2005 that would include only the designated routes and the retrieval tracks that were traveled during each of the past three years. This would allow for comparisons to be made of the overall condition of trails (on a percentage basis) as well as the identification of specific track segments that are above the impact threshold levels. The conditions on specific retrieval tracks could then be examined and compared over time.
2. Measurement of a set of specific “index sites” where the actual amount of ongoing ORV use (using pressure-sensitive vehicle counters buried in the track) could be quantified in combination with more detailed and time-intensive measurements at these sites to include cover of ground surface by plant taxa using point-intercept transects, species composition measurements using quadrats, measuring soil traits including track depth, soil compaction and soil temperature.
3. Measurement of a set of high-impact “control” sites where use would be eliminated and the same set of measurements described above for the index sites would be made. The control sites (if possible) should be selected in a manner that “pairs” them with the index sites that will be subject to continued ORV traffic. This design would thus allow comparisons of multiple sets of paired impact sites, one under treatment effects (ORV traffic) and one

control. The paired sites should therefore be located near each other, have similar slope, aspect, vegetation, soils, and initial impact levels.

4. Because motor vehicles would be traversing open soil areas on floodplains that are susceptible to invasion by exotic species, such as sweet clover (*Melilotus* spp.) annual visual reconnaissance of these areas for spreading of weeds would be an important component of the monitoring program.

Monitoring Impacts to Subsistence Harvest of Moose and Caribou

Same as Alternative 1.

ALTERNATIVE 3

Monitoring Impacts to Soils and Vegetation

The focus of monitoring under this alternative would be limited to the specific designated trails and routes.

A two-tiered approach to monitoring would be needed under this alternative that would include ground-based GPS mapping and visual inspection of the designated trails and routes in the TUA outside and in-depth annual comparisons of paired index and control impact sites. Specifically, the monitoring program should contain the following components:

1. Periodic repeat of the ground-based GPS-mapping activities using a data dictionary similar to the one developed for the ORV impact inventory project in 2005 that would include only the designated routes in the TUA. This would allow for comparisons to be made of the overall condition of trails (on a percentage basis) as well as the identification of specific track segments that are above the impact threshold levels.
2. Identification of a set of specific “index sites” where the actual amount of ongoing ORV use (using pressure-sensitive vehicle counters buried in the track) could be quantified in combination with more detailed and time-intensive measurements at these sites to include cover of ground surface by plant taxa using point-intercept transects, species composition measurements using quadrats, measuring soil traits including track depth, soil compaction and soil temperature.
3. Measurement of a set of high-impact “control” sites where use would be eliminated and the same set of measurements described above for the index sites would be made. The control sites (if possible) should be selected in a manner that “pairs” them with the index sites that will be subject to continued ORV traffic. This design would thus allow comparisons of multiple sets of paired impact sites, one under treatment effects (ORV traffic) and one control. The paired sites should therefore be located near each other, have similar slope, aspect, vegetation, soils, and initial impact levels.
4. Because motor vehicles would be traversing open soil areas on floodplains that are susceptible to invasion by exotic species, such as sweet clover (*Melilotus* spp.) annual visual reconnaissance of these areas for spreading of weeds would be an important component of the monitoring program.

Monitoring Impacts to Subsistence Harvest of Moose and Caribou

Same as Alternative 1.

ALTERNATIVE 4

2.6.5 Monitoring Strategies

Monitoring Impacts to Soils and Vegetation

Monitoring under this alternative would be conducted in order to monitor the recovery of impacted trails and areas through time. The removal of ORV traffic would allow the nearly 50 km of ORV track impacts mapped during 2005 to recover. A variety of monitoring plots would be established to track the recovery of these areas. This would potentially provide very useful information regarding the ability of these systems to return to the natural state once this stressor is removed.

A two-tiered approach to monitoring would be needed under this alternative that would include ground-based GPS mapping and visual inspection of the designated trails and routes in the TUA outside and in-depth annual comparisons of paired index and control impact sites. Specifically, the monitoring program should contain the following components:

1. Periodic repeat of the ground-based GPS-mapping activities using a data dictionary similar to the one developed for the ORV impact inventory project in 2005 that would include only the designated routes in the TUA. This would allow for comparisons to be made of the overall condition of trails (on a percentage basis) as well as the identification of specific track segments that are above the impact threshold levels.
2. Measurement of a set of “control” sites where the recovery of vegetation and soil from ORV impacts would be monitored through time. Data from each successive iteration would be compared in order to discern the changes in these variables through time, and the degree to which each site had recovered from ORV damage.
3. Because motor vehicles would not be traversing open soil areas on floodplains that are susceptible to invasion by exotic species, such as sweet clover (*Melilotus* spp.) annual visual reconnaissance of these areas would not be necessary under this alternative, as it was for alternatives 1 through 3..

Monitoring Impacts to Subsistence Harvest of Moose and Caribou

Same as Alternative 1.

APPENDIX 3

Implementation Cost Estimates for Management Alternatives

Note: All costs are estimated ranges and are for alternative comparison purposes only. These costs should not be used for specific planning or budgeting purposes.

ALTERNATIVE 1 (NO ACTION)

Item	Cost
Management Prescriptions	N/A
Bull River Access Trail Construction	N/A
Trail Construction and Trail and Route Maintenance Within Bull River and Upper Cantwell Creek Floodplains	N/A
Monitoring Strategy (helicopter/airplane time, personnel, logistics)	\$65,000 to \$70,000 annually in 2006 dollars (excluding cost of pressure-sensitive vehicle counters)
Closures and Rehabilitation of Recovery Areas/Trails	\$15,000 to \$20,000 for materials and one-time labor in 2006 dollars
Ranger Patrols (Staff and Aircraft)	~\$30,000 annually in 2006 dollars

ALTERNATIVE 2

Item	Cost
Management Prescriptions (materials, labor, administrative oversight)	\$165,000 to \$170,000 total in 2006 dollars
Bull River Access Trail Construction	\$135,000 to \$325,000 in 2006 dollars (depending on type & location of helicopter used to access site)
Trail Construction and Trail and Route Maintenance Within Bull River and Upper Cantwell Creek Floodplains	\$100,000 in 2006 dollars (assuming a need for full trail construction along 2 miles of floodplains)
Monitoring Strategy (helicopter/airplane time, personnel, logistics)	\$55,000 to \$60,000 annually in 2006 dollars (excluding cost of pressure-sensitive vehicle counters)
Closures and Rehabilitation of Recovery Areas/Trails	\$15,000 to \$20,000 for materials and one-time labor in 2006 dollars
Fisheries Inventory Associated with Bull River Floodplain Trail/Route	\$25,000 in 2006 dollars
Ranger Patrols (Staff and Aircraft)	~\$50,000 annually in 2006 dollars

ALTERNATIVE 3

Item	Cost
Management Prescriptions (materials, labor, administrative oversight)	\$165,000 to \$170,000 total in 2006 dollars
Bull River Access Trail Construction	\$135,000 to \$325,000 in 2006 dollars (depending on type & location of helicopter used to access site)
Trail Construction and Trail and Route Maintenance Within Bull River and Upper Cantwell Creek Floodplains	\$100,000 in 2006 dollars (assuming a need for full trail construction along 2 miles of floodplains)
Monitoring Strategy (helicopter/airplane time, personnel, logistics)	\$30,000 to \$35,000 annually in 2006 dollars (excluding cost of pressure-sensitive vehicle counters)
Closures and Rehabilitation of Recovery Areas/Trails	\$15,000 to \$20,000 for materials and one-time labor in 2006 dollars
Fisheries Inventory Associated with Bull River Floodplain Trail/Route	\$25,000 in 2006 dollars
Ranger Patrols (Staff and Aircraft)	~\$30,000 annually in 2006 dollars
Winter Patrols	\$30,000 annually in 2006 dollars

ALTERNATIVE 4

Item	Cost
Management Prescriptions	\$165,000 to \$170,000 total in 2006 dollars
Bull River Access Trail Construction	N/A
Trail Construction and Trail and Route Maintenance Within Bull River and Upper Cantwell Creek Floodplains	N/A
Monitoring Strategy (helicopter/airplane time, personnel, logistics)	\$30,000 to \$35,000 annually in 2006 dollars (excluding cost of pressure-sensitive vehicle counters)
Closures and Rehabilitation of Recovery Areas/Trails	\$15,000 to \$20,000 for materials and one-time labor in 2006 dollars
Winter Patrols	\$30,000 annually in 2006 dollars

APPENDIX 4

Draft Best Management Practices Framework

(The following is excerpted from the unpublished “Draft Proposed Best Management Practices for Off-Highway Vehicle Trails in Alaska” (NPS 2002).)

The concept of “Best Management Practices” (BMPs) is familiar for land managers in Alaska. BMPs are developed to reflect the current management “state-of-the-art” for a given activity and are designed to facilitate that activity in a manner that minimizes or mitigates detrimental impacts to other resource values such as water quality, wildlife habitat and visual resources.

The draft BMP framework for OHV/ATV trail management includes the following components:

1. “State of the Trail” Assessment
2. Trail Location Documentation
3. Trail Condition Assessment
4. Secondary Impact/Concern Assessment
5. Evaluation of Management Options
6. Formulation of Trail Management Prescriptions
7. Prescription Implementation
8. Annual “Light” Maintenance
9. Periodic Trail Monitoring and Evaluation

An associated set of proposed BMPs for technical aspects of OHV trail work include:

- a) Trail Alignment and Layout Guidelines
- b) Trail Construction Specification Guidelines
- c) Water Crossings and Bridges
- d) Sign Guidelines
- e) Map Guidelines
- f) Restoration Guidelines

A more detailed description of the BMP numbered components is presented below. The technical components have yet to be prepared.

1. The First Step—“State of the Trail” Assessment

The “State of the Trail” assessment is a preliminary review of the management status of an individual trail. It is based upon best available information and provides an initial handle on the management status of a trail or a group of trails. The assessment helps identify data gaps, inconsistencies in management oversight and problem trails.

2. Trail Location Documentation

Trail location documentation is the plotting of a trail alignment on a geographic referenced base. An accurate map of the trail location is a critical basic element for trail management. It provides information on trail mileage, and the relationship between the

trail alignment and surrounding environmental parameters such as terrain, landmarks, surface hydrology, etc. Coupled with a Geographic Information System (GIS) it provides an overlay for land status, landcover, wetland or other environmental data.

3. Trail Condition Assessment

Trail condition assessment is an inventory of a trail's physical conditions. It documents the condition of a trail's surface tread as it relates to soil, terrain and vegetation conditions. A condition assessment documents trail conditions at a given point in time. It provides a baseline for monitoring changes and identifies problems with trail conditions that might require repair or mitigation.

4. Secondary Impact/Concern Assessment

Secondary impact assessments document impacts of OHV trail use that are not directly related to the physical trail tread. These may include administrative, social, biologic and other physical resource impacts or concerns. A secondary impact analysis requires both an investigation along the trail corridor with a multi-disciplinary team and discussions with trail users, local residents and trail managers. To date, no one has developed a set format for the secondary assessment.

5. Evaluation of Management Options

The trail condition and secondary impact/concern assessments provide a basis to evaluate trail management options. The evaluation of management options should take place within the context of local zoning requirements and/or or land management plans or objectives for the trail and the lands surrounding it.

The range of trail management options include:

- a). Active Management of the Existing Alignment
- b). Realignment of Degraded Trail Segments
- c). Trail Hardening of Degraded Segments
- d). Seasonal Use Restrictions
- e). Type of Use Restrictions
- f). Controlled Use (traffic volume control)
- g). Trail Closure

The trail management options can be applied to entire trails, or to individual trial segments. Management options a, b and c would typically be applied in combination along a trail alignment, while options d, e, f and g would be applied to an entire trail or to a major segment of trail beyond some natural geographic feature such as a seasonally sensitive wetland.

6. Formulation of Trail Maintenance Prescriptions

Trail maintenance prescriptions identify where trail maintenance and/or mitigation actions are required. Prescriptions define where reroutes and trail hardening need to be installed and where active management actions such as ditching, brush control, water management and crossing structures are required. They describe where and what work needs to be done, and provide an excellent base for cost estimates.

7. Prescription Implementation (Construction and Heavy Maintenance)

Prescription implementation is conducting planned trail maintenance or mitigation based upon prepared trail maintenance prescriptions. The term “Heavy Maintenance” is used here to distinguish this work from “Light” maintenance sweeps that should occur on an annual basis without specified prescriptions.

8. Annual “Light” Maintenance Sweeps

“Light” maintenance sweeps should occur on an annual basis. These sweeps should be targeted at preventing minor trail problems from developing into major trail problems. The sweeps should be used to conduct routine maintenance actions such as cleaning culverts, reshaping water control features and dealing with other minor trail problems such as fallen trees and damaged signs. Inspections should also be made of bridges. Maintenance crews should also document developing problems and may be used to collect annual monitoring data. The sweeps should also be used to identify the development of major problems that might require a more formal maintenance prescription and heavy maintenance action.

9. Periodic Trail Monitoring and Evaluation

Detailed monitoring should be completed every four to six years, depending on levels of use, trail conditions and environmental factors. This frequency could be increased if significant environmental values are at risk, but sufficient time should be allowed so that the changes in trail condition are evident over seasonal and weather effects, and the subjectivity of field inventory crews. It is also important that the same trail condition inventory system be employed between condition inventories so direct relationships can be evaluated.

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APPENDIX 5

Trail Management Prescriptions

Newly Constructed Bull River Access Trail

	Specific Type of Action	Linear Feet
Newly Constructed Bull River Access Trail (8,512 linear feet total length)		
Trail Hardening	2-Inch Geoblock	54
	Puncheon-Ground Contact	148
Surface Grubbing	Light Grubbing	3,407
	Moderate Grubbing	2,804
	Heavy Grubbing	771
Bridges	Wooden Deck (2 bridges)	60 (total)
Clearing	Light Clearing	3,752
	Moderate Clearing	3,872
	Heavy Clearing	611
Cut and Fill	< 15% Side Slope	25
	15-45% Side Slope	1,287
	45-100% Side Slope	369
Fill on Flat	--	5

Gravel for fill material would be generated during construction activities from bench cuts or from using a slot inversion construction method (i.e., digging a shallow trench into underlying gravel along the alignment, backfilling with surface organics, and using the excavated gravel to top-cap the trail surface). Some of the excavated gravel may be transported short distances along the trail alignment for use as fill, but most would be incorporated into the bench or side-cast down slope. No gravel pits or long-term stockpiles would be developed.

Other than the distinct bench cut areas and slot inversion segments, most of the trail would be simply roughed in by knocking down the high spots and hummocks and using them to fill in the low spots, and by compacting the surface vegetation to provide a distinct trail alignment that would be further worn in with use. Drainage would be provided along the alignment using grade reversals and slot drains (shallow excavated swales that cross the trail and drain water well below the trail alignment).

Low puncheon-style bridges consisting of Alaskan cedar stringer and decking (totaling 60 feet) would be built across two streams, but no part of the bridges would be placed in the stream channels. In addition, there would be two small stream/spring crossings and two improved fords. The fords would be improved by cutting the banks slightly to allow ORVs easy access to and from the streams; if the stream banks or beds show any sign of potential erosion from ORV use, a hardened surface would be installed consisting of geogrid placed at grade and filled with native material (soil or gravel).

Existing Identified Trail Management Prescriptions

	Specific Type of Action	Linear Feet
Windy Creek Access Trail (4,639 linear feet total length)		
General Action	Maintain	4,284
	Upgrade	355
Trail Hardening	1-Inch Geoblock	355
	None Required	4,284
Surface Grubbing	Light Grubbing	355
	None Required	4,284
Windy Creek Bowl Trail (4,340 linear feet total length)		
General Action	Close/Barricade	1,708
	Maintain	2,632
Rehabilitation	Full Rehabilitation	1,708
	None Required	2,632
Cantwell Airstrip Trail (7,757 linear feet total length)		
General Action	Maintain	7,614
	Upgrade	143
Trail Hardening	1-Inch Geoblock	165
	2-Inch Geoblock	33
	Elevated Puncheon	67
	Ground Contact Puncheon	76
Surface Grubbing	None Required	7,416
	Light Grubbing	101
	Moderate Grubbing	97
	None Required	7,559
Pyramid Peak Trail (5,148 linear feet total length)		
General Action	Maintain	4,660
	Upgrade	488
Trail Hardening	Elevated Puncheon	488
	None Required	4,660
Clearing	Moderate Clearing	406
	None Required	4,742

Trail hardening with Geoblock (a porous pavement system) or puncheon (a type of elevated boardwalk) would bring treated segments to a "sustainable" level due to the resistant character of the treated tread surface. A "sustainable" trail segment is one that meets a specific set of design criteria formulated to provide a high level of environmental protection and long-term utility of the tread surface under all anticipated use levels and climatic conditions; *and* receives regular maintenance to remain within its original design specifications.

The implementation of surface grubbing (to dig up and remove all plants), clearing, grading, cut and fill, side-ditching, selected water control measures and gravel capping would bring treated segments to a "maintainable" level. A "maintainable" trail segment is one that is not built with a specific set of design criteria in-mind, but with appropriate and reasonable mitigation and maintenance, it will support a limited level of use without unacceptable environmental degradation or a decrease in travel surface utility.

Implementation of the recommended management prescriptions for the above NPS-managed existing trails would result in improvement of about 1,100 linear feet to a "sustainable" level, with the remaining approximately 21,000 linear feet of NPS-managed trail system brought to or staying at a "maintainable" level.

17B Easement Management Prescriptions

	Specific Type of Action	Linear Feet
17B Easement (8,868 linear feet total length)		
General Action	Close/Barricade	830
	Maintain	2,242
	Upgrade	654
	Upgrade/Rebuild	5,141
Grading	Heavy Grading/Leveling	591
	Light Grading/Leveling	2,584
	Moderate Grading/Leveling	1,258
	None Required	4,435
Trail Hardening	1-Inch Geoblock	178
	2-Inch Geoblock	140
	2-Inch Geoblock with Geotextile	67
	Gravel Cap	364
	Gravel Cap with Geotextile	277
	Elevated Puncheon	142
	Turnpike Sideditch	703
	Turnpike with Cross Drain	498
Capping D	None Required	6,498
	4-8 Inches	114
	8-12 Inches	528
Surface Grubbing	None Required	8,226
	Light Grubbing	95
	Moderate Grubbing	554
Clearing	None Required	8,219
	Light Clearing	232
	None Required	8,636
Side Ditching	Both Sides	732
	Left Side	2,819
	Right Side	1,446
	None Required	3,871
Rehabilitation	Full Rehabilitation	830
	None Required	8,037
Water Management	Light Water Management	69
	None Required	8,798
Cut/Fill Sections	Fill on Flat	50
	None Required	8,818

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APPENDIX 6

**STATEMENT OF FINDINGS FOR EXECUTIVE ORDER 11990
(PROTECTION OF WETLANDS)**

**CANTWELL SUBSISTENCE ORV MANAGEMENT
DENALI NATIONAL PARK AND PRESERVE, ALASKA**

May 2007

Recommended:

Superintendent, Denali National Park and Preserve Date

Certified for Technical Accuracy and Servicewide Consistency:

Chief, Water Resources Division, Washington Office Date

Approved:

Regional Director, Alaska Region Date

PURPOSE AND NEED FOR ACTION

The National Park Service (NPS) has prepared and made available for public review an environmental assessment (EA) to evaluate the impacts of a management plan for subsistence ORV use in the Cantwell Traditional Use Area in Denali National Park and Preserve.

In July 2005, the NPS published the final “Cantwell Subsistence Traditionally Employed Off-Road Vehicle Determination” which opened the entire 32,159 acre Cantwell traditional ORV use area (TUA) to the use of off-road vehicles (ORVs), for subsistence purposes by NPS qualified subsistence users. The NPS is taking this current action to assure subsistence ORV use in this area is proactively managed to minimize adverse impacts to the resources and values for which the park was established while also providing reasonable access for subsistence purposes.

Under the preferred alternative (Alternative 3) the NPS is proposing to construct a new Bull River Access Trail and Bull River and Cantwell Creek Floodplain Trails, harden and maintain the Windy Creek Access Trail, the Windy Creek Bowl Trail, the Pyramid Peak Trail, and the Cantwell Airstrip Trail. ORV access would also be allowed on the upper gravel bars of the Bull River and Cantwell Creek floodplains downstream of the park wilderness boundary. At the same time, the park would initiate maintenance on the ANCSA 17b easement created to allow public access across Native Corporation land between Cantwell and the park boundary.

Executive Order 11990 (Protection of Wetlands) requires the NPS, and other federal agencies, to evaluate the likely impacts of actions in wetlands. The executive order requires that short and long-term adverse impacts associated with occupancy, modification or destruction of wetlands be avoided whenever possible. Indirect support of development and new construction in such areas should also be avoided wherever there is a practicable alternative.

To comply with these orders, the NPS has developed a set of agency policies and procedures which can be found in Director’s Order 77-1: Wetland Protection, and Procedural Manual 77-1: Wetland Protection. The policies and procedures related to wetlands emphasize: exploring all practical alternatives to building on, or otherwise affecting, wetlands; reducing impacts to wetlands whenever possible; and providing direct compensation for any unavoidable wetland impact by restoring degraded or destroyed wetlands on other NPS properties.

The purpose of this Statement of Findings (SOF) is to present the NPS rationale for its proposed plan to construct portions of the TUA trails in the wetland area. This SOF also documents the anticipated effects on these resources.

WETLANDS WITHIN THE PROJECT AREA

Wetland boundaries were identified in the field by NPS personnel and the boundaries were transferred to 2005 air photos and transferred to a GIS layer by NPS staff to determine wetland acreage. Wetlands are identified in Figure 3.2 of the EA, and compensation and mitigation bank acreages are shown in Figure 8.1. Areas of identified open trails that cross wetland areas would be improved to minimize negative impacts and trail width. Wetlands would be affected on approximately 0.4 acres of existing trails due to construction actions used to harden the trails and make them sustainable for ORV use. Approximately 1 acre of the new floodplain trails alignments would be in wetlands of the willow floodplain type. About 0.1 acres of wetlands would be affected by construction of a new Bull River Access Trail and about 250 acres of

unvegetated gravel floodplain would be open for ORV use. Approximately 5.8 acres of upland would also be affected by this proposal.

The wetlands located within the proposed project area consist of wet scrub-shrub and forested saturated wetlands.

- To construct the Bull River Access Trail, 0.1 acres of Palustrine scrub shrub saturated wetlands (PSS1) are to be disturbed. The 1.0 acres of floodplain willow areas to be disturbed to delineate and harden the Cantwell Creek and Bull River Floodplain Trails are also PSS1 wetlands.
- The 0.4 acres of wetlands crossed by the 4 retained ORV trails that will be hardened and maintained under this alternative are Palustrine Forested, Needle-leaved Evergreen, saturated wetlands (PF04B).

All of the Palustrine wetlands provide habitat for small mammals, such as red squirrels, snowshoe hares, and porcupine; bird species, including gray jays, robins, thrushes, sparrows, and warblers. Caribou use the shrub wetlands for forage and cover, and moose also frequent the shrub wetlands for forage. The forested type is considered potential moose calving area, to be used as cover.

The major plant species on the Palustrine wetland sites include willow spp., including *Salix planifolia*, blueberry, Labrador tea, and white spruce in the forested areas. Common ground cover includes feather and sphagnum mosses in the forested areas, leaf lichens, and a variety of forbs. The palustrine wetlands attenuate snow melt surface flow during break-up, when the ground is still frozen.

All of the constructed and retained trails will have culverts or armored fords installed for all minor stream crossings to reduce or eliminate adverse impacts to water quality from the project. This is estimated to reduce the contribution of turbidity from trail construction and use to negligible within four years.

The two proposed floodplain trails would include 21 stream crossings (19 on Cantwell Creek and 2 on the Bull River) at places without culverts or constructed bed armoring connecting sections of trail crossing palustrine floodplains. The impacts of the turbidity release from ORV use at these crossings would be virtually unmeasurable during most of the summer due to the heavy bedload already carried by these glacial rivers. During September - the latter part of the moose hunting season - the rivers run clear unless there are heavy rains, and the turbidity from ORV use would be measurable for a short distance downstream. The flora and fauna of the two main streams, however, are adapted to long periods of turbid water and to common irruptions of turbidity in September, whether from groups of caribou crossing the creek or from heavy rains.

- The 250 acres of unvegetated gravel floodplain that would be open for ORV user route-finding are Riverine Upper Perennial Streambed Gravels (R3SB3).

The unvegetated gravel bars aid in surface water retention by delaying the release of water from the gravels, with the impact depending on the depth of the gravels. Caribou use the unvegetated floodplains as travel corridors and to find a bit of a breeze on insect-filled days.

The Cantwell Creek and Bull River Routes are areas of unvegetated gravel bars proposed for unrestricted subsistence ORV use. The gravel bars of those glacial rivers are very mobile and the

channels change size and pattern by the hour during much of the summer and the rivers usually carry a heavy bedload. Turbidity inputs from ORV use at that time of year would have a negligible effect on water quality. During September the turbidity from ORV use might be measurable for a short distance downstream, but the turbidity increase would not reach far downstream due to the large average grain size upstream and to the expected low intensity of use. Macroinvertebrate and other aquatic resources are generally lacking in the gravel bar sections of the rivers due to the annual scouring by the heavy bedload. No threatened or endangered animal or plant species are found in the area and no research or reference sites have been developed in the project area. No water supply points or wells are located downhill between the project sites.

The forested and scrub shrub wetland types described above are common throughout the eastern areas of Denali National Park and Preserve. The unvegetated gravel bars are common to all of the glacially fed rivers originating in the Alaska Range core of the park, and the impacts to the gravel-covered floodplains would be temporary as the evidence would be swept away by river channel changes and ice formation each year. The park has determined that the vegetated wetlands proposed to be affected the construction and use of ORV trails comprise a relatively minor part of the large acreages of local and park wetlands, and that filling, or otherwise disturbing the wetlands within the trail alignments by vegetation control, would have a minor impact on surface water quality, including sediment control and water purification, surface water retention and animal habitat.

THE PROPOSAL IN RELATION TO WETLANDS

The proposal and alternatives are described in detail in the project EA and else where in this Statement. Wetlands are identified in Figure 3.2 of the EA. Existing impacts to all vegetation types are identified in Figure 3.1.

The construction of new ORV trails and the retention of 4 other trails in the Cantwell TUA will impact a maximum of 1.5 acres of wetlands, in addition to 250 acres of unvegetated floodplain gravels that would be open for ORV travel. The statutory authorization for local rural residents to use vehicles on park lands for subsistence purposes, where traditionally employed, is limited by existing regulations at 36 CFR 13.460, and by the assignment by Congress to require the “appropriate use” of the vehicles. The trails and use envisioned in this alternative would allow substantial vehicle access to all of the lowlands within the TUA for hunting and other subsistence uses, in addition to the provision to set up an over the snow winter hunt to allow additional access to reach places perhaps farther away from the trail network.

Discharge of dredged or fill material into jurisdictional wetlands is regulated by the U.S. Army Corps of Engineers under Section 404 of the Clean Water Act. The project would affect wetlands under the jurisdiction of the Corps and the Corps is being consulted regarding the necessary compliance.

MITIGATION PROPOSED

Federal and NPS Policy is to avoid siting projects in wetlands whenever possible. If circumstances make it impracticable to avoid wetlands, then mitigation of unavoidable impacts must be planned. A NPS wetlands no-net-loss policy requires that wetland losses be compensated for by restoration of wetlands, preferably of comparable wetland type and function and in the same watershed (if possible).

The existing use by ORVs on 21.6 acres of wetlands would be eliminated under this proposal. These sites range from open wetlands to forested wetlands. Active restoration would occur on 0.4 acres of wetlands. Of the 8.2 acres affected by continuing or new actions under the proposal, 1.5 acres are classified as wetlands. This SOF commits to full 2:1 compensation for the 1.5 acres of disturbed wetlands.

On-Site Rehabilitation

Any areas disturbed by construction activities would be restored to as near natural conditions as possible. Prior to the start of construction activities, the NPS would salvage as much topsoil, organic matter, and vegetation as necessary for later use in site revegetation or for use in revegetating other local sites. Salvaged material would be stockpiled separately and would be placed in the disturbed areas following construction.

Off-Site Compensation (Wetland Restoration)

Compensation, by restoration of previously disturbed degraded wetlands, is required under the NPS no-net-loss policy for projects involving disturbance or loss of wetlands. Compensation will occur for the loss of 1.5 acres of palustrine and forested wetland. Two-for-one compensation will be completed by allowing 3.0 acres of formerly degraded trails through forested and open wetlands in the Cantwell TUA to naturally reclaim. Of the 1.5 acres of wetlands to be disturbed by this project, 0.4 acres are forested wetlands (PFO4B) and 1.1 acres are scrub shrub wetlands (PSS1). Wetlands removed from ORV use as compensation will include 0.4 acres of forested wetlands affected by the Windy Creek North Trail, and 0.4 acres of woodland wetlands affected by the Cantwell Northwest Trail. Compensation for palustrine wetlands loss will come from closing 2.2 acres of open wetlands affected by the Cantwell Creek West-Southeast Trail (see Figure 8.1 in this Appendix). The 3 acres of compensation area will not require active restoration and are expected to recover as fully functional wetlands within 5-20 years through withdrawal from ORV use. In addition to the 3 acres used for compensation, an additional 18.6 acres of degraded wetlands will also be closed to further ORV use. This acreage will be put into the NPS Alaska Wetland Mitigation Bank, to be used as compensation for proposed projects that would impact wetlands in the .

ALTERNATIVES CONSIDERED

Alternative 1 - Under the No Action Alternative off-trail and on-trail ORV use would be allowed for all subsistence purposes by NPS qualified subsistence users throughout the Cantwell Traditional Use Area (TUA). There would be no limits on the types of ORVs that could be used. The NPS would continue to monitor the impacts of ORV use in the TUA. However, unlike under Alternatives 2, 3, and 4, the NPS would not establish specific degradation levels to aid in determining when management action is needed. The pre-existing 17b easement through Ahtna Inc. property in the Windy Creek area near Cantwell would continue to be managed as it has in the past for the following uses: travel by foot, dogsleds, animals, snowmobiles, two- and three-wheel vehicles, and small all-terrain vehicles (ATVs) (less than 3,000 pounds gross vehicle weight). Impacts to wetlands could occur anywhere on the 2,314 acres of mapped wetlands within the TUA, as there would not be any limits to ORV use for subsistence purposes. The NPS feels that this alternative would lead to impairment of the vegetation and wetlands resources of the park.

Alternative 2 - Under Alternative 2, parts of 4 existing ORV trails would be retained and maintained, two floodplain ORV trails would be constructed as necessary, the Bull River Access Trail would be constructed, and the 17b easement would be managed and maintained for mixed light use, including use by ORVs. ORVs would be allowed to travel off-trail to retrieve an expected 8 moose and 4 caribou per hunting season, with areas closed to ORV use that are steeper than a 20% slope and which are mapped as saturated soils (i.e., open wetlands, low-shrub/open wetland mix, ravines and stream corridors, willow swamp, open water). This alternative is not the preferred alternative due to the major impacts to wetlands expected from the use of ORVs off-trail to retrieve moose and caribou.

Alternative 3, the NPS preferred alternative, is described above.

Alternative 4 describes a plan to retain only parts of the four existing trails, as mentioned above in the description of the preferred alternative. There would be no new trail construction and 0.4 acres of wetlands would be affected by trail hardening and other drainage-related improvements. Use on the floodplain trails would not be allowed and the Bull River Access Trail would not be built. The 17b easement would be managed and maintained for mixed light use, including use by ORVs. Even though this alternative provides the least impacts to the environment, it is not chosen as the preferred because it does not provide reasonable access into the two major lowlands of the TUA – Cantwell Creek and Bull River floodplains – during the traditional and customary time of year for hunting large game, and makes packing meat out at that time of year very difficult.

SUMMARY OF ENVIRONMENTAL CONSEQUENCES ASSOCIATED WITH THE PROPOSED ACTION

The potential environmental consequences of the proposed action and alternative are fully described in the EA.

CONCLUSION

The NPS concludes that the statutory requirement to allow the appropriate use of ORVs for subsistence purposes within the Cantwell TUA means that a reasonable ORV access management plan has to be devised. The NPS feels that constructing new trails and maintaining existing trails that lead to all the major lowlands within the TUA is an allowance that provides for resource protection as well as reasonable access for vehicles which are not generally allowed into the backcountry of NPS areas. Alternatives 1 and 2 would create extensive resource damage and cannot be approved with a Finding of No Significant Impact. Alternative 4 does not provide reasonable access to two of the three major lowland areas within the TUA during the traditional and customary time of year for hunting large game, and makes packing meat out at that time of year very difficult. Wetlands would be avoided to the maximum practicable extent. The wetland impacts that could not be avoided would be minimized. The NPS acknowledges that some natural localized wetlands processes would unavoidably be lost by the trails constructed or maintained under this proposal. Impacts on the 1.5 acres of wetlands would be compensated for, on a minimum 2-for-1 acreage basis, by closing existing ORV trails in the TUA with damaged wetlands. Degraded wetlands on 18.6 acres will be closed to further ORV use. This acreage will be put into the NPS Alaska Wetland Mitigation Bank, to be used as compensation for proposed projects that would impact wetlands in the future. The NPS finds that this project is consistent with the Procedural Manual #77-1, *Wetland Protection* and with NPS Director's Order #77-1, *Wetland Protection*. The NPS finds that this project is in compliance with Executive Order 11990, *Wetland Management*.

APPENDIX 7

DENALI NATIONAL PARK AND PRESERVE MINIMUM REQUIREMENTS DECISION GUIDE

The Minimum Requirements Decision Guide (MRDG) is a process to identify, analyze, and select management actions that are the minimum necessary for wilderness administration. It applies direction from the Wilderness Act and incorporates a two-step process. Step 1 determines whether administrative action is necessary. If action is found to be necessary, then Step 2 provides guidance for determining the *minimum* activity. Step 2 has been referred to as determining the minimum tool but could include any type of activity, method, or equipment.

The MRDG can be used as:

- a process for evaluation and documentation;
- a guide to help discuss proposals with interested parties; or
- a review of on-going management practices to determine if they are necessary or if a less intrusive practice can be implemented.

The MRDG is designed to assist with preparation of a NEPA analysis, if needed, but is not a substitute for a NEPA analysis. Portions of the MRDG may be transferable to a subsequent NEPA analysis.

Agency NEPA guidelines do not necessarily require a process to determine if administrative action in wilderness is necessary or to select the administrative activity that causes the least adverse effect to the wilderness resource and character. The MRDG provides a method to determine the necessity of an action and how to minimize impacts; NEPA analysis compares and discloses the environmental effects of alternatives, documents a decision, and requires public involvement.

WORKSHEETS

“ . . . except as necessary to meet minimum requirements for the administration of the area for the purpose of this Act...”

– the Wilderness Act, 1964

Step 1: Determine if any administrative action is necessary.

Description: Briefly describe the situation that may prompt action.
--

The National Park Service (NPS) is considering alternatives for managing subsistence-related off-road vehicle use in the Cantwell Traditional ORV Use Area. In July 2005, the NPS published the final “Cantwell Subsistence Traditionally Employed Off-Road Vehicle Determination” which opened the entire Cantwell traditional ORV use area (TUA) to the use of off-road vehicles (ORVs), for subsistence purposes by NPS qualified subsistence users. The NPS is taking this current action to assure subsistence ORV use in this area is managed to minimize adverse impacts to resources and values for which the park was established while also providing reasonable access for subsistence purposes. The 1980 Alaska National Interest Lands Conservation Act (ANILCA)

authorizes subsistence uses where traditional in the ANILCA additions of Denali National Park (Denali additions) by local rural residents. ANILCA also provides for reasonable access with methods of surface transportation traditionally used for subsistence purposes.

To help determine if administrative action is necessary, answer the questions listed on the following pages.

A. Is the situation an emergency that demands immediate action?

Explain: No

B. Describe valid existing rights or special provisions of wilderness legislation

Are there valid existing rights or is there a special provision in wilderness legislation (the Wilderness Act of 1964 or subsequent wilderness laws) that allows consideration of action involving Section 4(c) uses? Cite law and section.

Explain: Section 811 ANILCA provides for reasonable access for subsistence on public lands and the appropriate use of the methods of surface transportation traditionally employed for subsistence purposes. These provisions allow motorized equipment or mechanical forms of transportation in wilderness for subsistence purposes, subject to reasonable regulation to prevent adverse impacts to other resources, values or other purposes of the unit.

C. Describe requirements or special provisions of other legislation

How are other applicable laws for the unit relevant to the need for resolution of the situation?

Explain: None that are directly applicable to the decision on whether the proposed activity is appropriate within the park or on lands that have been determined to be suitable for designation. ANILCA provides the primary direction on this matter.

D. Describe other guidance

How does taking action conform to and implement relevant standards and guidelines and direction contained in agency policy, unit and wilderness management plans, species recovery plans, tribal government agreements, state and local government and interagency agreements that have received appropriate level of NEPA review?

Explain: Motorized transportation in support of subsistence use in this specific case is an allowable activity. However, the allowance is conditional. Section 811 allows for appropriate use. It can be regulated to prevent adverse impacts to other resources, values or other purposes of the unit.

E. Describe options outside of wilderness

Can the necessary information be obtained or the situation resolved by an administrative activity outside of wilderness?

Explain: The area of traditional use is within the park. Subsistence use within that area is legally appropriate and has been requested by the local users. As a result, the NPS is required to evaluate the possibility of use within the park.

F. Describe how resolving the situation is related to the purpose of the Act

Is action to resolve the situation necessary to accomplish the purpose of the Act which is: "...to secure for the American people of present and future generations the benefits of an enduring resource of wilderness"?

As applicable, explain how resolving the situation will conflict or be consistent with the direction in the Act to administer the area in a way that provides for:

- 1) The use and enjoyment of the public in such a manner as will leave it unimpaired for future use and enjoyment as wilderness (see #2 for factors that define wilderness)
- 2) The protection of the wilderness area and its wilderness character, considering such factors that define the wilderness and contrast it from other public lands such as
 - "untrammeled",
 - "undeveloped",
 - "...outstanding opportunities for solitude or a primitive and unconfined type of recreation...",
 - "natural conditions",
 - "...ecological, geological, or other features of scientific, educational, scenic, or historical value..." that are specific to the area
- 3) The gathering and dissemination of information regarding the area's use and enjoyment as wilderness (see #2 for factors that define wilderness)

Explain: There is not an inherent conflict with these factors within the limited context of the exceptions established by ANILCA for the type of access being considered. The degree to which there will be conflict with these factors is dependent upon how the use is allowed and managed. Like any other form of ground transportation, even hiking, ORV use has the potential to adversely impact a number of the factors listed above if it occurs at inappropriate locations or levels.

Step 1 Decision: Is any administrative action necessary?

An affirmative answer to one or more of the previous questions is required to proceed to Step 2 to determine the minimum activity.

Yes: **No:**
Yes, provided Step 2 shows no compromise of wilderness character
More information needed:

Provide a summary explanation: Yes, a specific and legally valid request to evaluate the use of ORVs to support subsistence purposes within the TUA has been received by the NPS. The NPS is required to conduct an evaluation to determine the effects of different management approaches

that could be used to provide for that activity while still being consistent with other direction to prevent adverse impacts to the resources, values and other purposes of the unit.

Step 2: Determine the minimum activity.

Description of Alternatives

For each alternative, describe what methods and techniques will be used, when the activity will take place, where the activity will take place, what mitigation measures are necessary, and the general effects to the wilderness resource and character.

Alternative # 1

Description: See description of the alternative as provided in Chapter 2 of the Environmental Assessment.

Effects: (Select and consider as appropriate for your situation) See effects as described in Chapter 4 of the Environmental Assessment.

Alternative # 2

Description: See description of the alternative as provided in Chapter 2 of the Environmental Assessment.

Effects: (Select and consider as appropriate for your situation) See effects as described in Chapter 4 of the Environmental Assessment.

Alternative # 3

Description: See description of the alternative as provided in Chapter 2 of the Environmental Assessment.

Effects: (Select and consider as appropriate for your situation) See effects as described in Chapter 4 of the Environmental Assessment.

Alternative # 4

Description: See description of the alternative as provided in Chapter 2 of the Environmental Assessment.

Effects: (Select and consider as appropriate for your situation) See effects as described in Chapter 4 of the Environmental Assessment.

Step 2 Decision: What is the Minimum Activity?

The selected alternative is: Alternative 3 (modified).

The alternative that is most compatible with the wilderness resource is Alternative 3 with modifications. It is the same as Alternative 3 with the exception that a trail would not be constructed to the Bull River and ORV use would not be allowed on the Bull River floodplain.

The effects of this modification can be derived from the discussions for Alternative 3 and Alternative 4 in Chapter 4 or the Environmental Assessment.

Describe the rationale for selecting this alternative: This modification to Alternative 3 represents the best balance between the legal obligation to provide for reasonable access and the equally important responsibility for preventing unnecessary adverse impacts to other resources and values. The alternative provides for substantial ground access to the majority of the TUA, particularly the areas where there is the best evidence of actual use prior to 1980. It does so without the construction of new access trails into areas where there is negligible evidence of current or past use. Reasonable access is provided to those areas by alternative methods with fewer impacts such as a winter hunt. This modified Alternative 3 confines all use to trails or routes on maintainable surfaces. This makes it consistent with other policy and regulatory direction for ORVs that suggests the use should be confined rather than allowed to disperse. By not adding new trails, the alternative retains the level of trail formation that was present in the TUA at the time the wilderness suitability review was conducted for the area.

In contrast, both alternative 1 and 2 allow for the continued development of random crosscountry damage from ORVs. Alternative 3 expands ORV use into areas that have negligible evidence of past or current use. Alternative 4 reduces ORV access below the level which was occurring in 1980 and makes winter travel the primary means of access in the area. This may not meet the test of reasonable access.

Alternative 3 (modified) is the minimum action that can be taken while still meeting the requirement to provide for ORV use on park lands, particularly those that have been found to be suitable for wilderness designation.

Describe any monitoring and reporting requirements: See Chapter 2 of the Environmental Assessment

Please check any Wilderness Act Section 4(c) uses approved in this alternative:

- | | |
|--|--|
| <input checked="" type="checkbox"/> mechanical transport | <input type="checkbox"/> landing of aircraft |
| <input checked="" type="checkbox"/> motorized equipment | <input type="checkbox"/> temporary road |
| <input type="checkbox"/> motor vehicles | <input type="checkbox"/> structure or installation |
| <input type="checkbox"/> motorboats | |

Be sure to record and report any authorizations of Wilderness Act Section 4(c) uses according to agency procedures.

Approvals	Signature	Name	Position	Date
Prepared by:	/s/ Joe Van Horn	Joe Van Horn	Wilderness Program Coordinator	3/15/07
Approved:		Paul Anderson	Superintendent	

APPENDIX 8

Vegetation in the Traditional Use Area

The following two tables provide detailed information about the vegetation in the Traditional Use Area. The first table, Vegetation Types and Classifications, quantifies the linear and area impacts on the vegetation map classifications depicted on Figure 3.2 Vegetation in the Traditional Use area. This first table also translates the map classifications to Cowardin and Viereck classifications. The second table, Vegetation Description and Distribution, provides the same quantitative information as the first table, but also describes the characteristics and general location of the vegetation in the TUA.

Vegetation Types and Classifications				
Map Classification	Wetland?	Impact in TUA, linear and area	Cowardin classification(s)	Viereck classification(s)
Wetlands				
		Note:	Proportions of lengths to areas are sometimes disparate (for example, a short length but a large area) because of the GIS methodology used to obtain total lengths and total areas of ORV impacts by vegetation type. Distances are based on the center of the ORV travel path (a theoretical line of no width) going *through* a vegetation type, while areas are based on a trail or impacted areas's impact width *overlapping* a vegetation type. Thus because many trails and impacted areas are at the edge of a vegetation type (frequently wetlands such as willow swamps), few have their center of travel through them but do often have their impacted areas overlapping adjacent vegetation.	

Vegetation Types and Classifications				
Map Classification	Wetland?	Impact in TUA, linear and area	Cowardin classification(s)	Viereck classification(s)
Open wetlands		11.3 miles, 19.5 acres	Acidic and basic wetlands, dominated by herbaceous plants or bryophytes, typically with little to no shrub vegetation, saturated soils or inundated ground. Mapped as a single unit (3a) including the variations below.	
3a.1. Open herbaceous-bryophyte wetlands	yes	Included in above.	PEM1 ; palustrine emergent persistent, PML1 ; palustrine moss-lichen moss.	III.A.3.j ; subarctic lowland sedge-bog meadow.
3a.2. Wet sedge (<i>Carex</i> spp.) meadows	yes	Included in above.	PEM1 ; palustrine emergent persistent vegetation.	III.A.3.c ; wet sedge herb-meadow tundra.
3a.3. Floating mat bogs	yes	Included in above.	PML1 ; palustrine moss-lichen moss.	III.B.3.c ; subarctic lowland herb bog meadow.
3a.4. Sedge-sphagnum bog	yes	Included in above.	PML1 ; palustrine moss-lichen moss.	III.A.3.k ; subarctic lowland sedge-moss bog meadow.
3a.5. Open wetland edge transition meadows	yes	Included in above.	PEM1 ; palustrine emergent persistent.	III.B.3.b ; subarctic lowland herb wet meadow.

Vegetation Types and Classifications				
Map Classification	Wetland?	Impact in TUA, linear and area	Cowardin classification(s)	Viereck classification(s)
<i>Shrubbed wetlands</i>			Acidic and basic wetlands, with shrub component and saturated soils or inundated ground.	
3b. Willow swamps	yes	5.9 linear feet, 301.4 square feet	PSS1 ; palustrine scrub-shrub wetland broad-leaved deciduous.	II.B.1.f , closed tall shrub swamp, II.B.2.f , open tall shrub swamp.
3c. Low shrub wetlands	yes	491.2 linear feet, 5726.4 square feet	PSS1 ; palustrine scrub-shrub broad-leaved deciduous, PEM1 ; palustrine emergent wetland persistent.	II.C.2.i , open low willow-graminoid shrub bog.
River floodplains, streams, and ponds			Complex mosaic of mainly wetland systems due to high water table, frequent flooding, and disturbance regimes. Frequent swales and wet meadows, willow swamps and wet shrublands, and occasionally open peatlands. Often occupy very small areas and transition abruptly into different systems. Some floodplain areas on Windy Creek support small stands of spruce forest, which appears to be rather similar to the wet spruce-willow type further upland in the same area.	
Floodplain vegetation		3054.5 linear feet, 10021.2 square feet	Mapped as a single unit (8a) including the variations below.	

Vegetation Types and Classifications				
Map Classification	Wetland?	Impact in TUA, linear and area	Cowardin classification(s)	Viereck classification(s)
8a.1. Floodplain willow swamps	yes	Included in above.	As map classification 3b, above.	
8a.2. Wet floodplain swales	yes	Included in above.	PUS5 ; palustrine unconsolidated shore vegetated	
8a.3. Wet floodplain shrublands	yes	Included in above.	PSS1 ; palustrine scrub-shrub wetland broad-leaved deciduous.	II.B.1.a ; closed tall willow shrub, II.B.2.a ; open tall willow shrub, and occasionally II.B.1.d ; closed tall alder-willow shrub.
8a.4. Open floodplain peatlands	yes	None seen on this type.	As map classification 3a.1 and 3a.2, above.	
2a. Ravines and stream corridors	yes	3301.2 linear feet, 1.04 acres	Closest to map classification 3b, above, but often with flowing water.	

Vegetation Types and Classifications				
Map Classification	Wetland?	Impact in TUA, linear and area	Cowardin classification(s)	Viereck classification(s)
0. Open waters	yes	4.3 linear feet, 1991.3 square feet) (probably more but traces not seen)	R3OW ; Riverine upper perennial open water & R3RB2 ; riverine upper perennial rock bottom rubble (Cantwell & Windy Creeks, Bull R.), R4SB ; riverine intermittent streambed (various subclasses; streams dissecting TUA), POW & PUB4 ; palustrine open water/unconsolidated bottom organic, L2 (occ. 1); lacustrine littoral (rarely limnetic) of various classes (open waters of larger ponds).	No classification.
8b. Lightly vegetated gravel bars	some	195.9 linear feet, 2400.3 square feet	R3RS ; riverine upper perennial rocky shore.	III.B.1.a ; seral herbs.
Shrublands			Shrublands occupy the greatest area of vegetation below alpine rock areas in the TUA, and is the "matrix" which surrounds other vegetation types. Two distinctive and quite different types are discussed here; willow (and/or alder)- and dwarf birch-dominated shrublands. Most overland travel in the TUA requires extensive transit across shrublands.	
Dwarf birch shrublands			Normally occur on better-drained areas than willow.	

Vegetation Types and Classifications				
Map Classification	Wetland?	Impact in TUA, linear and area	Cowardin classification(s)	Viereck classification(s)
1b. Dwarf birch shrublands	no	3.9 miles, 5.5 acres	none (non-wetland).	II.C.1.a ; closed low shrub birch shrub, and II.C.2.f ; open low shrub birch-willow shrub.
1c. Dwarf birch-gravel-mineral soil	no	None seen on this type	none (non-wetland).	II.C.2.c ; open low mesic shrub birch-ericaceous shrub.
Willow and alder shrublands		3.0 miles, 4.5 acres	Several variants based on willow or alder content and soil wetness. Transition to dwarf birch in better-drained areas and to open wetlands in poorly-drained areas; most wetlands have a border of willow shrub on their margins. Approximately 25% of the area in class 4 can be designated by Cowardin classification as wetlands. Willow is also the dominant vegetation in shrub swamps, shrubbed open wetlands and sedge meadows, ravine bottoms, and ravine and floodplain slopes. Mapped as a single unit (4) including the variations below.	
4.2. Willow shrublands	some	Included in above.	(Wet areas only) PSS1 ; palustrine scrub-shrub wetland broad-leaved deciduous.	II.B.1.a ; closed tall willow shrub, II.B.2.a ; open tall willow, II.C.1.b ; closed low willow, II.C.2.g ; open low willow.
4.3. Willow-alder shrublands	some	Included in above.	(Wet areas only) PSS1 ; palustrine scrub-shrub wetland broad-leaved deciduous.	Depending on density of cover: II.B.1.d ; closed tall alder-willow shrub, II.B.2.d ; open tall alder-willow shrub.

Vegetation Types and Classifications				
Map Classification	Wetland?	Impact in TUA, linear and area	Cowardin classification(s)	Viereck classification(s)
4.4. Alder shrublands	some	Included in above.	PSS1 ; palustrine scrub-shrub wetland broad-leaved deciduous.	II.B.2.b ; open tall alder shrub, II.B.1.b ; closed tall alder shrub.
2b. Vegetated floodplain slopes	no	13.5 m 55 m ² (44.3 linear feet, 592 square feet)	none (non-wetland).	Similar to map classification for 4.2 and, less commonly, 1b.
Woodlands			Wooded areas are of particular significance to ORV travel because the dense vegetation can limit availability of routes, including those around degraded areas.	
Spruce woodlands			Woodlands with black spruce (<i>Picea mariana</i>) are common in poorly-drained areas, and white spruce (<i>Picea glauca</i>) in more moderately-drained areas of the TUA. The soil and hydrology conditions of spruce woodlands are similar to their analogous shrublands (willow, alder, dwarf birch), and these woodlands normally transition to their analogous shrubland types at their edges.	
5. Willow and alder-spruce woodlands	some	2.3 miles, 3.5 acres	(Wet areas only) PFO4 ; palustrine forested needle-leaved evergreen.	Depending on main species: I.A.2.e ; open white spruce forest, I.A.2.f ; open black spruce, I.A.2.g ; open black spruce-white spruce.
1a. Dwarf birch-spruce woodlands	no	1601.4 linear feet, 19256.6 square feet	none (non-wetland).	I.A.2.e ; open white spruce forest.

Vegetation Types and Classifications				
Map Classification	Wetland?	Impact in TUA, linear and area	Cowardin classification(s)	Viereck classification(s)
<i>Aspen woodlands</i>				
7. Aspen groves	no	None seen on this type	none (non-wetland).	I.B.1.e ; closed quaking aspen forest.
Meadows and open areas		1.15 miles, 1.6 acres	Primarily herbaceous, graminoid, or low shrub vegetation with few or no trees. Mapped as a single unit (6a) including the variations below.	
6a.1. Upland graminoid meadows	no	Included in above.	none (non-wetland).	III.A.2.a ; bluejoint meadow and III.A.2.b ; bluejoint-herb meadow.
6a.2. Subalpine herb meadows	no	Included in above.	none (non-wetland).	III.A.2.b ; bluejoint meadow and III.B.2.a ; mixed herbs.
6a.3. Alpine meadows	no	Included in above.	none (non-wetland).	II.D.2 ; (with various level IV modifiers), III.A.1/2 (various level IV and V modifiers).

Vegetation Types and Classifications				
Map Classification	Wetland?	Impact in TUA, linear and area	Cowardin classification(s)	Viereck classification(s)
6b. Tussock meadows	no	None seen on this type.	none (non-wetland).	III.A.2.d ; tussock tundra.
6c. Rock outcrop opening	no	0.12 miles, 2153 square feet	none (non-wetland).	Closest to II.D.2.b ; <i>Vaccinium</i> dwarf shrub tundra, but also some characters of II.D.2.a ; bearberry dwarf shrub tundra. Apparently higher <i>Empetrum</i> component than above two types.

Vegetation Description and Distribution				
Map Classification	Wetland?	Impact in TUA, linear and area	Description	Distribution
Wetlands				

Vegetation Description and Distribution				
Map Classification	Wetland?	Impact in TUA, linear and area	Description	Distribution
		Note:	Proportions of lengths to areas are sometimes disparate (for example, a short length but a large area) because of the GIS methodology used to obtain total lengths and total areas of ORV impacts by vegetation type. Distances are based on the center of the ORV travel path (a theoretical line of no width) going *through* a vegetation type, while areas are based on a trail or impacted areas' impact width *overlapping* a vegetation type. Thus because many trails and impacted areas are at the edge of a vegetation type (frequently wetlands such as willow swamps), few have their center of travel through them but do often have their impacted areas overlapping adjacent vegetation.	
Open wetlands		11.3 miles, 19.5 acres	Acidic and basic wetlands, dominated by herbaceous plants or bryophytes, typically with little to no shrub vegetation, saturated soils or inundated ground. Mapped as a single unit (3a) including the variations below.	
3a.1. Open herbaceous-bryophyte wetlands	yes	Included in above.	String bogs, floating mat bogs, and similar systems. Relatively deep saturated organic soils. In many areas, particularly the flanks of string bogs, exposed soils have little or no vegetative cover.	Common between Cantwell Creek and Bull River; frequent near Windy Creek; scattered north of Cantwell Creek. Most occupy lower concave areas.
3a.2. Wet sedge (<i>Carex</i> spp.) meadows	yes	Included in above.	Soils saturated to wet, and often thinner than those of open wetlands. Sedge meadows tend to be smaller than the open wetlands, though some larger areas are found.	Common throughout the area.
3a.3. Floating mat bogs	yes	Included in above.	Floating organic mats of sedge and sphagnum peat occurring around open water.	Only seen in the western area in 2005 fieldwork.

Vegetation Description and Distribution				
Map Classification	Wetland?	Impact in TUA, linear and area	Description	Distribution
3a.4. Sedge-sphagnum bog	yes	Included in above.	Open sedge-sphagnum wetland was found. Soils were not observed because of heavy moss cover, but are of probably saturated peat. <i>Pinguicula villosa</i> was seen commonly in the heavy moss cover.	North of Cantwell Creek and possibly in other areas such as between Bull River and Cantwell Creek.
3a.5. Open wetland edge transition meadows	yes	Included in above.	Transition zone of meadow-type herbaceous vegetation several meters wide between hydric wetland vegetation and shrublands. Normally with wet to saturated soils, sedges, and forbs such as <i>Polygonum</i> spp., <i>Thalictrum alpinum</i> , <i>Parnassia</i> spp., <i>Sanguisorba officinalis</i> , and others.	Surround many open wetlands. Mainly western TUA, particularly between Cantwell Creek and Bull River.
Shrubbed wetlands			Acidic and basic wetlands, with shrub component and saturated soils or inundated ground.	
3b. Willow swamps	yes	5.9 linear feet, 301.4 square feet	Willow shrub areas with mostly inundated soils and >1.5m, rather dense cover of willow or alder. Differs from willow shrublands in presence of standing water.	Common, particularly in the western third of the area.
3c. Low shrub wetlands	yes	491.2 linear feet, 5726.4 square feet	Relatively open sedge dominated low shrub wetlands with low (<1m), dispersed (less than 50%) cover of willow. Represent possibly a transition stage from open wetland to shrubland. Differs from open wetlands in presence of shrub component.	Common, particularly west of the bend in Cantwell Creek and in the western third of the area.

Vegetation Description and Distribution				
Map Classification	Wetland?	Impact in TUA, linear and area	Description	Distribution
River floodplains, streams, and ponds			Complex mosaic of mainly wetland systems due to high water table, frequent flooding, and disturbance regimes. Frequent swales and wet meadows, willow swamps and wet shrublands, and occasionally open peatlands. Often occupy very small areas and transition abruptly into different systems. Some floodplain areas on Windy Creek support small stands of spruce forest, which appears to be rather similar to the wet spruce-willow type further upland in the same area.	
Floodplain vegetation		3054.5 linear feet, 10021.2 square feet	Mapped as a single unit (8a) including the variations below.	
8a.1. Floodplain willow swamps	yes	Included in above.	Often have very dense shrub growth over inundated thin organic soils. Similar to more upland willow swamps except for floodplain hydrological regime and substrate.	Common on backwater areas of floodplains. Most common on the Cantwell Creek floodplain.
8a.2. Wet floodplain swales	yes	Included in above.	Older channels supporting communities of plants uncommon above the floodplain, including <i>Pinguicula vulgaris</i> ; some better-drained areas have developed into small sedge meadows.	

Vegetation Description and Distribution				
Map Classification	Wetland?	Impact in TUA, linear and area	Description	Distribution
8a.3. Wet floodplain shrublands	yes	Included in above.	With the exception of their floodplain hydrology and somewhat different substrate (higher and variable water table, fluvial rounded gravels and sands, areas of organic soils, ridge and trough microtopography), the non-inundated floodplain shrublands are vegetationally similar to those in wetter areas above the floodplain, and are discussed under shrublands, below.	Willow swamps as described above are also common in backwater and swale areas of floodplains.
8a.4. Open floodplain peatlands	yes	None seen on this type.	Open peat wetlands only develop where floodplain sufficiently wide and hydrology stable enough for their gradual formation through time. One example at the north end of Cantwell Creek in the TUA, where a series of beaver dams has blocked drainage from uplands and created a large complex of floating mat bog, willow swamp, and open water.	Near north end of Cantwell Creek in the TUA. Rare on floodplains.

Vegetation Description and Distribution				
Map Classification	Wetland?	Impact in TUA, linear and area	Description	Distribution
2a. Ravines and stream corridors	yes	3301.2 linear feet, 1.04 acres	Ravines dissect the landscape at regular intervals, transmitting drainage from upslope mountain areas toward the rivers, but also occasionally connect or drain to or from wetlands. In the former case they often form steep sided, deep (to 10m or more) ravines, while in the latter they are usually shallower; often with beaver dams and/or a vegetation that is a cross between open wetland and stream valley systems. Slopes are usually eroded alluvium or glacial deposits, often with active slides. Most ravine bottoms have a poorly-sorted mixture of organic and mineral soils with some rocks and boulders with a willow or alder cover and various pools and stream widenings and meanders. Ravine slope vegetation is similar to that of river floodplain slopes.	Common on all areas of the TUA; particularly between Cantwell Creek and Bull River.
0. Open waters	yes	4.3 linear feet, 1991.3 square feet (probably more but traces not seen)	Open waters include ponds, rivers, and streams; of these the communities at their margins are more important to this document than the open water itself. Open wetlands and wet shrublands are usually found at water margins; these and the wetland characteristics of river floodplains and streams are discussed above.	Mostly western TUA; rare elsewhere in TUA.

Vegetation Description and Distribution				
Map Classification	Wetland?	Impact in TUA, linear and area	Description	Distribution
8b. Lightly vegetated gravel bars	some	195.9 linear feet, 2400.3 square feet	<50% vegetated (not bare) gravel; active vegetation succession with dispersed small shrubs and herbs. Likely represent areas of the floodplain that have been deposited in recent years but with little disturbance since, and thus are undergoing succession. Typically have dispersed herbaceous vegetation and small willows with mainly open gravels.	Cantwell Creek and Bull River floodplains; small areas on Windy Creek.
Shrublands			Shrublands occupy the greatest area of vegetation below alpine rock areas in the TUA, and is the "matrix" which surrounds other vegetation types. Two distinctive and quite different types are discussed here; willow (and/or alder)- and dwarf birch-dominated shrublands. Most overland travel in the TUA requires extensive transit across shrublands.	Shrublands are found from lowest to highest areas in the TUA, and across the area.
Dwarf birch shrublands			Normally occur on better-drained areas than willow.	

Vegetation Description and Distribution				
Map Classification	Wetland?	Impact in TUA, linear and area	Description	Distribution
1b. Dwarf birch shrublands	no	3.9 miles, 5.5 acres	Distributed from river floodplain slopes to alpine shrub areas on landscape mosaics with wetland matrix; most often on small knolls or ridges between open wetlands or willow shrublands on raised (thus better drained and more durable) mesic mineral soils with thin organic or humus layer. Often on moraines, drumlins, eskers, and alluvial features. In western TUA between Cantwell Ck. and Bull R. much of the landscape dominated by alternating linear wetlands and dwarf birch on higher ridges, and many alluvial fans throughout TUA occupied by dwarf birch. Occasionally intermixed with to 50% willow, depending on soil moisture; most areas of dwarf birch are adjacent to areas of willow on lower ground. A very few areas of saturated soils with dwarf birch seen in field between Bull River and Cantwell Creek.	All TUA; least common near Windy Creek. Also found on subalpine slopes, and occasionally on lower, wetter hummocky shrublands and even on some shrubbed wetland areas between Cantwell Creek and Bull River; though such areas normally transition to willow in areas of wetter soils.

Vegetation Description and Distribution				
Map Classification	Wetland?	Impact in TUA, linear and area	Description	Distribution
1c. Dwarf birch-gravel-mineral soil	no	None seen on this type	Distinctive dwarf birch vegetation type with small admixture of willow on a sparsely vegetated ground surface with approximately 30-50% open <i>Cladina</i> lichen covered ground; apparently on very well-drained coarse soils and gravels of old alluvial fans. Not observed on ground, but noted on satellite and helicopter photography in several areas of the western TUA; sufficiently unique to classify separately.	Several areas near Bull River; apparently ancient downcut alluvial fans with gravel. Also alluvial fans near north tip of Cantwell Creek.
<i>Willow and alder shrublands</i>		3.0 miles, 4.5 acres	Several variants based on willow or alder content and soil wetness. Transition to dwarf birch in better-drained areas and to open wetlands in poorly-drained areas; most wetlands have a border of willow shrub on their margins. Approximately 25% of the area in class 4 can be designated by Cowardin classification as wetlands. Willow is also the dominant vegetation in shrub swamps, shrubbed open wetlands and sedge meadows, ravine bottoms, and ravine and floodplain slopes. Mapped as a single unit (4) including the variations below.	Throughout TUA from floodplains to approximately 3000 feet elevation.
4.2. Willow shrublands	some	Included in above.	Occur on large areas of TUA from wet to mesic soils. Vary greatly in shrub height and density of cover, and thus match several Viereck types.	Willow ubiquitous on lower & wetter terrain, at the margins of wetlands, and on older floodplain areas; often forming very dense thickets.

Vegetation Description and Distribution				
Map Classification	Wetland?	Impact in TUA, linear and area	Description	Distribution
4.3. Willow-alder shrublands	some	Included in above.	As above, but with admixture of alder.	Eastern TUA at all elevations, western TUA at higher elevations and small areas in lower elevations.
4.4. Alder shrublands	some	Included in above.	Dense thickets of primarily alder. Upland alder shrublands are considerably denser here than equivalent sites north of the Alaska Range (Roland and Van Horn 2004).	Primarily between upper elevation woodlands and alpine; also lower elevations on saturated organic soils.
2b. Vegetated floodplain slopes	no	13.5 m 55 m ² (44.3 linear feet, 592 square feet)	Normally vegetated on more stable areas with willow, willow-alder, less commonly dwarf birch on shallower slopes; otherwise similar to Viereck types referenced. Generally not wet or saturated. Soil development is minimal or absent on many slopes, and drainage is high. Often on steep slopes with erosional gullies or slope failures; some slopes have minimal successional vegetation or partially open areas where slopes have eroded or slipped.	Along Cantwell Creek and Bull River; mostly forested on Windy Creek (type 5).
Woodlands			Wooded areas are of particular significance to ORV travel because the dense vegetation can limit availability of routes, including those around degraded areas.	

Vegetation Description and Distribution				
Map Classification	Wetland?	Impact in TUA, linear and area	Description	Distribution
<i>Spruce woodlands</i>			Woodlands with black spruce (<i>Picea mariana</i>) are common in poorly-drained areas, and white spruce (<i>Picea glauca</i>) in more moderately-drained areas of the TUA. The soil and hydrology conditions of spruce woodlands are similar to their analogous shrublands (willow, alder, dwarf birch), and these woodlands normally transition to their analogous shrubland types at their edges.	Common on middle and lower elevations to approximately 2600-3000 feet. More frequent to east; largely absent north and west of curve in Cantwell Creek.
5. Willow and alder-spruce woodlands	some	2.3 miles, 3.5 acres	Typically have a shrub layer of willow and increasing admixture of alder in wetter areas or higher elevations; alder common in wet wooded areas north of Cantwell Creek and the east side of TUA. In many areas these transition into willow or alder shrublands, open wetlands, dwarf birch-spruce woodlands, and occasionally upland meadows, depending on local conditions.	Spruce woodlands are most common in the southeastern and eastern areas of the TUA.
1a. Dwarf birch-spruce woodlands	no	1601.4 linear feet, 19256.6 square feet	On upland areas with better drainage; more productive than willow woodlands because of higher soil temperatures and increased nutrient availability. Transition to dwarf birch shrublands in drier areas; willow-type woodlands and shrublands in wetter areas; and occasionally to open wetlands or upland meadows. With admixture or mosaic of to 50% willow.	Common on better-drained upland sites including moraines, drumlins, and alluvial features in the eastern two thirds of the TUA.

Vegetation Description and Distribution				
Map Classification	Wetland?	Impact in TUA, linear and area	Description	Distribution
<i>Aspen woodlands</i>				
7. Aspen groves	no	None seen on this type	Aspen (<i>Populus tremuloides</i>) woodlands are generally less than several hundred meters in any dimension. Aspen woodlands have relatively open, well-drained conditions with a mesic herbaceous understory.	Rare in TUA, though a few small groves occasional in dry or mesic early successional sites near upper Bull River, on the north side of Cantwell Creek, and near Windy Creek.
Meadows and open areas		1.15 miles, 1.6 acres	Primarily herbaceous, graminoid, or low shrub vegetation with few or no trees. Mapped as a single unit (6a) including the variations below.	
6a.1. Upland graminoid meadows	no	Included in above.	Mesic upland meadows on mineral soils dominated by grasses such as <i>Calamagrostis</i> and <i>Poa</i> . At least some of these areas appear to be on very old alluvial fans and thus higher, better-drained ground.	On some middle elevation slopes. They are found mainly to the north of Cantwell Creek on shallow southeast-facing slopes.
6a.2. Subalpine herb meadows	no	Included in above.	At or above treeline; have a robust growth of lush graminoid-forb meadows dominated by <i>Lupinus nootkatensis</i> , <i>Veratrum viride</i> , <i>Geranium erianthum</i> , <i>Heracleum lanatum</i> , and <i>Carex</i> spp, as a result of moister growing conditions.	Appears to be distributed throughout the TUA at around treeline (appx. 3000').

Vegetation Description and Distribution				
Map Classification	Wetland?	Impact in TUA, linear and area	Description	Distribution
6a.3. Alpine meadows	no	Included in above.	Most often dominated by Rosaceae, Ericaceae, Salicaceae family dwarf shrubs with graminoids and forbs. Large amount of geomorphological disturbance and relatively young age of surfaces; many slopes essentially barren, supporting only a few scattered cushion plants.	Throughout TUA at or above treeline.
6b. Tussock meadows	no	None seen on this type.	Appears on satellite and helicopter photography as open herbaceous tussock meadows. Not investigated on the ground, but appear to be dominated by graminoids and some herbs with scattered willow shrubs.	Several areas located primarily along Bull River and a few areas between Bull River and Cantwell Creek.
6c. Rock outcrop opening	no	0.12 miles, 2153 square feet	Comprised of xerophytic woody and herbaceous plants such as <i>Empetrum nigrum</i> , <i>Arctostaphylos</i> , <i>Arnica</i> , <i>Lycopodium selago</i> , <i>Cladina</i> spp., <i>Dryas</i> , <i>Saxifraga</i> , <i>Campanula lasiocarpa</i> , and <i>Epilobium latifolium</i> on poorly formed thin soils over bedrock outcrops. Extent of this vegetation type unknown; was not delineated on satellite-interpreted vegetation mapping for this project. In some ways it resembles higher alpine vegetation.	Only one location field surveyed, west of Cantwell and traversed by the Cantwell Airstrip trail at about 2600' elevation, surrounded by dwarf birch-type vegetation. Possibly more widespread in area.

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