4.0 ENVIRONMENTAL CONSEQUENCES

4.1 Impact Criteria and Assessment

For each issue selected for detailed analysis (see section 1.4) and for which the subject resources are described in chapter 3, the direct, indirect, and cumulative effects are analyzed. The effects to the subject resources are analyzed on the basis of the duration, extent, and intensity of the impacts. Summary impact levels (characterized as negligible, minor, moderate, or major) are given for each issue topic in the analyses. Definitions of impact terms are provided below. Table 4-1 presents a summary of impact level thresholds.

Duration:

Temporary: Impacts would last no more than a season, or for the duration of the discreet activity, such as maintenance of a road or trail segment.

Long-Term: Impacts would extend for several years up to the life of the project.

Permanent: Impacts are a permanent change to the resource that would last beyond the life of the project even if the actions causing the impacts were to cease.

Context:

Common: The affected resource is widespread, and is not identified in enabling legislation as important to the park, nor is it rare within or outside the park. The portion of the affected resource impacted by the action does not fill a unique role within the park or its region of the park.

Important: The affected resource is identified by enabling legislation, or is rare either within or outside the park. The portion of the affected resource does not fill a unique role within the park or its region of the park.

Unique: The affected resource is identified by enabling legislation, and the portion of the affected resource uniquely fills a role within the park and its region of the park.

Intensity

Low: A change in resource condition is perceptible, but does not measurably alter the resource function in the park ecosystem, cultural context, or visitor opportunity.

Medium: A change in a resource condition is measurable or observable, and an alteration is detectable to the resource function in the park ecosystem, cultural context, or visitor opportunity.

High: A change in a resource condition is measurable or observable, and an alteration to the resource function in the park ecosystem, cultural context, or visitor opportunity is clearly and consistently observable.

Table 4.1 Summary Impact Levels

Negligible	Minor	Moderate	Major
Effects would tend to be low intensity, temporary, and would not affect unique resources.	Effects would tend to be low intensity and short duration, but common resources may sustain medium intensity and long-term effects.	Effects on common resources would tend to be medium to high intensity and long-term, while important and unique resources would tend to be affected by medium to low intensity and short-term to temporary impacts, respectively.	Effects would tend to be medium to high intensity, long-term to permanent, and affect important to unique resources.
Impairment occurs when a resource no longer fulfills the specific purposes in the enabling legislation or its role in maintaining the park's natural integrity.			

4.2 Cumulative Effects

As defined in 40 CFR 1508.7, cumulative impacts are the incremental impacts on the environment resulting from adding the impacts of an alternative to the impacts resulting from other past, present, and reasonably foreseeable future actions, including those taken by both federal and nonfederal agencies, as well as actions undertaken by individuals. Cumulative impacts may result from singularly minor but collectively significant actions taking place over a period of time. A simple way to view cumulative impacts is with an equation a + b = c, where "a" is the effects of past, present, and future impacts of human activities not addressed by the alternative, "b" is the effects of the alternative, and "c" is the total combined effects to the resource of all these activities. Cumulative impacts have been prepared for each impact topic for each alternative. These analyses are based on the following assumptions and list of relevant past, present, and foreseeable future actions.

The reader should bear in mind that most impacts on federal parklands and resources were inherited when the park was established by ANILCA, and the U.S. Congress and the President recognized these impacts prior to establishment of this park for its national significance. The park was not entirely pristine at the time of its creation, but the park still protects large relatively unspoiled, superlative, exceptional quality areas. The inherited level of disturbance presents the point of departure for the analyses of impacts to the various resources, including wilderness.

4.2.1 Assumptions for the Cumulative Effects Analyses

There are approximately 784,000 acres of nonfederal lands within Wrangell St. Elias NP/P. Past development includes, settlement of the towns of McCarthy and Chisana, mineral exploration and mining circa 1900 until the present (USNPS 1990, Mining EIS),

oil and gas seismic exploration circa 1960, commercial logging 1990's, homestead settlement 1900 until 1970, facilities supporting commercial guiding and hunting operations, and land subdivisions and sales with settlements for residential and recreational use proximal to the Nabesna and McCarthy road systems and Chisana.

Most of the past development within WRST occurred on private lands within the 488 patented (5,681 acres) and 2) unpatented mining claims (292 acres), small private tracts (8,700 acres) and the University of Alaska lands [(1)]. The State of Alaska and University of Alaska currently control 34,430 acres. The University of Alaska subdivided lands near McCarthy in the mid-1990's. Numerous lots have been sold and are currently being developed. In general, lands conveyed to native corporations from the Alaska Native Claims Settlement Act (ANCSA) have little past development except for logging in the Chitina area and oil and gas seismic lines put in before ANCSA. These Native Corporations currently own approximately 735,000 acres within WRST.

There is a limited amount of past mineral development on parklands associated with lapsed unpatented mining claims and acquired properties that reverted to federal ownership. In addition, there are two ROWs granted to the State of Alaska at the time of statehood under the Omnibus Act. These include the Nabesna and McCarthy Roads.

4.2.2 Motorized Access Facilities on Parklands

Existing access facilities include ORV trails and routes and fixed-wing aircraft landing strips. These contribute to the cumulative effects in Wrangell-St. Elias NP/P and are likely to affect several or all resources evaluated in this EA.

4.2.2.1 ORV Trails:

We estimate that there may have been 600 miles or more of trails or routes within the area that became WRST when it was established in 1980 (USNPS 1990, Mining EIS). These were used for a variety of purposes including, hunting, recreation, mining, oil and gas exploration, subsistence and access to private lands. Many facilities have shared use. Some of these are historic trails originally utilized by native Alaskans, others were developed using bulldozers. The history and use pattern of each trail is unique; many have evolved over time due to changes in technology and level of use.

Within WRST there are generally three user types that currently operate ORVs on parklands over portions of the trail system that existed under BLM management prior to 1980. These include (1) individuals accessing their private lands, (2) recreational users on the established trails for which a Special Use Permit is required prior to operating an ORV, and (3) local rural residents using an ORV in support of recognized subsistence activities.

4.2.2.2 Airstrips:

Currently there are more than 100 fixed-wing aircraft landing strips of which more than 50 are on federal land within Wrangell-St. Elias NP/P. These facilities range in size from barely discernable short airstrips less than 900 feet in length on barren floodplains to

extensively developed areas where motorized equipment was used to clear vegetation and soils and/or blade a gravel surface. The Chisana Airstrip is an example of a large airstrip, which is approximately 5,000 feet long and 50 feet wide. Fixed-wing landing strips are used for access to the backcountry for recreation and access to inholdings. The greatest level of use is for recreation on most, but some also serve as an essential component of access to an inholding. The NPS currently undertakes some maintenance operations on 24 established airstrips.

4.2.2.3 Alaska State Road Rights-of-Way (ROW):
The two Alaska State ROWs within WRST, Nabesna Road and McCarthy Road, were granted at the time of statehood under the Omnibus Act. These include the Nabesna Road, a 42-mile long and 200-foot wide ROW, and the Chitina - McCarthy – May Creek Road, which is a 100-foot wide ROW with spurs to Chititu and Dan Creek traversing approximately 80 miles.

Table 4.2 Summary of Facilities & Actions.

Facilities, Condition, or Actions within Park	Number	Estimated Total
Trails, Tracks, Roads		600 miles
ADOT&PF Roads	2	125 miles
Airstrips	100 within park boundary	
Recorded mining claims areas circa 1990[1]	1,389	19,952 acres

Foot note (1) Circa 1990 recorded mining claims indicate there were then approximately 19,950 acres of patented (10,629 acres) and unpatented (9,323acres) mining claims with had various levels of past development (USNPS 1990, Mining EIS).

4.3 Effects to Aquatic Resources and Fish

Motorized vehicles can alter or affect drainages and wetlands in ways that can significantly change runoff patterns and amounts (see figure 4.1). Off-road vehicle activity nearly always results in greatly increased erosion (Hinckley et al.1984). ORVs compact and disrupt the soil reducing infiltration capacity resulting in increased frequency and duration of runoff. ORV activity also destroys or disperses surface stabilizers creating relatively smooth trails that entrain surface flow and enhance runoff effectiveness (Meyer 2002). Off road vehicles can contribute large suspended sediment loads to receiving waters especially during storm events (Ayala et al.2005). Although extremely difficult to measure, some estimates of ORV-induced erosion rates have ranged as high as 5 to 50 times greater than natural rates (Hinckley et al.1984).

The physical impact of ORVs on the landscape strips surface vegetation and compacts soils leading to surface subsidence or entrenched trails. Entrenched trails can intercept and drain water from surrounding landforms (Meyer 2002). These effects can ditch and drain wetlands or at least impact wetland structure and function. ORV tracks oriented

perpendicular to natural drainage patterns are more likely to intercept and potentially reroute surface flow than parallel oriented tracks. Tracks that run parallel to hill slopes promote soil erosion and development of rills and gullies (Brooks and Lair 2005). Braiding of trails compounds these effects.

Figure 4.1. A braided access route that has intercepted and rerouted surface flow.

Motorized vehicle passage can directly affect water quality in two main ways. These include the suspension (turbidity) and deposition of fine sediment and/or leakage and combustion of petroleum products and other fluids at stream crossings. Fine sediments suspended in water create turbidity which is a quantifiable water quality characteristic affecting aquatic biota (Lloyd et al.1987). Hydrocarbon or other fluid contaminants are often washed directly from ORVs and can be precipitated from the atmosphere following combustion of fossil fuels.

Disturbed or resuspended sediments are typically transported downstream as bedload or suspended sediment for a short distance (meters or tens of meters) where they are deposited in pools or along channel margins where current velocities decline. Accumulated sediment downstream of motorized stream crossings can subsequently be scoured, resuspended, and transported on a much wider spatial scale as a result of extreme precipitation and flooding events. Flood events capable of resuspending and transporting deposited sediments occur primarily during the wet season at annual or less frequent intervals. Flooding events in the Wrangell-St. Elias National Park/Preserve typically occur during spring snow melt in April and May and during the wet season from June through October. The extent of sediment movement and transport is dependant on sediment particle size and composition, gradient or channel slope, stream velocity, and magnitude of precipitation and discharge events.

Finer sediment such as silt and fine sand is typically more easily disturbed and transported (critical velocity = 20 cm/s) than course gravel (critical velocity = 1 m/s), for example (Allan 1995). Larger particles are typically transported as bed load along or near the streambed rather than suspended in the water column. Under average and low flow conditions, silt and sand are transported over relatively short (meters or tens of meters)

distances. However, flooding events and associated increased current velocities typically transport finer materials over much greater distances (hundreds of meters to kilometers).

Turbidity is a fluid optical property describing the amount of light scattered by suspended solids (MacDonald et al.1991). More simply, it is a visual property of water that implies a reduction in or lack of water clarity. Suspended silt and clay are typically the primary causes of turbidity but other contributors to turbidity include finely divided organic and inorganic matter, some soluble colored organic compounds, plankton, and microscopic organisms (APHA 1998). Suspended particles < 0.1 mm in diameter are typical for Alaska (MacDonald et al.1991). But particles as large as 1 mm can become suspended during high flow discharge events. Because so many different particles can affect turbidity, the relationship between turbidity and suspended sediments is nonlinear. However, about 80% of suspended sediment variability can be explained by turbidity measurement (MacDonald et al.1991). Turbidity, measured as nepholometric turbidity units (NTU), is typically quantified using a photoelectric turbidimeter. Alaska Administrative Code (18 AAC 70) specifies that turbidity standards for fish, aquatic life and wildlife:

> *"May not exceed 25 NTU above natural conditions."*

Vegetation cover, type of substrate, steepness of approach/topography, and water conditions can influence the level of the effect. For example, Rinella and Bogan (2003) noted that only one of three stream fords they monitored in the Kenai Peninsula actually contributed measurable sedimentation effects. This was attributed to the fact that this site consisted of ample, unconsolidated, fine sediment and a sloped approach topography which entrained sediment during rain events. Ayala *et al.*'s (2005) work confirmed the effect of precipitation events and higher magnitude, low-frequency floods in transporting greater sediment loads.

High turbidity can decrease light penetration and significantly reduce primary (aquatic plants), secondary (invertebrates) and even tertiary (fishes) biological productivity. Extremely high turbidity and subsequent sedimentation can have both sublethal and lethal effects on aquatic biota. Suspended sediment can also facilitate the transport of heavy metals, nutrients and other sediment-associated pollutants (LaPerrier et al.1985).

Vegetation loss as a result of ORV disturbance to soil and roots can also result in increased water temperatures. The mechanism is typically through vegetative loss and reduced shading effects. Oxygen concentration in water is inversely related to temperature, thus increased water temperatures are typically known to decrease oxygen levels. However, ORV effects on vegetation would likely need to occur along a significant portion of riparian habitat throughout the watershed in order to affect water temperature to the extent that oxygen concentration and/or temperature would exceed aquatic biota tolerances.

Right of way use and maintenance in areas adjacent to streams has the potential to reduce large woody debris levels. Maintenance prevents the growth of trees within the right of

way and trees that naturally fall across the right of way are typically cut and removed rather than entering the aquatic system. Stream crossings that are undersized often trap large woody debris as it is transported by high flows, where it is later removed as part of a standard maintenance activity. In some cases, hazard trees are removed to protect the right-of-way. Channel manipulation to protect right of ways often includes the removal of large woody debris from stream channels to reduce flooding.

Few studies have taken place on large rivers, on glacial rivers, or in interior Alaska. In smaller or clearer water bodies, large woody debris (LWD) plays a direct role in salmonid habitat, particularly for juvenile fish. This is largely related to the spawning and cover- use characteristics of this group of fishes (e.g., Lister and Genoe 1970, Lee 1985, Murphy et al. 1989, Hicks et al. 1991, Inoue and Nakano 1998). In large streams, the role for LWD may be more indirect, because water velocities in mainstem channels are often high, and much of the LWD is on bars or jams above the free- flowing water during winter months. In large glacial streams, the chief role of LWD may well be in shaping stream morphology, adding hydraulic roughness to glacial streams, providing bank armoring, contributing to the formation of river bars and islands, and blocking side channels (Fetherston et al. 1995, Abbe and Montgomery 1996, Montgomery et al. 1996, Dudley et al. 1998). Because of its size, LWD in large rivers can be more stable than the relatively mobile bed load sediments, and can function as substrate for aquatic invertebrates used by fishes as food. Hypotheses indicate LWD could play an important, but short-term, role during migration by providing eddies where upstream movement is easier and where fish can rest.

Petroleum product or hydrocarbon contamination of water can result directly from the leakage of fuel (primarily gasoline) or other fluids (i.e., lubricating oils, brake fluid or antifreeze) from ORVs. Alaska Administrative Code (18 AAC 70) specifies petroleum, hydrocarbons, oils and grease standards in waters for fish, aquatic life and wildlife.

"Total aqueous hydrocarbons (TAqH) in the water column may not exceed 15 µg/l (see note 7[1]). Total aromatic hydrocarbons (TAH) in the water column may not exceed 10 µg/l (see note 7). There may be no concentrations of petroleum hydrocarbons, animal fats, or vegetable oils in shoreline or bottom sediments that cause deleterious effects to aquatic life. Surface waters and adjoining shorelines must be virtually free from floating oil, film, sheen, or discoloration."

Because volumes of these materials are typically thought to be small (a few gallons or less) for most ORVs and because of the of the dilution factor associated with significantly

[1] Note 7 (from 18 AAC 70). *Samples to determine concentrations of total aromatic hydrocarbons (TAH) and total aqueous hydrocarbons (TAqH) must be collected in marine and fresh waters below the surface and away from any observable sheen; concentrations of TAqH must be determined and summed using a combination of: (A) EPA Method 602 (plus xylenes) or EPA Method 624 to quantify monoaromatic hydrocarbons and to measure TAH; and (B) EPA Method 610 or EPA Method 625 to quantify polynuclear aromatic hydrocarbons listed in EPA Method 610; use of an alternative method requires department approval; the EPA methods referred to in this note may be found in Appendix A of 40 C.F.R. 136, Appendix A, as revised as of July 1, 2003 and adopted by reference.*

larger relative volumes of water at stream crossings where these materials are most likely to be discharged or accumulate, the effect is likely to be negligible, localized and short term.

Hydrocarbons and other contaminants can also be leaked into aquatic systems when combusted and uncombusted fuels pass out the exhaust pipe of internal combustion engines. The mechanism for water pollution by these sources would occur either through exhausting combusted gasoline underwater (which sometimes happens at water crossings during high water periods) or through dry or wet deposition of combusted particulates (Stoker and Seager 1976). Heavy metals and nitrogen oxides, accumulate along ORV trails and may be mobilized into freshwater systems during precipitation events (Trombulak and Frissell 2000).

Repeated exposure to high concentrations of gasoline or gasoline combustion by-products can have carcinogenic effects, cause damage to internal organs (particularly kidneys and liver) and/or cause birth defects and chromosomal damage in humans. Carbon dioxide, carbon monoxide and various hydrocarbon contaminants including benzene, N-hexane, N-heptane, cyclohexane, methyl-t-butyl ether, and toluene are components of or combustion products from gasoline. However, again because of the dilution factor, these contaminants are likely to have negligible or minor localized effects of extremely short term duration on exposed downstream fishes and aquatic life.

4.3.1 Impacts of the No-Action Alternative

4.3.1.1 Direct and Indirect Impacts of the No-Action Alternative

If the no-action alternative is selected, some landowners may choose to reroute their access or utilize multiple access routes to their property. In addition, landowners may widen their existing access routes by cutting live or dead trees that would potentially provide large woody debris to fish habitat in the future. Unrestricted, multiple access routes, or access management methods that fail to protect aquatic and riparian areas, are likely to negatively affect aquatic resources by increasing fine sediment levels, turbidity, and contaminants. Negative effects are also likely to occur from reducing large woody debris levels.

4.3.1.2 Cumulative Effects of the No-Action Alternative

Cumulative effects to aquatic resources within the affected areas from past, present and ongoing activities are resulting in increased sedimentation of aquatic habitat, reduced large woody debris levels, fragmentation of fish habitat, reduced complexity of fish habitat, and downward trends in fish populations. Ongoing access use threatens aquatic habitat and populations. Vehicles, ranging in size from small ORVs to highway vehicles or large tracked equipment, ford fish bearing streams and disturb stream channel substrate and cause increases in turbidity as well as hydrocarbons and other contaminants. Disturbed areas generating sediment that is transported or resuspended would continue to generate sediment. Access use and maintenance reduces the amount of

large woody debris in stream channels. Undersized stream crossings trap large woody debris. Many fish populations occurring within the Park/Preserve are at the northern edge of their natural range. Relatively small impacts can threaten their viability.

Wrangell-St. Elias National Park and Preserve lacks any formal aquatic conservation strategy that establishes site specific management goals or protection for aquatic habitat. Other agency regulations related to fish habitat are poorly understood and due to staffing constraints, typically there is little field monitoring for compliance. The effects to aquatic resources from hundreds of miles of road and trails, over 100 airstrips, and existing ADOT&PF Roads are moderate overall. The additive effects to aquatic resources of selecting the no-action alternative are expected to be minor in the context of the sum of the cumulative effects.

4.3.1.3 Conclusions

The no-action alternative could result in minor effects to aquatic resources and fish, which would not lead to the impairment of park natural resources that are key to the purposes and values for which the park unit was established.

4.3.2 Impacts of the Preferred Alternative

4.3.2.1 Direct and Indirect Impacts of the Preferred Alternative

The preferred alternative does not address access facilities to inholdings with fords over fish bearing streams. The established gravel road to the Four Mile settlement near Slana has a properly designed culvert over Rufus Creek. Access routes within areas contributing large woody debris to fish bearing streams would not be issued RWCAs where operation and maintenance of the established facilities would result in measurable adverse affects to the contribution of large woody debris for fish habitat. The preferred alternative would not create any new disturbance or result in any impacts to fish-bearing streams. Restricting use to one access alignment is expected to reduce the amount of fine sediment input and would allow areas producing and supplying large woody debris to streams to recover. Hydrocarbon and other contaminant input is expected to remain the same. Other direct or indirect effects to aquatic resources would be negligible.

4.3.2.2 Cumulative Effects of the Preferred Alternative

The cumulative effects to aquatic resources and fish from all other human-caused effects in the study areas would be the same as described above for the no-action alternative in section 4.3.1.1, moderate. The effects to aquatic resources from the preferred alternative are expected to be negligible in the context of the sum of the cumulative effects.

4.3.2.3 Conclusions

The preferred alternative would result in negligible effects to aquatic resources and fish, which would not lead to the impairment of park natural resources that are key to the purposes and values for which the park unit was established.

4.4 Effects to Cultural Resources

4.4.1 Impacts from Alternative 1: No Action

4.4.1.1 Direct and Indirect Impacts

Under this No-Action Alternative, established and acceptable airplane, highway vehicle, off-highway vehicle (ORV), and waterline access to inholdings would continue. While the NPS has authorized a few corridors in the past, no additional ROWs would be issued under this alternative unless the landowner specifically requests one. The use of these access routes and methods under their current conditions would result in minor new negative impacts to the historic fabric due to erosion and the gradual widening of the existing, acceptable corridor footprints.

4.4.1.2 Cumulative Impacts
Human activities and natural events have caused major impacts to cultural resources throughout this undertaking's area of potential effect, including these particularly significant loci:

McCarthy Corridor: The construction and maintenance of the McCarthy Road permanently destroyed the integrity of about 60 miles of the historic Copper River and Northwestern Railway (CR&NW), many elements of which have been determined eligible for the National Register of Historic Places. Modifications to the Kuskulana Trestle greatly diminished its integrity of design. The construction of local airstrips, platted access corridors, and logging trails adversely affected other cultural features.

Nabesna Corridor: The construction of the Nabesna Road destroyed portions of the original pack trails leading from Slana to the Nabesna Mine and traversed unsurveyed, but potentially site-rich, prehistoric and early historic areas near Long and Twin Lakes and along Jack Creek. Maintenance activities have caused additional damage. Trails branching off this corridor have increased the potential for vandalism and looting.

May Creek Corridor: Flooding destroyed large portions of the May Creek Road, including both approaches to the Young Creek Bridge. Parts of the Nizina River Bridge were damaged by flooding in the 1950s and 1960s. Features along the corridor's Chititu branch have also been affected. Flooding has destroyed at least one building in Chititu Camp (XMC-053) and the Nizina Post Office (XMC-012) has collapsed.

McCarthy Creek Corridor: The McCarthy Creek valley contains twelve known historic sites. Four, the Green Butte Mining District (XMC-096), the McCarthy Creek Road (XMC-439), and two nearby cabins (XMC-044 and XMC-102), have been determined

eligible for listing on the National Register of Historic Places. The total impact to cultural resources along this corridor has been major, including the complete destruction of the lower Nikolai Creek cabin (XMC-051), the Meadow construction camp (XMC-042), and the Hero mill site (XMC-064).

Kennecott Mines National Historic Landmark (NHL): Many historic buildings within the Kennecott mill town were demolished in the 1950s, and several others were severely damaged. Even buildings at Kennecott's individual mines have been affected. Construction and maintenance activities within the McCarthy-Kennecott ROW have damaged or displaced other features.

Chisana-Gold Hill Historic Mining Landscape: Recent mining activity on Bonanza and Big Eldorado Creeks has adversely affected some cultural features. The expansion of the Chisana Airfield in the 1950s and the construction of the Chicken Creek Airstrip around 1960 produced similar effects.

Extensive vandalism, looting, damage, and destruction of cultural resources occurred under past conditions. Within a regional context, these actions have had a major effect on WRST's cultural landscape. Although the incremental effect of the No-Action Alternative is minor, the overall cumulative effects would remain major.

4.4.1.3 Conclusion

Implementing this No-Action Alternative would result in minor new impacts to cultural resources, but would not materially degrade their present condition. These effects would not result in the impairment of cultural resources fulfilling the specific purposes identified in the park's enabling legislation or that are key to its cultural identity.

4.4.2 Alternative 2 – NPS Proposed Action to Issue RWCAs

4.4.2.1 Direct and Indirect Impacts

This alternative specifically excludes any action possessing the potential to affect historic properties adversely. All access corridors would be surveyed by WRST personnel before a RWCA is issued. If those surveys identify any cultural features, those features would be formally evaluated for integrity and significance. Any access corridor containing features deemed eligible for the National Register of Historic Places would require additional analysis and be addressed in future NEPA compliance. Because the access facility footprint would be documented and maintained with approved terms and conditions in the RWCA to avoid effects outside that footprint and possibly reduce the area of effect, the potential for any future impacts to cultural resources would be avoided.

4.4.2.2 Cumulative Impacts

Extensive vandalism, looting, and destruction of historic features has occurred under past conditions, resulting in a major impact to the park's cultural landscape (see section above

at 4.4.1.2). The increased inventory and monitoring efforts associated with this authorization process would eliminate most future damage to cultural resources and help mitigate some past impacts. Within a regional context and given the more rigorous analysis this alternative requires, its contribution to cumulative impacts on cultural resources would be minor beneficial, leaving the total cumulative effects as major.

4.4.2.3 Conclusion

Implementing this NPS Preferred Alternative to issue RWCAs with terms and conditions to protect cultural resources, among others, would result in minor beneficial effects to cultural resources. These effects would not result in the impairment of cultural resources fulfilling the specific purposes identified in the park's enabling legislation or that are key to its cultural identity.

4.5 Effects on Inholder Property

4.5.1 Impacts from Alternative 1: No Action

4.5.1.1 Direct and Indirect Impacts:
There would be no new impacts to private land uses and property values from the no-action alternative as the current situation would not change. Property owners would use their present modes of access to their inholdings. There would be limited documentation of established access, and it would remain unclear whether the access needs of the landowner would be met.

Those inholders wishing to document their established access and obtain a RWCA would have to submit a complete SF-299 application form. Environmental compliance would be undertaken before the NPS could issue a RWCA. Any request would be processed separately and be addressed at some future time. For those not obtaining a RWCA or other authorized access to their inholdings, there would be uncertainty and a continued potential for misunderstanding and conflict between the landowners and the NPS regarding what constituted their ANILCA 1110(b) access facility and appropriate maintenance. Land values would likely increase only for those landowners that secured a RWCA. Property owners with established and maintainable access would have to wait for an individual EA to be completed before the NPS would issue them a RWCA. Without a RWCA the landowner is not authorized to sign or control use on the facility on parklands. Unintended trespass on private lands is more likely as the general public may not understand that the facility leads to private lands.

4.5.1.2 Cumulative Impacts

Approximately 600 miles of roads and trails and over 100 landing strips in the park, including State roads and park maintained airstrips, provide access to many inholder properties. This alternative addresses a subset of about 30 miles of roads and trails and 15 landing strips. The long-term effects to current private land ownership, uses, and property values from all of these access facilities would not materially change. Access would only

be assured for those who obtain individual access authorizations, where the NPS establishes public roads, or where the State of Alaska secures a ROW. Uncertainties about the validity of unauthorized access routes and means would remain the same through the foreseeable future. The additive effect of the no-action alternative to inholder property would be negligible in view of the overall access to nonfederal lands throughout the park.

4.5.1.3 Conclusions

The no-action alternative would not measurably impact the ownership, access to, or value of inholdings, but uncertainty about access uses and validity would remain.

4.5.2 Impacts from Alternative 2, NPS Proposed Action

4.5.2.1 Direct and Indirect Impacts:

Property owners with established and maintainable access who apply for a RWCA within the scope of this EA would not have to wait for an individual EA to be completed before the NPS would issue them a RWCA. For those obtaining a RWCA to their inholdings, there would be certainty and a reduced potential for misunderstanding and conflict between the landowner and the NPS regarding what constituted their ANILCA 1110(b) access facility and appropriate maintenance.

Access rights-of-way increase the appraised value of property. Property without clearly documented access is problematic; the uncertainty elevates the risk to the current owner or potential buyer. Properties with authorized rights-of-way have sold for 30%, and more, than similar properties without ROWs. This is because the real-estate market measures risk and adjusts for it. Having a RWCA would reduce or eliminate uncertainty regarding undocumented access. The risks include time, money, and uncertainty. Even though adequate and feasible access is provided for in law; a prospective purchaser must consider how much it would cost and how long it would take, to obtain a documented access right-of-way. Return on money invested in property may be lost while access rights are processed for full enjoyment of the land. These uncertainties do not apply when access is secured by a right-of-way certificate of access.

The owner or occupier of an inholding can post their property to prevent trespass. Under the proposed action, the NPS may allow the landowner to post the access route on federal lands with signs limiting vehicular use of the access route to authorized users. This would decrease the likelihood of trespass and unintended impacts to the tread surface, which would require more maintenance. These options can reduce trespass incidents and improve the owner’s enjoyment of their lands.

4.5.2.2 Cumulative Impacts

Many access facilities originate from the State of Alaska Nabesna Road and McCarthy Road ROWs or landing strips maintained by the NPS. For those inholdings adjacent to

these public access routes that do not need a RWCA, the uses and values of these lands would not change as a result of the proposed action.

The proposed action is expected to decrease the uncertainty and potentially increase the value of some inholdings; especially for those within the McCarthy and Nabesna road corridors, the Chisana area, or remote areas where RWCAs could be authorized. The no action alternative would also reduce potential trespass and therefore the enjoyment and property values of those properties obtaining a RWCA. The number of inholdings with authorized access within WRST is expected to increase. The overall effect to inholder property within the park would be a moderate increase in property values (up to 30%) and certainty of access for a subset of inholder lands.

4.5.2.3 Conclusions
The proposed action would have a moderately positive impact on the uses and values of inholdings for those landowners who obtain a RWCA.

4.6 Effects on Public Access and Recreational Use

4.6.1 Impacts from Alternative 1: No Action

4.6.1.1 Direct and Indirect Impacts:

Public access and recreational use based on continued unauthorized use of existing access to inholdings would change very little. The primary impact to public access and recreational use under this alternative would be the potential confusion about the location and appropriate access facilities for public lands in the vicinity of inholdings. Some incidents of unintentional trespass may occur due to lack of signs or confusion about current land status and appropriate access routes. Some visitor frustration would most likely result from this confusion. Trespass incidents could also result in conflicts between inholders other park visitors.

4.6.1.2 Cumulative Impacts

The cumulative impacts to public access and recreational use result from adding the past impacts to the foreseeable future impacts identified under this alternative.

There are approximately 784,000 acres of nonfederal lands within WRST. Past development includes, settlement of the towns of McCarthy and Chisana, mineral exploration and mining circa 1900 until the present (USNPS 1990), oil and gas seismic exploration circa 1960, commercial logging in the 1990's, homestead settlement 1900 until 1970, facilities supporting commercial guiding and hunting operations, and land subdivisions and sales with settlements for residential and recreational use proximal to the Nabesna and McCarthy road systems. Existing access facilities include ORV trails and routes, fixed-wing aircraft landing strips, and two Alaska State Roads - McCarthy and Nabesna.

Development of inholdings and improvements to access facilities in future years could result in increased volume of users and more substantial use of access facilities. Such increases could impact public access and recreational use by shifting the character of these areas from generally primitive to more developed. Overall, such a change would have minor impacts for those visitors that expect a more undeveloped and self-reliant experience. The NPS would use the NEPA process to evaluate these potential future changes and would minimize and mitigate impacts as warranted.

The effects on scenic quality and increased noise resulting from about 600 miles of roads and trails and over 100 airstrips for access to nonfederal lands in WRST have a moderate negative effect on primitive recreational opportunities. These facilities also provide necessary access for both inholders and recreational users to remote parts of WRST. The effects of the no-action alternative from continued unauthorized use of about 30 miles of road and trails, 15 landing strips, and 4 waterlines and associated foot paths would contribute minor negative impacts to visitor use and recreation. There would also be minor positive impacts to public access and recreational use due to the continued availability of access facilities under the current conditions. This results in no change in the overall moderate cumulative impacts of these access facilities to public access and recreational use.

4.6.1.3 Conclusions

Implementation of the no-alternative would have minor negative effects on public access and recreational use.

4.6.2 Impacts from Alternative 2, NPS Proposed Action

4.6.2.1 Direct and Indirect Impacts:

The NPS proposed action would result in NPS authorization and management of existing access facilities for inholdings that are maintainable in their current footprint and use patterns. Minor benefits to visitor experience would occur due to the implementation of this alternative. The process of issuing RWCAs to inholders for their access facilities would provide documentation of these routes. This information could be made available to visitors so they would know what activities were appropriate on any individual route; thus decreasing the potential for trespass incidents and conflicts between visitors and landowners. Minor negative effects to public access and recreational use would occur due to the implementation of this alternative if access routes issued RWCAs were restricted.

Private property may be posted with “no trespass” signs at any time at the discretion of the landowner. Under this proposed action, the access facility route on public lands may be posted with signs limiting vehicular traffic to authorized users. These options would restrict public access and recreational use (minor negative impact), but there would be a minor improvement in visitor experience by clarification of appropriate access routes and public use areas.

Issuance of RWCAs for inholder access facilities would provide landowners with clear standards and maintenance tools for their access facilities. The use of these tools would ensure that resource impacts would not be occurring on adjacent park and preserve lands. Accordingly, visitors would see minor improvements to the visual quality on and adjacent to these routes due to effective management and maintenance. Noise impacts would remain essentially as in the no action alternative.

4.6.2.2 Cumulative Impacts

Cumulative impacts of access facilities in WRST to recreation and visitor use would continue to be moderate as described above in section 4.6.1.2 despite the minor benefits to visitor use and recreation from the proposed action to issue RWCAs and actively manage inholder access facilities.

4.6.2.3 Conclusions

Implementation of this alternative would have minor adverse and beneficial impacts on public access and recreation.

4.7 Effects on Soils

4.7.1 Impacts of Alternative 1 (No Action)

4.7.1.1 Direct and Indirect Impacts:

Soil impacts are a function of the established level of development (covered, bladed, or trammeled), use of motorized vehicles (frequency, vehicle class, period of use) ongoing maintenance (grading, ditching, and placing fill) as well as natural processes responding to these disturbances. Direct soil impacts are primarily confined to the established access disturbance footprint. Along these routes soils would continue to degrade through compaction, erosion, and thermokarst. Many sections of the established facilities are already impacted and have lost soil and/or exposed underlying unconsolidated surficial mineral deposits. Impacts are expected to be worst on those portions of facilities that pass through wetlands or traverse steep slopes. Repeated passes during breakup or over partially thawed soils underlain by ice during periods of excessive wetness and on slopes would lead to deterioration of soils conditions. These would result in erosion and the loss of some soil function.

Impacts to soils adjacent to a facility principally result from indirect consequence to the surface hydrology and changes to the underlying permafrost. These include the disruption of surface water flow, reductions in infiltration and percolation, surface ponding, and the loss of water-holding capacity. Other potential indirect impacts include wind and water erosion and deposition of transported material.

Under this alternative, a number of factors would likely contribute to an expected increase in soil impacts outside the minimum footprint necessary for acceptable access

along established facilities. There would be an increased footprint of damage to the soil resources because there would be limited control of: a) access construction, rerouting, and facility maintenance; b) where ORVs travel; and c) no controls related to soils protection. The amount of damage cannot be accurately predicted, but over the long term it could result in degradation of soils from continued travel through wetlands and along braided trails.

We anticipate that there would be small incremental changes in the nature of the established access facility footprint width, access class, and soil conditions. For access facilities that are generally acceptable and maintained, these changes would be negligible. For those that are not acceptable or adequately maintained there would be additional minor and moderate impacts to soils.

Soils would be lost and degrade along access routes that are not protected by a gravel cap or in areas without any substantial natural soil development such as barren gravel floodplain. Changes in soil conditions would be most noticeable within unimproved ORV tracks/facilities from continued use. Locally there would be low to medium intensity, long-term new impacts to common soils within the footprint of unimproved tracks. Braiding most commonly occurs along unimproved ORV tracks/facilities which have not had a gravel pad constructed or been bladed. Expansion of the existing disturbance corridor would likely occur locally from continued ORV use. Expansion destroys the permafrost and vegetation cover, which protect soils, unless maintenance operations such as surface water control or facility hardening are undertaken.

Construction of new access facilities, expansion or upgrades would directly and indirectly impact pristine soils or substantially affect functional soil systems. These impacts are potentially greatest in locations with well developed soil horizons and wetlands. Where an operator does not select an acceptable location or fails to adequately design or maintain a facility, the impacts to soils can be of medium to high intensity, long-term and affect important or unique resources.

The use of motorized equipment across frozen ground with ice or snow cover has a negligible affect on soil hydrology, stratigraphy, and function. Local soils contamination could occur from fuel spills.

Effects of Gravel Roads (Access Class 1)

For constructed facilities where gravel has been placed to support the passage of motorized vehicles, the principal affect on soils is that the in situ soils are covered. For facilities that were originally constructed over undeveloped routes the soil stratigraphy is essentially intact. Gravel roads in many situations were developed after overland travel had commenced and the underlying soils may have lost some or most of their functional value. Soils underlying gravel roads are compacted and local soil hydrology within the footprint is modified. These impacts reduce or eliminate the soil's ability to support native plant life and alter the existing plant community. Although fill locally provides a barrier that protects the root systems of trees adjacent to the facility, the water content, temperature and density of soils is altered. Placing fill in areas may reduce the potential

of a degraded facility to capture and divert surface flow and alter local soil hydrology adjacent to the alignment and may enhance insulation of the under laying permafrost. Hence placing fill in degraded areas often provides a net benefit to adjacent soils. Long-term, high intensity impacts to common soils within constructed facility footprints would result from covering natural surfaces with gravel or fill material.

Effects of Bladed Facilities (Access Class 2)
The soils in established facilities that were bladed with motorized equipment such as a bulldozer commonly have had all or most of the organic soil horizon removed from the facility footprint along with some of the underlying mineral soils. These soils are either cast aside forming berms of mixed organic and mineral deposits or placed as fill in lower topographic features within the facility alignment. Soils in established facilities, where blading did not remove all of the organic or underlying mineral material, result in a "disturbed" soil regime, which provides for a reduced level of soil function. The removal of the organic horizon destroys the protective layer making the area susceptible to erosion. Removal of soils also creates a topographic "low" and changes the thermal regime. Topographic lows tend to capture surface water and alter local soil hydrology. Vehicle travel and maintenance grading prevents natural soils from reestablishing and functioning naturally.

Blading impacts soils. It involves disturbance that changes or degrades the natural conditions of the area affecting plant growth, water regime, or the natural soil stratigraphy. In poorly drained areas melting of seasonal frost and permafrost zones occurs more rapidly and to greater depths. Adverse soil effects occur where a bladed and traveled surface disturbs an area to the degree the soils no longer support plant life or the disturbance alters the existing plant community. These impacts are usually of a mechanical nature including stripping, shearing, abrasion, compaction, and mixing. Changes to soil are greatly amplified by a change in water regime that affects hydrology.

Medium intensity, long-term impacts to common soils would result within facility footprints from blading and grading of natural surfaces. Blading can lead to subsequent problems of rutting, erosion, muddy sections or ponding where the underlying substrate lack sufficient coarse material to support vehicle passage or where the permafrost is more directly affected by melting due to removal of the organic horizon. Surface water control features (SWCF) such as ditches and culverts impact soils when constructed and maintained but these disturbances subsequently allow for reestablished soil function. In some cases SWCFs may greatly enhance the ongoing hydrologic functions of soils adjacent to the established footprint.

Effects of Unimproved Tracks and ORV Trails (Access Class 3)
Soils underlying unimproved ORV trails and 4-wheeled drive tracks are impacted from wheel contact by abrasion, shearing, compression, and displacement within the established footprint. Abrasion strips surface vegetation and roots. Compaction causes surface subsidence. Displacement results in the mechanical movement of soil particles. These disturbances change or degrade the natural soil conditions of the area affecting plant growth, water regime, or the natural stratigraphy. Often these soils no longer

support plant life, or the disturbance alters the existing plant community. Vehicle travel can lead to subsequent problems of rutting, erosion, muddy sections or ponding where the underlying substrate lacks sufficient coarse material to support vehicle passage or where the permafrost is more directly affected by melting due to removal of the organic horizon. Changes to soil are greatly amplified by a change in water regime that affects hydrology. Melting of seasonal frost and permafrost zones occurs more rapidly once vegetation and soils are disturbed; it is greatest in poorly drained areas.

Long-term, medium intensity impacts within facility footprints to common soils would result from overland travel on unimproved facilities across natural surfaces. Soils impacts are expected both on-and off facility, intensifying in previously low-impacted areas and expanding to adjacent non-impacted areas. Continuation of past use levels would further strain the soils, reduce their functional value, and result in the continuation of the same or similar impacts.

Construction of new access facilities and expansion or upgrades of established facilities pose threats to soils and can cause loss of soils and/or reduces the soil function in manners outlined above. These impacts are potentially greatest in areas with well developed soil horizons and wetland areas. Where an operator does not select an acceptable location and/or fails to adequately design or maintain a facility, the impacts to soils can be of medium to high intensity, long-term, and affect important or unique resources.

Effects of Access Facilities on Barren Lands (Access Class 4)
For established facilities located in barren floodplains and relatively young upland terraces containing a gravel and/or sand substrate which are generally well drained, the impacts would be barely perceptible and temporary to short term principally because of the lack of any well developed soils or periodic reworking of gravels in barren floodplains.

Effects of Waterline Facilities
Soils impacts resulting from ongoing waterline maintenance and use are principally associated with footpath travel as all established waterline utilities are placed above ground. Impacts to soils would generally be low intensity and temporary for foot travel along waterline corridors.

4.7.1.2 Cumulative Impacts:

Historic and recent activities in WRST have impacted native soils and underlying substrates. These include clearing for development sites, overland travel with ORVs, construction of roads, railroads, trails, airstrips and utilities, and undertaking logging, mining and recreational operations. Past activities removed soils from production and led to loss of soil resources by burial, grading, and wind and water erosion. The loss of production ranges from temporary to long term. When temporary use and occupancy was discontinued, soil productivity resumed at a reduced level. Disturbances principally changed the character of native soils by modifying the texture, organic content, and

drainage. Motorized vehicle travel, facility construction and maintenance, and blading disrupted soil productivity and soil development, exposed areas to erosion, and affected plant communities. Impacts are greatest in wet areas and areas underlain by permafrost. In total, impact activities that occurred before establishment of the park have had a moderate impact on soil resources. Any foreseeable future action would likely be limited to those occurring along a historic or existing alignment to private properties or on private lands. These access facilities would likely be within the footprint of past disturbance and be minor or moderate. The addition of impacts from actions under this alternative would generate minor to moderate additional cumulative impacts to soils, depending upon the access class. The total cumulative impacts to soils resources within WRST from past, ongoing, and future effects would be considered moderate.

4.7.1.3 Conclusion:

Under Alternative 1, soils impacts from continuing operation of motorized vehicles and maintenance would generally be confined within the existing footprint corridor of development and associated disturbance. It would generate minor adverse impacts to soil resources. The level of effects on soils would not result in an impairment of park resources.

4.7.2 Impacts of Alternative 2:

4.7.2.1 Direct and Indirect Impacts to Soils

The effects to soils would be essentially the same as those presented in Alternative 1 for those soils in and along acceptable and maintainable access facilities for which an ANILCA 1110(b) RWCA is issued. These RWCAs would document the necessary established footprint dimensions, vehicle class, agreed upon maintenance operations and conditions, and allow for monitoring operations. RWCA terms and conditions would prevent unnecessary and reduce or eliminate adverse impacts to soils and the environment outside the established disturbance footprint. In some cases short widened or duplicative routes may be abandoned allowing for natural restoration processes to occur, which provide a net benefit to soil resources. Erosion of soils would be controlled. Some of the ongoing and potential future disruption of surface water flow, reductions in infiltration and percolation, surface ponding, and the loss of water-holding capacity would be reduced. In some cases we anticipate there would be net benefits to soil hydrology, surface water hydrology, seasonal and permafrost conditions and prevent additional loss of soil. A documented access facility provides for collaboration between the landowner and the NPS to reduce the potential for new impacts from ongoing operations while providing for the established and acceptable access and protecting park resources. Improvements outside an authorized RWCA would receive additional future environmental analysis.

NPS RWCAs, collaboration with the landowners, and monitoring would minimize some of the potential soil impacts, especially the indirect impacts.

NPS technical staff would collaborate with landowners on maintenance conditions and approach with incorporation of practical and feasible maintenance practices, as warranted, to document in the terms and conditions of an ANILCA 1110(b) RWCA. This would move inholder access operations to an acceptable design, which would potentially reduce and mitigate soils impacts in the corridor and adjacent to the established facility disturbance.

4.7.2.2 Cumulative Impacts:

Present and future conditions would be as outlined in the Alternative 1, section 4.7.1.2. The overall cumulative impact with Alternative 2 on soil resources coupled with any past, present, and future actions would likely be moderate. Alternative 2 would contribute negligible additional adverse effects within the footprint and potentially minor beneficial effects to adjacent park lands.

4.7.2.3 Conclusion:

Overall, effects on existing soil conditions for established acceptable access facilities would result in negligible adverse impacts and possibly minor beneficial effects. The level of impacts to soils anticipated from this alternative would not result in an impairment of park resources that fulfill specific purposes identified in the establishing legislation or that are key to the integrity of the park.

4.8 Effects on Vegetation and Wetlands

4.8.1 Impacts from Alternative 1: No Action

4.8.1.1 Direct and Indirect Impacts

The following analysis recognizes impacts from two types of actions: (1) direct impacts from existing facilities and construction of new facilities, expansions and upgrades to established facilities without appropriate design and mitigation measures and (2) indirect impacts from fugitive dust, changes in water flow, and the escapement of exotic invasive plants into natural park areas. Impacts within facility footprints are considered direct, impacts outside of the facility footprints are considered indirect. All components of vegetation could have indirect and direct effects. Common vegetation types include vast expanses of white spruce forest, black spruce forest, mixed hardwood and evergreen forest, various scrub-shrub types, and alpine and sub-alpine tundra areas. Important vegetation types noted in the enabling legislation would be habitat for fish and wildlife including, but not limited to caribou, brown/grizzly bears, Dall sheep, moose, wolves, trumpeter swans, and other waterfowl. Wetlands connected to navigable waters are protected by the Clean Water Act and would be important for waterfowl and fish. Riparian areas would be important for fish, bear, and moose habitat. Rare plants are considered to be unique vegetative resources.

Impacts to Vegetation and Wetlands

Vegetation and wetlands on access to inholdings have already been altered to various degrees through removal of vegetation, erosion of topsoil, placement of fill, compaction of soil, changes in hydrology and the thermal regime and subsequent changes in species composition. It is estimated that there have been some direct impacts to vegetation on a maximum of 60 acres of established subject access facilities in the park. Approximately 24% of the established access facilities within the park are classified as wetlands. The continued use of these access routes without the implementation of mitigation measures would most likely result in additional losses of vegetation and wetlands and changes in species composition adjacent to the routes as soil erosion, soil compaction and altered hydrology progress. Vegetation disturbance is directly related to soil disturbance. As described in Section 4.7, the indirect effects to vegetation adjacent to facilities would be greatest on unimproved ORV trails (especially those in wetlands and with well developed soil horizons), bladed trails, and facilities with gravel fill. Indirect impacts to vegetation would be less to vegetation on barren floodplains and young river terraces.

The direct effects to vegetation and wetlands within and adjacent to established facilities would be long term to permanent in duration but of low intensity, localized and representing a small portion of the these important resources in the park. The indirect effects to vegetation and wetlands adjacent to facilities would range from low to medium intensity over short durations to common resources (in well-drained soils such as floodplains and early river terrace communities with little soil development), to medium intensity and longer duration effects to important resources (in wetland communities, areas with permafrost and areas with well-developed soil horizons).

Construction of new facilities, expansions and upgrades to established facilities without appropriate design and mitigation measures could occur under the No Action Alternative. These actions would directly and indirectly impact vegetation and wetlands as described above. The effects to vegetation could vary greatly depending on soils, hydrology and landscape position.

Impacts due to Exotic Plants

Native sub-arctic plant communities, with their relatively low species diversity, may be poorly suited to adapt to rapidly evolving exotic species (Levine 2000, Levine and D'Antonio 1999). A principal of natural resource management is to protect healthy functioning ecosystems (not to manage for individual species). Slowing down the rate of spread of invasive exotic species into natural communities should promote co-evolution and adaptation of native species and communities to the rapidly changing global environment (Cox 2004).

Airplanes, highway vehicles and ORV's are the primary vectors for the spread of exotic plants as is the spread of infested road fill. Therefore, we expect the use of these facilities with continued disturbance to increase the rate of spread, number, and area covered by exotic plant species in the park. Established inholder access facilities cover a maximum of 65 miles in the park, all of which are potential vectors for the spread of exotic plants. Most of this mileage is adjacent to the McCarthy and Nabesna Roads, the

main vectors in the park, but many facilities are remote and have the potential to spread exotic plants into disturbed landscapes of natural communities throughout the park.

The spread of exotic plant species could have indirect impacts to native plant communities with continued use of facilities without the implementation of mitigation measures. The effects could be wide spread with a measurable alteration to the park's native plant communities and therefore of medium intensity. Also, there could be long term to permanent alterations to the integrity of native plant communities adjacent to facilities.

Impacts to Rare Plants

Rare plant surveys have not been conducted of the subject access facilities, so the impact of this alternative is difficult to assess. There are 25 species, however, which occur in areas adjacent to facilities and 15 additional species that are likely to occur based on their distribution in the park. Four species of rare plants in the park are known from five or fewer populations in the world. Impacts to their habitat or populations could impair the survival of these species. Additionally, there are 31 rare plants in the park that are known from five or fewer localities in the state. Removing these populations or their habitat could affect the distribution of the species in Alaska and the species' ability to survive at the edge of their range.

If there are populations of rare plants directly adjacent to or in alignments, these populations would be impacted by continued access to inholdings without mitigating measures. These populations could be removed by natural widening of the alignment, by changes to the hydrology and soils which would alter the habitat, and by competition with invasive plant species (native and non-native).

If no rare plants are found within or adjacent to existing facilities there would be no adverse effects to this resource. If rare plant populations are found within or adjacent to facilities, then the impacts to rare plants under Alternative 1 would be of low to high intensity, long term to permanent to these unique park resources. Therefore, potential impacts to rare plants could vary widely depending on the global and state distributions of the species.

4.8.1.2 Cumulative Impacts

Human induced effects to vegetation in the vicinity of established access to inholdings include:

- Facility development. There are 727 miles of trails, tracks and roads in the park, 102 airstrips and 19,952 acres of mining claims. The vegetation and wetlands on these facilities have been either permanently altered or removed. Most of these facilities were present prior to the establishment of the park. All of these facilities as well as development on private land increase the spread and dispersal of exotic plant species (Forman et. al. 2003).

- Global warming is causing an observable reduction of wetlands (particularly lacustrine types) and an expected reduction in alpine plant communities in the park. This adds stress to rare plants in these communities in the form of lowered genetic availability and reduced habitat availability.
- Fires along the McCarthy Road corridor have created a mosaic of successional forest communities, opening up the forest canopy and promoting higher species diversity.
- Clear-cut logging occurs along the McCarthy Road on private land in a buffer zone between park lands and the road. This has created disturbed ground for the introduction of exotic and invasive plant species and is likely to affect adjacent native plant communities on park land.
- Increased recreational visitation occurs near airstrips and trails in the park, especially remote areas of the park. Exotic weeds have been spread on the tires of fixed-wing aircraft and are likely to be spread on the soles and clothes of visitors.
- Development of private property in park. Private property owners may plant non-native seed or invasive horticultural species that escape cultivation. This has been observed throughout the park.
- Increased traffic along the McCarthy Road has increased the spread of exotic plant species. Road dust and vehicle pollution have detrimental affects to the buffer zone vegetation decreasing species' ability to adapt to other environmental stressors (such as competition with exotics and changing climate). Trampling of vegetation adjacent to the road by campers is also increasing.
- Road improvements and maintenance on the McCarthy and Nabesna Roads. Exotic weed seed is spread in fill. Hydrology and soils are altered, which in turn effect the composition and health of adjacent plant communities.
- Grazing. Imported feed for horses grazing on allotments throughout the park contain weed seed. Grazing alters the composition of native plant communities.

The effects of past and present impacts of human activities to the vegetation resources in the park are moderate because the effects are of low intensity but long term. The impacts from actions under Alternative 1 are also mixed but moderate overall, therefore, cumulative impacts to vegetation from Alternative 1 past, proposed and future activities remain moderate.

4.8.1.3 Conclusion

Overall, implementing this No-Action Alternative could have moderate adverse effects to the wetlands and vegetation (plant community structure, distribution and composition) of the park. This impact level incorporates the impact analysis described above for the separate components of vegetation. Continued implementation of this alternative would not result in the impairment of park natural resources that are key to the purposes and values for which the park was established.

4.8.2 Impacts from Alternative 2, NPS Proposed Action

4.8.2.1 Direct and Indirect Impacts

The effects to vegetation under alternative 2 would be the same as those presented in Alternative 1 except for vegetation in and adjacent to established and acceptable access facilities for which an ANILCA 1110(b) right-of-way certificate of access is issued. These facilities would be surveyed for the presence of wetlands and rare and exotic plant species. This alternative specifically addresses any action possessing the potential to affect these vegetation resources through the implementation of mitigation measures and the terms and conditions of the right-of-way agreement. If the surveys identify wetlands adjacent to or in the facility footprint, stipulations would be developed in collaboration with the landowners to prevent additional loss of wetland area, function, or value. Stipulations would also be developed to help reduce the spread of exotic plant species onto park lands and to protect any rare plant populations that are documented.

Damages to resources in the existing footprints and adjacent areas that have not yet been documented would be reduced through the terms and conditions of the right-of-way agreement thereby having some potential beneficial effects for all vegetation resources. Effects to the specific components of vegetation under Alternative 2 are described below.

Impacts to Vegetation and Wetlands

Existing perceptible and measurable impacts to vegetation and wetlands within the footprint would continue due to continued authorized brushing and the edge effects of vehicle use (such as soil erosion, fugitive dust, vegetation breakage, and effects from pollutants). These effects would be low intensity and intermittent, long term to permanent, but localized in a small portion of the park. Surveys to identify wetlands under Alternative 2 and stipulations to improve wetland function and to ensure the NPS policy of no net loss of wetlands would result in small measurable beneficial effects.

Impacts due to Exotic Plants

It would not be possible to completely stop the spread of exotic plants onto park lands from access facilities, even with stipulations. Therefore, there would be small measurable effects to native plant communities due to the spread of exotic plants because the effects would be of low intensity (due to the implementation of stipulations) but long term to permanent.

Impacts to Rare Plants

Effects to the park's rare plant populations under Alternative 2 would be of very low intensity if any measurable effect at all. Surveys would document any populations that occur in the facility footprint or in adjacent areas, and stipulations would be developed to prevent impacts to these populations.

4.8.2.2 Cumulative Impacts:

Cumulative impacts from past and current activities described for Alternative 1 apply to Alternative 2 and have a potentially moderate effect on the park's vegetation resources. The contribution of minor adverse and minor beneficial effects from Alternative 2 to the cumulative impacts on vegetation resources would not change the overall cumulative effects from a moderate level.

4.8.2.3 Conclusion:

Changes to vegetation resources on established and acceptable access facilities under Alternative 2 would be minor because of the beneficial effects of documenting resources and the development of stipulations to minimize impacts within and adjacent to facility footprints. Implementation of this alternative would not result in the impairment of park natural resources that are key to the purposes and values for which the park was established.

4.9 Effects on Wilderness

4.9.1 Impacts from Alternative 1 - No Action

4.9.1.1 Direct and Indirect Impacts of Alternative 1:

Under this alternative, the use of five access facilities to inholdings in designated or eligible wilderness would continue. One is a bladed driveway off the McCarthy Road, which traverses about 1.2 miles of designated wilderness. There may be a couple of unimproved class 4 ORV trail routes to inholdings and the others are remote airstrips with limited motorized track to the inholdings. No RWCAs would be issued and there would be no documentation of routes except when requested by the landowner. The number and type of access routes could increase without active management, resulting in medium impacts to the wilderness resources (of undeveloped, untrammeled, naturalness and opportunity for solitude or unconfined recreation). There would be a low level of use expected for these access facilities to accomplish private, personal access to private properties. The value of wilderness includes the opportunity for solitude or unconfined recreation, and a wilderness experience is also partly dependent on the wilderness setting representing a natural ecosystem. The presence of access routes alters the natural condition, and there would be occasional temporal impacts to the opportunity for solitude or unconfined recreation over the long term use of these access facilities.

Additional effects to the naturalness of wilderness could result from invasive plants which are commonly brought into wilderness areas with vehicles along access routes or at access portals such as airstrips. (See section 4.8.1.1.) These invasive plants could alter the natural condition of the ecosystem potentially leading to additional management actions, which would also affect the untrammeled character of wilderness.

The issuance by landowner request of any RWCA within the Class 1 or Class 2 category for a constructed road would result in authorized long term impacts on wilderness resources where this would occur in designated or eligible wilderness. This may reduce the status of eligible lands as they would no longer meet the standard eligibility criteria for wilderness designation, however, Congress could authorize wilderness all around these access facilities and even include them as with the ANILCA 1110(b) exception.

4.9.1.2 Cumulative Effects:

The current access within designated or eligible wilderness is already taking place and many of the impacts are already occurring on airstrips and several miles of roads, tracks, and winter trails in the park and preserve designated or eligible wilderness. There is the possibility of new or expanded access routes occurring in this alternative, which would add to the cumulative presence of access routes in WRST. In designated or eligible wilderness there are numerous landing strips that are not maintained with heavy equipment, 28 miles of bladed routes or ORV trails, about 10 miles of overland track remaining from mineral development, and about 30 miles of winter access routes (see Table 4.3).

Table 4.3 Access Facilities in Wilderness

	Distance in Wilderness (miles)	
Facility	**Designated**	**Eligible**
Landing Strips	4 (~1.8 miles)	8 (~3 miles)
Bladed Road (from McCarthy Road)	1.2	
Bladed Route (e.g. Kotsina Trail)	8	
Overland Track (e.g. Orange Hill Mining trail)		10
Winter Access Routes (e.g. Beaver Lake Trail)		30
ORV Trails to Native Lands (e.g. Mt Drum Trail)		20
TOTAL	~10	~63

There have been no previously approved ROWs issued in designated wilderness, but short-term special use permits have been issued for overland ORV travel and winter trail access for the movement of large equipment and supplies. The presence of roads has a long term impact to wilderness resources. Additively the no-action alternative, considering the established and acceptable access facilities under review in this EA, would contribute minor adverse effects to wilderness resources and the overall effect to wilderness resources in the park from existing access facilities would be moderate.

4.9.1.3 Conclusion:

Implementation of this alternative would result in minor additional impacts to wilderness resources but would not materially degrade their present condition. The effects of this alternative would not result in the impairment of wilderness resources in WRST that are key to the purposes and values for which the unit was established.

4.9.2 Impacts from Alternative 2, NPS Proposed Action

4.9.2.1 Direct and Indirect Impacts of Alternative 2:

Under this alternative use of established access routes would be managed and maintained in an acceptable condition. We anticipate that approximately 5 RWCAs could be issued for access facilities partly or wholly within park wilderness. Park staff would complete a minimum requirements analysis on each existing facility before issuing a RWCA. Any RWCA issued under this alternative would result in no new adverse impacts to park wilderness resources.

Under this alternative no new construction would be allowed, but small improvements within facility footprints would be allowed to existing access. Each RWCA would include approved terms and conditions to avoid effects occurring outside the existing footprint, so new impacts to wilderness resources would be avoided. The value of wilderness includes the opportunity for solitude or unconfined recreation, and a wilderness experience is also partly dependent on the wilderness setting representing a natural ecosystem. The presence of long term access routes alters the natural condition, but the impacts to the opportunity for solitude or unconfined recreation would be low because levels of uses are anticipated to be of low intensity and short duration. There is already less of an expectation of solitude at access portals such as airstrips in the wilderness.

Additional effects to the naturalness of wilderness could result from invasive plants which are commonly brought into wilderness areas with vehicles along access routes or at access portals such as airstrips. (See section 4.8.2.1.) These invasive plants could alter the natural condition of the ecosystem potentially leading to additional management actions also affecting the untrammeled character of wilderness. Under this alternative, invasive plants would be more likely to be identified and controlled due to the surveys and other management oversight that would occur.

Overall the impacts to the wilderness resources (of undeveloped, untrammeled, naturalness and opportunity for solitude or unconfined recreation) would be long term because of the assignment of rights of way certificates of access for long term or constructed roads. The issuance of these certificates would change the status of eligible lands as they would no longer meet the standard eligibility criteria for wilderness designation. Other forms of access such as trails, routes and airstrips may not have the same impact as permanent roads on eligible areas as they may be more easily mitigated if

use patterns or needs change over time. For a more detailed analysis of wilderness impacts see appendix K.

4.9.2.2 Cumulative Effects:

Five of the established and acceptable access facilities are already located within designated or eligible wilderness and can not be rerouted to exclude their effect on wilderness. The current access within designated or eligible wilderness is already taking place and many of the impacts are already occurring on airstrips and several miles of roads, tracks, and winter trails in the park and preserve designated or eligible wilderness as summarized above in the no-action alternative section 4.9.1.2. Additively the proposed action alternative to issue RWCAs would contribute minor adverse effects to wilderness resources, with some beneficial effects due to increased management involvement in locating and maintenance of the access facilities. The overall effect to wilderness resources in the park from existing access facilities and these RWCAs would remain moderate.

4.9.2.3 Conclusion:

The assignment of RWCA in designated or eligible wilderness would result in no new impacts to wilderness resources, and, due to documenting and managing access routes, would have a minor beneficial effect. The effects of this alternative would not result in the impairment of wilderness resources in WRST that are key to the purposes and values for which the unit was established.

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