

4.0 ENVIRONMENTAL CONSEQUENCES AND CUMULATIVE IMPACTS

4.1 No Action (Existing Access)

4.1.1 Physical Environment

4.1.1.1 Geologic Resources

The no-action alternative using existing access with no improvements would have negligible to minor effects on soil stability for three reasons. Permafrost is probably absent, the coarse alluvial gravels are thaw stable, and the slope is nearly level along the existing mining access road up the valley bottoms of Moose and Spruce Creeks. Minor channels down the existing roadbed would continue to form during floods. The existing road has rutted through the fine-grained cover deposits in many places, creating the potential for these depressed roadbeds to capture flowing water during floods. This channeling has the potential to increase erosion of fine-grained soils near the surface, but the gravel and cobbles near the surface limit extent of erosion. This phenomenon was observed in the August 2000 floods. No gravel sources would be developed for this alternative.

Conclusion: In summary, the overall impacts to geological resources from the no-action alternative would be negligible and would not result in the impairment of park natural resources, purposes, or values of the park.

4.1.1.2 Natural Quiet

Vehicles traveling to the parcels at Spruce #4 would make a maximum of 40 roundtrips during the summer season (20 for each applicant), and airplane access would stay at a low level (estimated at one Super Cub flight per week) at the lower Glen Creek airstrip. Noise associated with these activities would cause minor increases over ambient noise levels in the area and would be generated only intermittently.

Conclusion: In summary, the no-action alternative would cause minor increases over ambient noise levels because the low frequency and short duration of noise-generating activities along the access route to the Spruce #4 property. This alternative would not result in an impairment of the natural resources and wilderness forms of recreation in the park.

4.1.1.3 Visual Quality

The visual impacts of the no-action alternative would be low because of the lack of construction activity and the low frequency of traffic accessing the Spruce #4 property. The most noticeable visual impact would be the small airplane flights to and from the lower Glen Creek airstrip. Level terrain and thick vegetation along the valley bottoms would limit the visual impacts of the applicants' occasional vehicle traffic to and from the cabins at Spruce #4.

Conclusion: In summary, the effects on visual resources would remain unchanged. This alternative would not result in an impairment of the scenery and wilderness forms of recreation in the park.

4.1.1.4 Water Resources

The no-action alternative, the continued use of the existing route, would require stream crossings at 38 locations along Moose and Spruce creeks and 1,600 feet of instream travel in Spruce Creek by a variety of vehicles.

Potential impacts on water resources include alteration of hydrologic characteristics and water quality during operation. Studies have noted the importance of these clear-water fish habitats in the Kantishna area streams, contrasting with the other, mostly glacially affected streams in Denali National Park and Preserve (Meyer and Kavanagh 1983, NPS 1990). The number of stream crossings repeated throughout the open-water season slightly increases the potential for impacts on the water quality of recovering (post-mining) or pristine streams along the existing route.

Vehicle passage on this route during the open-water season would result in localized long-term impacts from the periodic exposure to short-duration increases in low levels of suspended sediments and turbidity. In a field trial designed to assess potential impacts from vehicle crossings in Moose Creek, Marshall (1998) noted three sources of sediment inputs during stream crossings or fordings by various vehicles. These were stream-bank erosion from wake action, dust or mud carried on the body of the vehicle, and resuspension of streambed load. Single vehicle passes often (50% of observations) resulted in increases of >5 NTU (nephelometric turbidity units) within 50 m downstream from the crossing, causing some excesses of state water quality standards (Marshall 1998).

Chronic exposure to elevated levels of suspended sediments is known to lead to the loss of aquatic habitat. This habitat loss, which would occur in the stream stretches immediately below the crossings, would result from both the physical and chemical impacts of suspended sediments. Physical impacts would include filling of spaces between streambed materials and scouring of substrates for algal growth. Chemical impacts would include reductions in dissolved oxygen and a possible increase in exposure to heavy metals naturally bound in the sediments.

The direct effects of this alternative on stream discharge, flood frequency and magnitude, and flow duration would likely be minimal. The effect of up to 80 vehicle trips through stream channels between the Denali Park Road and Spruce #4 and up to an additional 100 vehicle passes between the Glen Creek Airstrip and Spruce #4 would be unlikely to alter these hydrologic characteristics. The stream-flow effects of the existing access road on the adjacent floodplain would likely be minor to negligible, given the size of the Moose Creek watershed. Discharge and flow duration, however, would constrain the ability of vehicles to ford the stream. Although discharge levels typically are low enough to allow the stream to be safely forded, there occasionally would be periods when water levels would be too high for successful passage. Reductions in water quality would be expected to occur from contamination by accidental spills and leakage of fluids from vehicles using stream crossings, although these impacts would be transient and of low magnitude. Occasional strandings of vehicles in the Moose Creek crossings during high-water events would increase the potential for accidental spills of petroleum products.

Conclusion: In summary, water quality would experience impacts from the continued summer vehicle traffic throughout the life of the access, and the likelihood of increased periodic exposure to low levels of suspended sediments, hydrocarbons, and possibly heavy metals. These impacts, while minor in magnitude, would contribute to long-term degradation of water quality and channel morphology in the affected streams. These effects are not likely to lead to the impairment of the natural resources and values in the park.

4.1.2 Biological Environment

4.1.2.1 Aquatic Resources

The impacts of this alternative on instream habitats in Moose Creek and its tributaries would result in reduced quality of aquatic habitats for invertebrates and fish below 38 stream crossings (totaling approximately 2,350 m of stream habitat) along the length of the route. About half of those crossings would affect habitats in the portion of Moose Creek that is cataloged as an anadromous stream, and the majority would affect stream habitats categorized as having moderate to high densities of arctic grayling. Meyer and Kavanagh (1983) suggested that repeated crossings of streams or use of creeks as travel corridors would alter the migration patterns of grayling, presumably by altering the availability of food organisms, increasing suspended sediments, and disrupting water flow by instream traffic.

Long-term effects of instream traffic, streambed modifications, and removal of riparian vegetation would reduce aquatic habitat quality. Chronic increases in turbidity and suspended sediments would result in localized loss of aquatic habitat for instream organisms and spawning habitat for fish immediately below the stream crossings. Previous fish population studies found very few fish and low aquatic productivity in stretches of creeks that were used as road corridors (Meyer and Kavanagh 1983). The physical disturbance and low levels of sedimentation resulting from repeated crossings would lead to small reductions of spawning habitat for salmonids.

Lastly, grayling fall migration to over-wintering habitats farther down Moose Creek could be disrupted by instream vehicle traffic past the first week in September. In most years, this migration occurs during the second week of September (Meyer and Kavanagh 1983). Given the number of creek crossings, vehicle travel should avoid spring migration, spawning, and fall migration periods.

Conclusion: In summary, the periodic summer vehicle traffic, and the potential for increased and chronic exposure to low levels of suspended sediments and hydrocarbons would cause a reduction in riparian and aquatic habitat quality, raising the possibility of reduced use of those habitats by fish, or possibly reduced fish populations. The low level of access across streams would result in minor impacts that would not likely lead to an impairment of aquatic habitat in the park.

4.1.2.2 Vegetation and Wetlands

4.1.2.2.1 Vegetation

The no-action alternative would result in minor further disturbance of vegetation. Removal of vegetation by vehicle use along the existing mining access road on Moose and Spruce Creeks would be minimal. The principal impact of this alternative, however, would be the continued suppression of natural revegetation as long as vehicles continue to travel the access road consistently.

4.1.2.2.2 Wetlands

Direct impacts to palustrine (vegetated) wetlands would be limited under this alternative because of the use of an existing mining access route. Some rutting in the tundra bench segment on Spruce #1 would cause widening of the route footprint by up to 3 feet of width over 300 feet of length of that segment. No fill would be used for construction of the access. Some riparian wetlands that once occurred along the existing mining access road following Moose and Spruce Creeks have long since been converted to uplands as a result of the extensive mining that historically occurred in these

drainages. No new placement of fill would occur. Further impacts on wetlands would therefore be minor using the existing access to the parcel.

Continued use of the existing road with no improvements would result in minor impacts to riverine wetlands. Maintenance of the access would be limited to occasionally moving boulders in the streambed and smoothing the Glen Creek airstrip. Flooding in August 2000 actually increased the length of in-stream travel for this alternative by cutting 4-foot ledges into the banks where there previously has been exits onto upland segments. Although the riverine and riparian wetlands adversely affected by this route have high wetland functional importance the magnitude of those impacts would be low because of the low traffic volume and lack of road construction under the no-action alternative. The impacts to riverine wetlands would be minor.

Conclusion: In summary, the impacts to vegetation and wetlands would be minor and would not result in the impairment of these natural resources or the purposes and values of the park.

4.1.2.3 Wildlife and Habitat

4.1.2.3.1 Mammals

No new impacts on wildlife habitats would be incurred if improved access were not provided. No additional disturbance of wildlife would occur beyond that currently resulting from the low level of temporary access permitted to the private inholdings at Spruce #4 and Rainy Creek. Some localized disturbance of wildlife near the existing road would be caused by vehicle passage up Moose and Spruce Creeks, and airplane disturbance (Piper Super Cub) would occur sporadically at and near the lower Glen Creek airstrip. Disturbance of wildlife in winter, especially moose in riparian shrub stands, would be low because road access between the airstrip and Spruce #4 cabins would not be maintained. Access in winter would be overland by snowmobile when adequate protective snow cover exists, by skis, or by snowshoes. The potential for attraction of carnivores would continue, as at present, around the existing cabins at the Spruce #4 parcel, but the low level of human activity would keep that potential to a low level.

Conclusion: In summary, the impacts to wildlife would be negligible because of the continued low level of human use in the area. These impacts would not result in the impairment of fish and wildlife habitat to be protected in the park.

4.1.2.3.2 Birds

Localized direct impacts would result from use of the facilities on the Spruce #4 parcel, but impacts along the access route would be restricted to minimal vegetation impacts, low-level sedimentation below crossings along the existing mining access road, and localized disturbance to breeding birds from vehicle and airplane noise. The no-action alternative would incur no new impacts on birds from direct habitat loss due to road upgrades or construction.

Conclusion: In summary, occasional short-term behavioral disturbance of local breeding birds would result from air access to the lower Glen Creek airstrip and limited vehicle access to the private land on Spruce #4. These effects would be negligible. These impacts would not result in the impairment of wildlife habitat to be protected in the park.

4.1.3 Social and Economic Environment

4.1.3.1 Cultural Resources

Under this alternative, no new effects on cultural resources would occur. Access to the Spruce #4 parcel would continue to be achieved via the existing mining access road from the park road up the valley floors of Moose and Spruce Creeks. No historical and archeological resources are known to occur along this route. The few building remnants and the tailings piles that are present along the route resulted from more recent (i.e., less than 50 years ago) mining activity, and thus would not yet be eligible for listing on the National Register of Historic Places (NRHP). Because no historic properties eligible for NRHP listing would be affected, there would be no impacts on cultural resources.

Conclusion: In summary, there would be no impacts to or impairment of cultural resources with this alternative.

4.1.3.2 Public Use

Under the no-action alternative, access would not be improved over the existing situation. This alternative would maintain the current access on the existing mining road to the Spruce #4 parcel through continued renewal of temporary access permits. Safety concerns would continue to focus on vehicle strandings during stream crossings at high water levels and on airplane operations at the 1,120-foot airstrip at Glen Creek (currently suitable only for small airplanes.)

Under the no-action alternative, the level of recreational use of the area is not likely to change. As a result, the recreational experiences of guests at the four existing lodges would not be changed substantially from the present condition. The noise and visual impacts on recreational uses would be largely avoided, and few direct conflicts would occur with winter or summer recreationists. Lack of improved access would deter secondary development in the Moose Creek valley, avoiding additional degradation for and conflicts with recreational users.

Conclusion: In summary, public access by vehicle and airplanes to the area would not change. Impacts to recreation and visitor use would be negligible, and such uses would not change noticeably from the present condition. This alternative would not result in the impairment of wilderness recreational activities in the park.

4.1.3.3 Subsistence

Access to Moose Creek for moose hunters on the existing mining access road would continue unabated and no new road access would be created.

Conclusion: In summary, this alternative would have no impacts on subsistence uses in the project area, nor would it impair subsistence activities as permitted in the park additions under ANILCA.

4.1.3.4 Wilderness

This alternative would not generate additional development or traffic in the Kantishna Hills area. The possible wilderness suitability of lands in the area would remain intact, except 100 yards on both sides of the road corridor and airstrip would not become suitable for wilderness designation as with the park road. The existing wilderness character and resources of the area would be unaffected. There

would be no additional visual intrusions, airplane overflights, or road traffic to affect wilderness users in adjacent designated wilderness. The nationally significant status of Denali National Park and Preserve as a wilderness area and wilderness park in areas off the main park road would be maintained.

Conclusion: In summary, the no-action alternative would not result in impacts to designated wilderness, nor would wilderness recreational activities in adjacent designated wilderness or the park additions be impaired.

4.1.4 Cumulative Impacts of the No Action Alternative

The cumulative impacts analyses evaluate the incremental contribution of impacts from the access alternatives to the impacts of past mining activities and reasonably foreseeable future development and activities in the Kantishna area. This analysis draws on the information and analyses in the *Cumulative Impacts of Mining* EIS (NPS 1990) and the *Entrance Area and Road Corridor Development Concept Plan* (i.e., the “front-country” plan, NPS 1996). This analysis also considers the conclusions and recommendations of the Denali Task Force (NPS Advisory Board 1994) regarding Kantishna area development and the *North Access Route Feasibility Study* (NPS 1997). The feasibility study is a preliminary analysis of the scope and approximate costs to provide either road or rail access to Kantishna from Healy through the northern additions to Denali National Park and Preserve. Although it is possible that new access to Kantishna may occur at some point in the future under the North Access proposal, that prospect is not considered to be reasonably foreseeable due to the substantial costs and controversy it will engender. In the event that the North Access option is pursued formally, a separate EIS would fully evaluate all of the alternatives to that action.

Past, present, and reasonably foreseeable future actions in the Kantishna area include the following:

- past mining (which resulted in substantial environmental impacts in the Kantishna Hills), possible future mining, claim validity sampling (the effects of which would likely be minor), and reclamation of some mining claims;
- existing and future commercial lodge operations;
- potential development and use of other inholdings (principally, private portions of two patented claims on Rainy Creek; four patented claims straddling the western portion of Skyline Drive; and the patented Galena claim near Kantishna);
- potential development of a 20–30 bed hostel, 10-site backpacker campground, and 15 backcountry campsites in the Kantishna area, as described in the front-country plan.

Cumulative impacts are eased somewhat by the remoteness and restricted access to the Kantishna area, which is largely isolated from the statewide road system by approximately 75 miles of controlled-access gravel road. The scope of analysis is the Kantishna area (as portrayed in NPS 1990) and the park road.

4.1.4.1 Physical Environment

The no-action alternative would not result in cumulative impacts to geological resources in the area. Because no additional gravel would be excavated under the no-action alternative for access to Spruce #4, no cumulative decrease in the gravel resources of the Kantishna area would occur. Existing mining tailings would be available for potential future mining reclamation if the unpatented mining claims in the area are determined to be invalid and revert to NPS ownership.

The natural quiet of the Moose Creek drainage would be maintained at levels close to the present situation, which is subject primarily to human-generated noises associated with vehicular access to inholdings and overflights by small airplanes traveling to and from Kantishna. The ongoing access to inholdings in the upper Moose Creek valley would result in minor intrusions on the natural quiet of the area from people driving to their inholdings on Rainy Creek, Spruce #4 and unpatented mining claims, the NPS, BLM, and subsistence users. Occasional transits by vehicles and small airplanes would result in episodes of increased noise levels that would be similar to the existing situation.

The scenic integrity of the view of the upper Moose Creek valley from Backcountry Units 35 and 36 was altered by the presence of the NPS Glen Creek camp from the 1980s to 1999. This camp may be re-established in summer 2002 and subsequent years for BLM crews to determine validity and fair market value of mining claims in the area. Scenic impacts increased with the construction in 1998 of the applicants' two cabins and saunas on Spruce #4 and the unrelated inholder cabins along Rainy Creek. The continued access with temporary permits would result in minor cumulative impacts to the scenic integrity of the area.

The no-action alternative would result in cumulative impacts on water resources that would be low in magnitude. The numerous stream crossings (38) along the existing mining access route, coupled with the lack of improvements to those crossings would result in channel widening and streambed modifications. Increased sediment and turbidity downstream of the existing low-water crossings would result from access to inholdings at Rainy and Spruce Creeks, unpatented mining claims, NPS personnel for monitoring, and subsistence users. Indirect impacts from sediment inputs and other water quality degradation in 1.2 mile (2,000 m) would add a small increment (~3%) to the 37.4 miles of disturbed streams in the Kantishna Hills. Even though the no-action alternative would result in up to 40 trips from the park road to Spruce #4 and another 50 trips from the Glen Creek airstrip to Spruce #4 annually, the resulting impacts would affect the same number of stream miles.

Increased use of the existing mining access road and fords would contribute additional incremental impacts through erosion, sedimentation, channeling, and channel widening at crossings; but the cumulative effect would be minor. Contingent on a settlement between the NPS and the holders of Gold King mining claim on upper Glen Creek, the Bureau of Land Management (BLM) is planning to sample mining claims along upper Glen Creek during summer of 2002 to determine their validity for an ongoing court case. Heavy equipment, 4-wheel-drive (4WD) trucks, and ORVs would transit up Moose Creek to Glen Creek and back out. BLM personnel would use 4WD trucks or ORVs to travel daily for 40-50 days between a camp near the Glen Creek airstrip and the mining claims farther upstream. About 1.4 acres of surface area would be disturbed from excavations, but these areas would be reclaimed after sampling activities are completed. A similar sampling program on unpatented mining claims held by Northwest Explorations in the upper Moose Creek tributaries may occur in the summer of 2003 or other future year, but the extent of surface area disturbance is not yet estimated.

4.1.4.2 Biological Environment

Cumulative impacts on aquatic resources would consist of occasional, low-level degradation of aquatic habitats (through mechanical disruption and increased sedimentation and turbidity) at and within 50 m downstream of the 38 low-water crossings along the existing mining access road to the Spruce #4 parcel of land. These impacts would result from access to inholdings at Rainy Creek (3 crossings), over 40 unpatented mining claims on upper Glen Creek (16 of the same crossings and 24 more up Glen Creek) and along Moose and Spruce Creeks (same crossings as requested access), by subsistence users (after the summer season), and by the NPS and BLM for administrative purposes.

The incremental impacts of this alternative on vegetation types, wetlands, and wildlife habitats would continue to be minor, adding up to 40 vehicular trips a year to the 30-40 trips a year by others on Moose Creek drainage mining access roads. This vehicular use would prevent or delay recovery of the affected habitats through which the road passes. About 1.4 acres of new surface area and vegetation would be disturbed by the BLM sampling program on mining claims along upper Glen Creek, but these areas would be reclaimed afterwards. Cumulative impacts on wildlife would consist of occasional disturbance by three inholders along Rainy Creek, mining claimants (Gold King and Northwest Explorations, Inc.), subsistence users (less than 10/year), recreationists (no vehicles beyond first ford of Moose Creek), NPS and BLM personnel, and the Spruce #4 inholders.

4.1.4.3 Social Environment

The cumulative effects on cultural resources, visitor use, and subsistence would be minimal. No new road or improvement of existing road for access would be constructed, so no increment would be added to the existing network in the Kantishna area (primarily the 92-mile park road and approximately 75 miles of mining access roads and trails). Continued use of the existing mining access road up Moose Creek would maintain a low-quality access route to Spruce #4 along almost 10 miles of that route created by past mining activities, posing occasional safety risks of strandings for travelers crossing Moose Creek during seasonal high-water conditions. Vehicle trips by BLM and NPS for mining claim validity sampling would be added to the maximum 40 round trips to Spruce #4 from the park road and additional 50 round trips from the Glen Creek airstrip for both inholders.

No additional cumulative impacts on the current level of subsistence use or cultural resources would be expected to occur as a result of this alternative. Subsistence users would continue to exercise their existing methods and means of access. The suitability of the road corridor and airstrip as designated wilderness would continue to be low in view of the extensive alteration of the area by past mining and existing access to and development of inholdings. No further impacts to cultural resources would occur.

4.2 Proposed Access (NPS Preferred Alternative)

4.2.1 Physical Environment

4.2.1.1 Geologic Resources

Road construction along the proposed route would have minor effects on soil stability because the soils along most of the route have only thin, fine-grained floodplain cover deposits over alluvial gravel. Although these fine-grained cover deposits can be eroded (see below), compaction, erosion, or settlement of the underlying gravels is unlikely. Soil stability along the floodplain portions of this route would be high.

Displacement of riverbed materials caused by vehicles fording the stream likely would be minor because of the high proportion of coarse rock material in the riverbed. Flooding would consistently alter the riverbed at the numerous stream crossings on this route, however, requiring occasional maintenance repairs at some of the crossings.

Approximately 4.2 miles of the 9.5 miles of the route for this alternative would follow the floodplain of Moose Creek, which would be at moderate to high risk of being flooded. Degradation to the route

would not significantly affect its use by OHVs and a limited number of high-clearance pickups. Erosion could be minimized by proper bank protection at fords. Risk for slope failure along this route would be negligible because the road would be almost entirely on the flat floodplain.

Approximately 100 cu yd of gravel needed for road construction on Spruce #1 would come from the bank on the western side of the creek where the road would be constructed to bypass the stream channel. The 62 cu yd of gravel fill needed for road construction on Spruce #4 would be obtained from a gravelly bank on Spruce #4. A small amount of cut-and-fill construction would occur along the route. Maintenance needs are estimated at 10 cu yd per year and would be provided for at former mining tailings along and within the route. The gravel resources used in this route construction and anticipated maintenance would be insignificant compared to the thousands of cubic yards that would need to be moved during potential future restoration of the mining claims along Spruce Creek.

Conclusion: In summary, the proposed access would have negligible effects on soil stability, riverbed stability and on the adjacent floodplain. Gravel extraction for road construction would require placement of about 205 cubic yards of gravel on the Spruce Creek floodplain and a tundra bench east of the creek. This alternative would not result in the impairment of the geological resources in the park.

4.2.1.2 Natural Quiet

Potential noise sources associated with the proposed access include up to 40 OHV trips per summer between the park road and Spruce #4, an additional 50 OHV trips per summer between the Glen Creek airstrip and Spruce #4, up to 8 light truck transits between the park road and Spruce #4 in June and September, and multiple airplane landings at the Glen Creek airstrip. Snowmobile activity would be likely at times during the winter to access the property. Noise generated by vehicle passes would vary depending on the vehicle type, speed, and distance to the receptor. The noise level from a Ford F-350 pickup truck driving slowly along the existing Moose Creek road in July 1998 was recorded at 69 dBA (at 4 m from the noise monitor). Heavy equipment operating along the road during upgrades and construction also would constitute additional noise sources, with their effects being localized and temporary.

The relative impacts of noise generated by vehicle impacts would be modified by attenuation associated with surrounding vegetation, terrain features, existing natural noise sources (running water and windblown vegetation), distance from the source, and atmospheric conditions (USAF 1995). Given these factors and the location of the proposed route, much of the noise generated by vehicle passage would be masked by flowing water and attenuated in many areas by thick riparian vegetation along this route. In mid-July 1998, instantaneous measurements of ambient noise levels along Moose Creek varied from 43–55 dBA at various locations encompassing natural sounds, including flowing water along the creek (53–55 dBA) and wind through the riparian vegetation adjacent to the creek (45–50 dBA). For comparison, ambient (“natural quiet”) levels near the Glen Creek airstrip (with no human activity or stream sounds) were 30.5–33.0 dBA. Thus, the noise generated by pick-up trucks and OHVs would be greater than ambient environmental levels, but would not be substantially greater than the natural noise levels along Moose and Spruce creeks. Noise levels would be substantially higher, however, during road construction.

Intermittent airplane operations at the lower Glen Creek airstrip would increase noise levels at that site, which currently receives occasional use by the applicants in a Piper Super Cub (a relatively quiet small airplane). The noise generated by airplanes can be separated into two general components: (1) noise associated with take-offs, landings, and taxiing, where maximum noise levels

are generated relatively close to the ground and on the airstrip, and (2) noise generated by airplanes overflying the park in transit to and from the airstrip. Noise measurements associated with airplanes vary depending on the type of operation (taxiing, take-offs, landings, overflights), the type of airplane, distance to the observer, and the attenuation (reduction) or amplification of noise, depending on vegetation and terrain near the airstrip. To sample the noise generated in the immediate vicinity of an existing active airstrip in the area, baseline noise measurements were collected during two days in mid-July 1998 at the Kantishna airstrip, which supports an estimated 600 flights per season. The hourly noise level (HNL, a measurement analogous to hourly L_{eq}) at the Kantishna strip averaged 47 dBA over a 27-hr period (standard deviation = 10 dBA; range = 41–80 dBA). In contrast, the hourly L_{eq} at the lower Glen Creek strip (with no airplane activity) averaged 35 dBA (standard deviation = 2 dBA; range = 31–38 dBA).

In addition to the hourly noise levels, each “noise event” (defined as a noise exceeding 75 dBA) was recorded at the Kantishna airstrip as a Sound Exposure Level (SEL). This level represents the total sound energy generated by the noise event (presumably an airplane operation) and incorporates both the maximum level of sound generated and the event duration. Ten SELs at the Kantishna airstrip averaged 82 dBA (SD = 22 dBA, range = 56–115 dBA). Another sound metric, L_{max} , which is the highest A-weighted sound level measured during an event, also was recorded during the noise events at the Kantishna airstrip. The L_{max} ranged from 53 dBA to 114 dBA and averaged 79 dBA (SD = 23 dBA). The L_{max} often is used to assess the potential effects of noise events on animals; it should be noted, however, that L_{max} does not describe the total amount of sound energy generated or the duration of the noise event (USAF 1995). The hourly noise levels associated with the Kantishna airstrip do not exceed the 55 dBA threshold identified by the EPA as the maximum outdoor level that avoids interference with human outdoor activities (USAF 1995: p. 4–81). Because the lower Glen Creek airstrip would support far fewer flight operations per week than the Kantishna airstrip, the relative magnitude of the noise impact from the proposed operations is also likely to be of lower magnitude. These operations would result in a source of intermittent noise over the long-term in a relatively undisturbed area of the park.

Characterizing the noise associated with airplane overflights to and from the lower Glen Creek airstrip is less straightforward than measuring noise levels at the airstrip. The noise generated by an airplane flying over an area is subject to several modifying factors. These factors include attenuation, or lessening, due to atmospheric conditions, the altitude of the airplane, the horizontal distance of the observer from the airplane, and the slant distance (the hypotenuse of a triangle made up of the altitude and horizontal distance). The actual sound level experienced by a person on the ground is the result of this slant distance. Those sound levels are reduced approximately 6 dB (a 3-dB reduction represents a halving of sound energy) for every doubling of the slant distance (Anderson and Horonjeff 1992 in USAF 1995). In addition to this slant distance, noise from airplane overflights is attenuated by intervening hills (15–25 dB reduction), heavily forested areas (10–15 dB reduction), and “acoustically soft” terrain such as grasslands (10–15 dB reduction). These reductions occur only at relatively low altitudes and at large horizontal distances. Simply increasing flight altitudes may not reduce noise from airplanes because the attenuation effects of terrain and ground vegetation become less at greater altitudes. Increasing slant distances from approximately 125 ft to 1,000 ft would produce large reductions in sound levels but increasing altitudes above 2000 ft did not provide large reductions. Thus, to achieve effective mitigation of overflights and reduce noise by 4–10 dB, a doubling of the slant distance between the airplane and the potential receptors is required. This requirement suggests that effective routing of airplanes to and from the airstrip would be important to reduce the noise impacts of overflights; such routes should assess the attenuation effects of the local terrain and vegetation.

During winter, the primary access to the Spruce #4 parcel would be via airplane travel to the lower Glen Creek airstrip and by snowmobile. Noise propagation across the winter landscape would likely be greater than that experienced during the summer season. This winter increase in noise propagation would be caused by changes in atmospheric parameters (temperature and relative humidity), the lower attenuation associated with snow and snow-covered vegetation, the limited amount of other natural noise sources (running water, wildlife, other human activities), and the possible alterations in flight routes and altitudes caused by changing weather conditions. In general, the propagation of noise associated with winter flight operations would be expected to exceed summer noise levels; but fewer people or animals would be present in winter to be disturbed by noise generated by these flights.

Conclusion: In summary, the proposed access would result in slightly greater noise levels than the no-action alternative, primarily from short-term road construction, a slight increase in permitted vehicle trips to Spruce #4, and a slight increase in flights in and out of the Glen Creek airstrip. This alternative would not result in the impairment of natural quiet or wilderness recreational activities to be provided in the park.

4.2.1.3 Visual Resources

The visual impacts of the proposed access alternative would be similar to the no-action alternative. Visual effects would be minor because of the limited construction activity and the low frequency of traffic accessing the Spruce #4 property. The most noticeable visual impacts would be the small number of airplane flights to and from the lower Glen Creek airstrip, a potential parking and/or storage shelter at the Glen Creek airstrip, and an additional 300 feet of road construction on a tundra bench east of Spruce Creek. Level terrain and thick vegetation along the valley bottoms would limit the visual impacts of the applicants' occasional vehicle traffic to and from the cabins at Spruce #4.

Conclusion: In summary, this alternative would have minor impacts on the scenic quality of surrounding locations because of the adjacent thick vegetation and generally low position in the environment. These impacts would not result in an impairment of the scenery in the park.

4.2.1.4 Water Resources

The proposed access alternative would require 32 stream crossings in total including (24 locations along Moose Creek, and 1 crossing at Jumbo Creek [2 braids], 1 crossing of Glen Creek, and 6 fords over Spruce Creek) by four-wheel-drive vehicles. Sections of the road that currently proceed in the stream bed of Spruce Creek would be eliminated and replaced by fewer, shorter crossings at a right angle. This route would require 6 fewer stream crossings than currently exists for access to Spruce Creek (Alternative 1, no-action).

Potential impacts on water resources include alteration of hydrologic characteristics and water quality during construction and operation, as noted in the previous section. As a result, there will be short-term declines in water quality during the road repair and relocation phase. The potential impacts on water quality from road construction, through an increase in suspended sediments and turbidity, are well-documented (ADFG 1986a, Murphy 1995, Waters 1995). Use of "best management practices" to control sedimentation would be required to mitigate construction impacts, but some increased sedimentation from vehicle fording during construction and operation would be unavoidable.

When compared to the no-action alternative, the fewer number of stream crossings repeated throughout the open-water season slightly decreases the potential for impacts on the water quality of recovering (post-mining) or pristine streams along the Moose Creek route.

Vehicle passage on this route during the open-water season would result in localized long-term impacts from the intermittent exposure to short-duration increases in low levels of suspended sediments and turbidity, as noted in the no-action alternative.

Chronic exposure to elevated levels of suspended sediments is known to result in the loss of aquatic habitat. See section 4.1.1.4 Removal of riparian vegetation bordering stream channels in some areas during road upgrading and construction would likely cause minor increases in water temperatures above normal, increasing the risk of metal toxicity in suspended sediments. Construction activity and vehicle passage directly adjacent to the streams would contribute minor chronic sediment inputs from erosion.

The direct effects of this alternative on stream discharge, flood frequency and magnitude, and flow duration would likely be minimal. The effect of up to 120 vehicle passes through stream channels (60 between the Denali Park Road and Spruce #4 and 60 between the Glen Creek Airstrip and Spruce #4) would be insufficient to alter these hydrologic characteristics. The stream-flow effects of the upgraded road on the adjacent floodplain would likely be minor to negligible, given the size of the Moose Creek watershed. See Section 4.1.1.4.

The use of material from mine tailings along Spruce Creek for construction and maintenance of this route could also impact water quality. The use of such materials would create a minor risk of mobilization of heavy metals within the tailings, potentially degrading water quality further in adjacent streams from runoff or dust fallout from passing vehicles.

Conclusion: In summary, water quality impacts (sedimentation and turbidity) would increase over the no-action alternative during the construction phase with re-routing up Spruce Creek. After construction and repair, however, the impacts would be less than from no action. Traffic throughout the life of the project, and the likelihood of increased chronic exposure to low levels of suspended sediments, hydrocarbons, and possibly heavy metals, would contribute to long-term minor degradation of water quality and channel morphology in the affected streams. These effects would not result in the impairment of natural resources to be protected in the park.

4.2.2 Biological Environment

4.2.2.1 Aquatic Resources

As described for water resources (section 4.2.1.4), the impacts of this alternative on instream habitats in Moose Creek and its tributaries would result in reduced quality of aquatic habitats for invertebrates and fish below 32 stream crossings (totaling approximately 1,550 m of stream habitat) along the length of the route. About half of those crossings would affect habitats in the portion of Moose Creek that is cataloged as an anadromous stream, and the majority would affect stream habitats categorized as having moderate to high densities of arctic grayling. Meyer and Kavanagh (1983) suggested that repeated crossings of streams or use of creeks as travel corridors would alter the migration patterns of grayling, presumably by altering the availability of food organisms, increasing suspended sediments, and disrupting water flow by instream traffic.

Construction of improved fords (6 crossings on Spruce Creek) and road sections along the Spruce Creek floodplain would cause short-term reductions of habitat quality due to increased sedimentation. The immediate impacts of road construction on fish populations and aquatic invertebrates in streams affected by such construction are well documented (ADFG 1986a, Tikkanen et al. 1994, Murphy 1995, Waters 1995). The physical impacts of sedimentation in streams include settling of fine particles onto the stream bed, which can change channel morphology through pool-filling and bed-sealing (Bjerklie and LaPerriere 1985); escape of drifting aquatic invertebrates (Rosenberg and Wiens 1978, Tikkanen et al. 1994); prevention of algae and plant establishment and growth by abrasive action (Van Nieuwenhuyse 1983); abrasion of fish gill filaments; delayed maturation; dietary deficiencies (Simmons 1984); and lowered ability to find prey (Scannell 1988). Additionally, rearing habitat for juvenile salmonids is reduced in streams exposed to high sediment loads (Redding et al. 1987). The release of sediments is known to adversely affect migration, feeding, and spawning, so mitigation would focus on implementing best management practices to avoid and minimize sediment inputs. Depending on the magnitude of disruption of the streambed and bank approaches at crossings, the effects on aquatic life could either be temporary or long lasting. In general, upgrading the road corridor in riparian habitats would lead to minor, short-duration increases in sediment inputs and localized reduction or loss of certain instream features important for high-quality aquatic habitat.

Long-term streambed modifications and removal of riparian vegetation would reduce aquatic habitat quality. Chronic increases in turbidity and suspended sediments would result in loss of aquatic habitat for instream organisms and spawning habitat for fish immediately below the fording sites. The physical disturbance and low levels of sedimentation resulting from periodic crossings would lead to small reductions of spawning habitat for salmonids.

In the event that gravel sources have been underestimated or additional material is required for maintenance in the future, existing mine tailings may be required for road materials. Use of such materials would create the potential for increased concentrations of metals in aquatic habitats, causing additional small reductions in habitat quality. The highly mineralized watersheds in the Kantishna Hills area that were targeted for historical placer mining operations have naturally high levels of heavy metals such as arsenic, antimony, cadmium, chromium, copper, iron, lead, manganese, nickel, selenium, and zinc. Oswood et al. (1990) reported reduced algal and moss biomass, lower aquatic invertebrate abundance and taxonomic richness, and increased presence of heavy metals in historically mined streams.

Conclusion: In summary, below 32 stream crossings the distance of instream impacts (1,550 meters) after a short construction period would lead to long-term minor impacts to water quality along Spruce Creek and the North Fork of Moose Creek. Because there would be six fewer fording sites, up to 60 fewer vehicular passes, and less distance of travel in the water of Spruce Creek, this alternative would have less impact on aquatic resources than the no-action alternative. Coupled with the ADFG permit prohibiting vehicle travel and construction in streams during critical periods in the life history of grayling, the adverse impacts of this alternative on aquatic resources would be minor. This alternative would not result in the impairment of water resources and natural resource values to be protected in the park.

4.2.2.2 Vegetation and Wetlands

4.2.2.2.1 Vegetation

To replace instream travel in Spruce Creek, approximately 0.31 acres of tall shrub, 0.23 acres of low shrub, and 0.09 acres of white spruce forest would be removed for construction. All of these communities are regionally and locally common. Half of the tall shrub community to be removed is alder that have grown up in abandoned road segments and leveled tailings. Half of the ericaceous plant community (low shrub) is part of the existing access route but has not been bladed or received fill. A few white spruce trees would be removed near and on Spruce #4 where the road access would be routed out of the creek bed. In addition, alder and willow branches growing out over the access route would need to be trimmed on an annual basis.

The rest of this alternative uses the existing access route. The other impact of this alternative, however, would be the continued suppression of natural revegetation as long as vehicles continue to travel the access road consistently, or as long as route maintenance is performed.

4.2.2.2.2 Wetlands

An estimated total of 0.37 acres of wetlands would be impacted directly by construction of the proposed access route. Approximately 0.23 acres of the impact would be to scrub shrub communities and 0.14 acres would be to riparian shrub communities. The area of wetlands directly affected is lower than expected for these valley floor locations, because of the presence of the existing mining access road and land conversion from past mining. In a number of locations along the route, mining disturbance and deposition of tailings have converted what were once seasonally flooded riparian shrub communities into tall-shrub uplands (non-wetlands).

Approximately 200 cu yd of gravel would be placed on 0.22 acres of wetlands, over 90% of which would be in the scrub shrub community. Two culverts would be required to keep crossings of minor drainages from becoming mud holes. The rest of the wetland acreage to be used provides a surface durable enough for limited use of light vehicles. Additional wetland impacts would consist of brush cutting along the existing road. Less than 10% of the estimated 10 cu yd per year future gravel maintenance needs are expected to be placed on the wetland sections of the route.

The primary wetland impacts of this route would occur in rivers and streams, which would be affected by the multiple crossings required by this route. Aquatic impacts would include direct removal of fish habitats, increased erosion, and changes in water quality from sedimentation. The riverine and riparian wetlands adversely affected by this route are ranked high for wetland functional importance. Qualitatively, the types of impacts to Moose Creek resulting from this alternative would be similar to those resulting from continued use of the existing access road under the no-action alternative. The impacts to the waters and habitats of Spruce Creek, however, would be much less because of the elimination of 1,659 feet of instream travel and the reduction in the number of crossings from 12 to 6.

Conclusion: In summary, the preferred alternative would result in minor disturbance of vegetation. The impacts of this alternative to wetland resources would be minimal given the small total area of projected impacts to wetland areas from road construction and the elimination of instream travel. This alternative would not result in the impairment of vegetation or wetlands in the park.

4.2.2.3 Wildlife and Habitat (Mammals and Birds)

4.2.2.3.1 Mammals

Knight and Gutzwiler (1995) provide a good general overview of the impacts of recreation on wildlife. The principal species considered for this analysis are ungulates (hoofed mammals: moose and caribou), carnivores (bears, wolves), and furbearers (lynx, wolverines, marten, red foxes, beavers, muskrats, weasels).

Murie (1944), Tracy (1977), and Dean and Tracy (1979) all noted wolves and other animals traveling on the park road in Denali, most frequently in seasons when the road was not in use. Despite localized effects on distribution, large mammals frequently cross the Denali Park Road, which has a substantially higher traffic level than would a route to Spruce #4. Thus, it is unlikely that the single access road to Spruce #4, with its low level of permitted traffic, would result in habitat fragmentation for large mammals in the project area.

The following periods are of greatest concern regarding potential disturbance and displacement of wildlife: winter denning and concentration at seasonal food sources by grizzly and black bears; summer denning by wolves and foxes; winter concentrations and calving by moose, especially in riparian shrub stands; and calving and lambing by caribou. For this project alternative, the greatest concern would involve potential impacts during periods of seasonal concentration by bears and moose. A few bear and wolf dens have been found in the general project area, but there are no recent records of caribou calving.

Traffic noise and human activity would cause disturbance and avoidance of habitats immediately adjacent to the route (within 100–200 m), but large-scale changes in species distribution and abundance are not likely to occur. Habituation of some animals to human activity and noise and attraction to areas of human activity would be likely during the life of the access project.

Impacts on wildlife and their habitats would be nearly identical to the no-action alternative or the existing conditions. The road and airstrip remove about 12.8 acres of habitat. Minimal habitat impacts would result from gravel extraction and hauling to a section of tundra along Spruce Creek. A few alder shrubs would be cut where the access route traverses new sections in the Spruce Creek floodplain, and a few spruce trees would be cut where the access road approaches Spruce #4. A slight increase in vehicle trips would add minor disturbance to wildlife beyond that currently resulting from the low level of temporary access permitted to the private inholdings at Spruce #4 and Rainy Creek. Disturbance from small airplanes would occur sporadically at and near the lower Glen Creek airstrip. Disturbance of wildlife in winter, especially moose in riparian shrub stands, would be low because road access between the airstrip and Spruce #4 cabins would not be maintained. Access in winter would be overland by snowmobile when adequate protective snow cover exists, by skis, or by snowshoes.

Conclusion: In summary, the impacts to wildlife and their habitat would be negligible because of the continued low level of human use in the area. This alternative would not result in impairment of wildlife or their habitat in the park.

4.2.2.3.2 Birds

Disturbance of birds using riparian habitats would occur during the few vehicle passages along this route, but long-term impacts on the bird community in the area would be unlikely. Birds using aquatic habitats (e.g., harlequin ducks, common mergansers, American dipper) would be affected in the short term by road vehicle crossings, particularly if low-level sediment inputs diminished the

availability of aquatic invertebrates below stream crossing locations. Indirect loss of habitat adjacent to the road due to disturbance by vehicle traffic would be minimal because of the low volume and slow speed of traffic.

Recent studies of the effects of roads and traffic on bird communities have found when the noise level associated with traffic was low, no effects on bird species were found, indicating that the mere presence of the road did not affect densities of breeding birds (Reijnen et al. 1995). Thus, the human activity and noise, and not the physical presence of the road, would result in indirect disturbance of birds near the road.

Motorized access such as airplanes and snowmobiles would create a potential for noise disturbance to over-wintering birds.

Conclusion: In summary, the preferred alternative would incur nearly no new impacts on birds because of the very small area of habitat loss due to minor road rerouting by Spruce Creek. Impacts along the access route would be restricted to minimal vegetation impacts and low-level sedimentation below crossings along the existing mining access road. Occasional short-term behavioral disturbance of local breeding birds would result from road access, from continued air access to the lower Glen Creek airstrip, from snowmobile access, and from recreational activities originating at the Spruce #4 parcel, but these effects would be negligible. This alternative would not result in the impairment of swans, other waterfowl, or other birds in the park.

4.2.3 Social and Economic Environment

4.2.3.1 Cultural Resources

The potential for historical resources to occur in the Moose Creek and Spruce Creek valleys is generally high because mining occurred consistently in the Kantishna Hills area since 1903. Cultural resource surveys have been conducted in various portions of the Moose Creek valley and tributary drainages since 1986 in support of the Cultural Resource Mining Inventory and Monitoring Program (CRMIM). Only one historical site is known to be present along this access route, and no archeological sites were discovered. Those surveys focused on mining claims, so the likelihood of locating historic properties in those areas was relatively high. Other building remnants and the tailings piles that are present along the route resulted from more recent (i.e., less than 50 years old) mining activity, and thus would not yet be eligible for NRHP listing.

This alternative takes a route on the opposite side of Spruce Creek from the cabin ruins historic site, and no additional impacts to the site are anticipated. Accordingly, the principal concern would be the potential impacts of access construction and use on undiscovered resources along the access road. Following release of the decision document on this project, a cultural resource survey would need to be undertaken along the entire route to provide clearance for road construction. For any additional historic properties found in the project area a plan would be developed in consultation with the ACHP and SHPO to ensure adverse effects on cultural sites would be avoided or minimized. In general, however, the potential for preservation of prehistoric sites and the probability of finding undiscovered archeological resources would be low along the proposed access, due to its location in and along active streambeds and to the extensive disturbance caused by more recent mining activity.

Summer would be the season of concern for impacts on cultural resources because that is when access use would primarily occur. Winter impacts would be negligible or absent, except perhaps for the unlikely possibility of minor damage from snowmobiles driving over sites covered by snow.

Mitigation of adverse effects on newly discovered cultural resources along this route would be accomplished primarily through avoidance or minimization, such as shifting the right-of-way. For sites that could not reasonably be avoided, mitigation would involve data recovery through detailed excavation and documentation of the resources present at the sites.

Conclusion: In summary, the potential for adverse impacts to historic or archeological resources would be negligible given the minimal distance of new road construction in recently disturbed areas and the results of the CRMIN inventory. This alternative would not result in an impairment of historical or archeological resources in the park.

4.2.3.2 Public Use

Access to the Spruce #4 parcel in summer and fall along the proposed route would commence from the park road at mile 89 near Kantishna. Permission would need to be obtained from landowners of private parcels crossed by the route. Currently, the existing mining access route has no public access restrictions. Foot access would still be allowed, and access for backcountry use would continue under the existing NPS allocation system. About 12–17 hikers per day from Kantishna area lodges use the first three miles of the proposed access route. The proposed use of this access route by OHVs and light trucks would vary slightly from the existing situation. Thus, public access to the upper Moose Creek valley would not be affected in summer.

Air access in summer, fall, and winter would occur at the lower Glen Creek airstrip. Maintenance of the Glen Creek airstrip would be the responsibility of the applicants, and access by the general aviation community probably would not be restricted, unless the NPS follows the regulatory process for closures in 40 CFR Part 36.11(h).

Primary access to the private properties at Spruce #4 in the winter season would be via airplanes using the Glen Creek airstrip. The road between the airstrip and Spruce #4 would not be maintained for OHVs or light trucks. Secondary access to the property in winter would be via snowmobile, dogsled, skis, or snowshoes. The primary winter trail between Healy and Kantishna follows the Stampede Trail, Clearwater Fork of the Toklat River, Myrtle Creek, Willow Creek, and down the North Fork of Moose Creek about one mile south of Spruce #4. This route has been used for years by park visitors and recently by the applicants. This use is likely to continue and increase over time as the applicants invite friends to their cabins. A regularly used trail could be established, but overflow ice in the Clearwater Fork typically impairs snowmobile access to the area in winter.

The primary safety concern arising from the use of the proposed summer access would be vehicle strandings in stream crossings, and their attendant risk of injury, hypothermia, or drowning. It is expected that up to 3 days each year vehicles would be unable to ford Moose Creek safely due to high water levels, judging from anecdotal reports of vehicles becoming stranded in fords on the existing mining access road. Stranded vehicles would be most likely during seasonal high-water periods in spring (from snowmelt) and late summer (from high precipitation). The applicants would likely forego access to their property during floods. During some years (such as June 1999) a large build-up of overflow ice along Moose Creek and its tributaries would delay access for vehicles to upper Moose Creek.

Conclusion: In summary, improved access along Spruce Creek would result in no significant effects on public access or safety in the area. Maintenance of the existing Glen Creek airstrip by the applicants would enhance public access to the landing strip. The large number of stream crossings

via fords would pose safety risks for property owners during periods of high water, when vehicle strandings would be likely. Ice build-up would limit safe vehicle access during the early part of some summer seasons. This alternative would not result in an impairment of park natural resources and the access to and public enjoyment of park resources and values.

4.2.3.3 Subsistence

The impacts of this project on subsistence uses would depend on the degree to which access to the road corridor is restricted, both for general access and specifically for discharge of firearms (safety closure). Currently, the area within one mile of the park road in Kantishna is closed temporarily to the discharge of firearms in September, during the season of overlap between tourism and moose hunting. In 1998, the subsistence season for moose was open during September 1–30 and November 15 to December 15. Kantishna area lodge operations host fewer guests after Labor Day, and most are closed by mid-September, in anticipation of road closure by snow in the mountains to the east. Because of the projected low use of private property at Spruce #4 in September, it is unlikely that the closed area would be extended along the length of the proposed route.

The Moose Creek valley is the area of highest potential for subsistence hunting of moose in the Kantishna Hills, due to the abundance of favorable riparian habitat and the unavailability of the area affected by the annual temporary closure (within one mile of the park road) near Kantishna. Minor improvements to the access route along Spruce Creek would have a negligible effect on subsistence access to the area. No new subsistence use of the area is expected to occur as a direct result of access to the private property for personal uses.

Conclusion: In summary, the preferred alternative would result in a negligible change to subsistence activities for the small number of subsistence users who currently hunt moose and collect other subsistence resources in the Moose Creek valley. This alternative would not impair subsistence resources or uses in the park pursuant to ANILCA.

4.2.3.4 Wilderness

The improved access road and maintained landing strip at Glen Creek would preclude future inclusion of the Moose Creek drainage as designated wilderness. This impact would be negligible, however, because the area has not been included in the proposed wilderness designation, having been the site of extensive historical mining activity.

Conclusion: This alternative would not impair designated wilderness or the wilderness recreational purposes and values of the park.

4.2.4 Cumulative Impacts of the Preferred Alternative

4.2.4.1 Physical Environment

There would be minor impacts on gravel resources in the Kantishna area because the proposed access would require about 200 cubic yards to construct a new section of road above the eastern bank of Spruce Creek and across short segments of wetlands near the southern boundary of Spruce #4. Gravel resources are abundant in the Kantishna Hills and use of gravel from the Spruce #4 parcel and existing mining tailings on lower Spruce Creek for the proposed action would keep the effects of gravel removal local. NPS geologists and mining specialists estimate that 70% of the volume of mining tailings would be required for reclamation of lands disturbed by past mining, but the

proposed amount of gravel would be less than 2% of the estimated total gravel tailings along Spruce Creek (10,250 cu yd). Annual maintenance to keep the road and airstrip in the condition found in August 2000 are estimated at about 10-20 cu yd, which could total a couple hundred cu yd over the life of the access project. The Glen Creek airstrip survived the August 2000 floods, so it is unlikely to require much, if any, gravel maintenance of its surface. The BLM plans to sample up to 1.4 acres of geological deposits in upper Glen Creek in summer 2002 for mining claim validity determinations and fair market valuations. The NPS is updating its gravel acquisition plan to maintain park roads and parking facilities, including a significant component in the western end or Kantishna area of the park.

Impacts on the natural quiet of the Moose Creek drainage and larger Kantishna area decreased as the number of operating mines declined in the last few decades. At the same time, increases of visitor transportation and recreation in the park road corridor to their current levels have resulted in increased noise levels in the vicinity of Kantishna and the existing lodges. Noise levels in the upper Moose Creek drainage generally have been relatively low since mining declined and the NPS terminated its use of the Glen Creek field camp. The proposed action would maintain the status quo or slightly decrease the number of motor vehicles entering the area from up to 40 annually to 30 each year. The existing level of air operations and flightseeing by other commercial interests has created daily overflights of the Kantishna area in summer, including the Moose Creek corridor. The addition of the small number of flights to and from the Glen Creek airstrip under this alternative (up to 50 flights each summer season) would pose a minor incremental effect in summer over the whole Kantishna area and a minor increase in the local Glen Creek area. A short-term addition of noise is likely when sampling begins on unpatented mining claims held by Northwest Exploration, Inc. and the Gold King claims during the summer of 2002 with use of backhoes, loaders, and wash-plants.

Visual resources in the Kantishna area have been affected most by past mining activities and by commercial lodge development along the park road corridor. Although past mining disturbed much country, the effects of that disturbance are diminishing as stream recovery and natural revegetation proceeds. Even though experienced observers can detect the altered vegetation patterns resulting from that recovery, many park visitors may not perceive the impact. As mining impacts have become less visible, however, other, newer impacts have been added. Before the winter of 1997–1998, several old buildings on mining claims, several cabins (such as the Parker cabin), and the NPS tent shelters at the Glen Creek airstrip were the only human structures in the upper Moose Creek drainage. Two new cabins were built at Spruce #4 in the winter of 1997–1998 and one new cabin was built at Rainy Creek in early summer 1998. Before the end of August 2000 another cabin was built on an inholding along Rainy Creek and two saunas and three outbuildings were tucked into the woods on Spruce #4, adding a slight visual impacts to these areas. In the future other structures may be erected on the three inholdings along Rainy Creek. Administrative sampling of mining claims held by Northwest Explorations, Inc. and the Gold King group would create small tailings, but these areas would be reclaimed, making additional visual effects temporary. The proposed additional 300 feet of road on tundra east of Spruce Creek and a potential storage structure at Glen Creek airstrip would add a minor impacts to visual resources in the area.

Cumulative impacts on water resources would result from combining past and continuing impacts of mining with the predicted future impacts of access to Spruce #4 via the proposed access. Past gold-mining operations on several freshwater streams in the Kantishna Hills resulted in losses and reductions of aquatic habitat necessary to support fish populations (Miller 1981, Meyer and Kavanagh 1983, NPS 1990, Oswood et al. 1990). The degree to which those streams have recovered since mining essentially ceased in the mid-1980s remains to be assessed, but it is assumed for this analysis that post-mining recovery is occurring. By the mid-1980s, approximately 20% (37.4 miles)

of 189.3 miles of stream courses in the Kantishna Hills aquatic study area (255,247 acres) had been disturbed by mining activities (NPS 1990: table 15). The incremental impact of this alternative would add 0.9 miles (1,550 m) of indirect stream disturbance from sediment inputs and other water quality impacts at the 32 stream crossings (channel widening, hydraulic alterations) and gravel roadway sections (erosion, sedimentation) in the active floodplain. This increment would equal about 2.4% of the amount of disturbance from past mining, although the amount of existing stream disturbance is overestimated somewhat because natural recovery has continued since the mining EIS was published (NPS 1990). Continued recovery in the future would result in further decreases of past stream disturbance in the Kantishna area, thereby increasing the relative contribution of the existing access to the total disturbance in the area.

The virtual cessation of mining since the mid-1980s has greatly reduced traffic in and through, and sedimentation of, streams in the Kantishna area. Administrative sampling of unpatented mining claims held by Northwest Explorations, Inc. is may occur in summer of 2003 or later to verify or correct findings in NPS validity reports that these claims along Moose Creek and its tributaries are invalid (NPS 1998-2000). Similar sampling may occur on the Gold King unpatented mining claims in upper Glen Creek if a negotiated sale is not agreed to by end of spring 2002. These efforts would likely cause additional sedimentation along the proposed access route in the upper Moose Creek drainage for one to a few years, depending on the results of the sampling programs. Cumulative impacts from additional hydrologic changes, channeling, and local instability of the proposed access road in the floodplain would be relatively minor in a regional sense. The reduction of stream fords and instream travel in Spruce Creek from the existing conditions would slightly reduce the overall cumulative effect. Recurring problems with instability of stream crossings and the road along Moose Creek and the North Fork, however, would continue.

4.2.4.2 Biological Environment

The incremental impacts of the proposed action on the biological environment of the Kantishna area would generally be minor to negligible, compared with the impacts of past mining, as described by NPS (1990). The incremental impacts on vegetation types and habitats (0.63 acres) would affect less than 0.001% of the 85,735 acres in the Kantishna Hills wildlife study area, about 0.04% of the area disturbed by past mining. The impacts of potential future activities (like claim sampling) are likely to be small in view of the strong regulatory processes that now govern mining in the parks, which processes were not in place when past mining was undertaken. The area of vegetation disturbance to sample the Gold King mining claims in upper Glen Creek is estimated at less than 1.4 acres.

Past mining (and a few other activities) in the Kantishna area studied by NPS (1990) disturbed approximately 1,555 acres of land, mostly in stream valleys. Taking into account the extent of natural recovery (subject to the constraints imposed by the type and severity of disturbance) after mining ceased, however, the NPS (1990) determined the then-current estimate to be 1,254 acres. Much of the area disturbed by the proposed access (12.8 acres) would fall into the “disturbance” category in the mining EIS (NPS 1990); thus, the process of natural recovery on those previously disturbed lands would be arrested. The first three miles (3.6 acres) of the proposed access, however, could not be attributed solely to this request because other inholders use the first three miles of the mining roads to access their property on Rainy Creek.

Past mining caused direct impacts (alteration of stream courses) on approximately 20% of the stream lengths and over 1,123 acres of aquatic and riparian habitats in the 255,247 acres of watersheds studied by NPS (1990). Indirect impacts of mining, principally from high levels of sediments and turbidity, affected additional areas of habitat downstream. Natural recovery of aquatic systems

(supplemented by an active restoration project on Glen Creek) began after mining ceased, raising the possibility that former functions (e.g., grayling and chum salmon spawning) eventually may be restored in stream reaches affected by placer mining. The proposed action may retard that recovery in a portion of the upper Moose Creek drainage by introducing small amounts of sedimentation and turbidity below the 32 stream crossings along the proposed access. This alternative would result in the second greatest cumulative impacts on aquatic ecosystems, but the effects would be negligible compared to past mining activities.

Cumulative impacts on wetlands have resulted primarily from past mining (e.g., disturbance along 37 miles of stream courses); wetlands in the Kantishna area have been little affected by other activities. Thus, the area of wetland impacts decreased as natural recovery occurred after mining essentially halted in the mid-1980s. A comprehensive wetlands map of the Kantishna area has not been completed, but is under preparation by the U.S. Fish and Wildlife Service National Wetlands Inventory (Jon Hall, pers. com.). In view of the abundance of wetlands in the general area, however, the incremental contribution of this action (0.37 acres) would be negligible. The magnitude of impacts of additional future activities on wetlands in the Kantishna area is also likely to be small, in view of the regulatory processes now in place to avoid, minimize, and compensate for such impacts.

The incremental contribution of direct loss and modification (in terms of area) of wildlife habitats resulting from the proposed action can be estimated and compared with the impacts of mining. The proposed access would directly affect about 12.8 acres of habitat. For example, past mining disturbed the following estimated areas of primary habitats for large mammals within the 85,735-acre Kantishna Hills wildlife study area (NPS 1990):

- grizzly bear — 1.3%, or 817 acres (vs. 63,689 undisturbed acres);
- black bear — 2.1%, or 437 acres (vs. 20,791 undisturbed acres);
- moose — 4.5%, or 760 acres (vs. 16,986 undisturbed acres);
- caribou — 0.3%, or 167 acres (vs. 48,108 undisturbed acres);
- wolf — not considered to be directly affected by vegetative disturbance and loss.

In comparison with these figures, the incremental impacts of the proposed action would be small, affecting 0.01%–0.04% of the primary habitats for these species in the Kantishna Hills area. The incremental impacts would be reduced further by the continuing natural revegetation of many of the habitats affected by past mining.

Before mining began in the Kantishna Hills, riparian wildlife habitat, which is important to a wide variety of birds and mammals, was estimated to occur along 94.2 miles of stream courses in the Kantishna Hills wildlife study area (NPS 1990), of which 35% (33.3 miles) was disturbed by past mining. This alternative would further disturb up to 6 miles of riparian wildlife habitat previously affected by mining, although the magnitude of the disturbance would be reduced because the route would follow the existing mining access road and would not be widened, disturbing no more riparian vegetation.

Disturbance of birds and mammals by personal recreational activities would be additive to that caused by backpackers and other existing lodge operations in the area, including hikes along the existing road from the park road to the first crossing of Moose Creek, Skyline Drive, Wonder Lake/Blueberry Hill area, and McKinley Bar. Winter impacts on birds from trail use by skiers, dog mushers, and snowshoers near the Spruce Creek cabins would likely be minimal in view of the low number of winter resident bird species and the limited time frame of winter use.

The potential for attraction of carnivores would continue around the existing cabins at the Spruce #4 parcel, but the low level of human activity would keep that potential to a low level.

The proposed access would contribute no cumulative increment to impacts on sensitive species. Several species of concern (harlequin duck, olive-sided flycatcher, lynx, and chum salmon) occur in the project area, but the proposed action would cause minor to negligible impacts on those species, primarily through occasional behavioral disturbance. The cumulative disturbance or loss of habitat for those species would be minor to negligible.

4.2.4.3 Social and Economic Environment

Cumulative impacts to the social and economic environment would be minor to negligible because the proposed actions would be consistent with management plans for the area and would result in few conflicts with other users along the Moose Creek drainage. The 30 total vehicle allocations across the Denali Park Road fall easily within the estimated 100 trips per year for inholders other than lodge operators provided for in the front-country management plan (NPS 1996) and final road regulations (FR 37878-37879, June 19, 2000).

Past mining activity was responsible for the creation of most of the 45 historic sites identified in the Kantishna Hills area by NPS (1990), whereas the smaller number of known archeological sites (11) resulted from prehistoric hunting; additional prehistoric sites are certainly present. The concentration of most mining activity in stream bottoms minimized the impacts on archeological resources, which are mostly on higher ground. The incremental effect of the proposed action on cultural resources would be negligible, in view of the scarcity of known sites and the low probability of finding undiscovered sites along the access route and in the Spruce #4 vicinity. Also, the route would mostly follow the existing mining access road, which reduces the probability of incurring further impacts. The likelihood of current and future activities negatively affecting cultural resources has been greatly reduced by the requirements of protective laws and regulations that require detailed pre-construction surveys and appropriate mitigation of potential impacts.

The backpacker campground and backcountry campsites proposed by NPS (1996) for the Kantishna area presumably would be occupied by visitors who would have camped elsewhere and thus would not represent a cumulative increase. The projected use of the private cabins on Spruce #4 in winter would introduce visitation in the Kantishna area in addition to the light use by dog-mushers, skiers, and others visiting private cabins associated with the Kantishna area lodges. The estimated private use of the cabins in summer and winter (500 visitor days maximum) would be minor (3%) in comparison to the estimated 16,576 annual visitor-days currently estimated for the Kantishna area in the summer.

A small number of snowmobilers probably would access the private cabins for long-distance winter trips. The travelers would most likely follow the existing mushing route from the Stampede Trail via the Clearwater Fork of the Toklat River, Myrtle Creek, and Willow Creek drainages to Spruce Creek. Although that route would be difficult and fairly long, the existence of an overnight facility at the end of the trip would increase the trip's attractiveness. Some interest already has been expressed in snowmobile access into the park (Gauna 1998a, 1998b), but NPS has issued a regulation banning snowmobile use in the former Mt. McKinley portion of Denali National Park and Preserve (NPS 2000 – FR 37878-37879, June 19, 2000).

The road mileage for this alternative would total 9.6 miles, including 0.64 miles (3,370 feet) of new construction to avoid instream travel in Spruce Creek, and 0.2 miles of maintained landing strip at Glen Creek. The improved access road to Spruce #4 thus would constitute 5–6% of the existing road network that comprises the 92-mile park road to Kantishna and approximately 75 miles of existing mining access roads and trails in the Kantishna Hills (NPS 1990). Because public access would be allowed on the entire route, including subsistence moose hunting in fall, there would be no cumulative impact on public use of the area. The maintenance and consistent use of the lower Glen Creek airstrip would not increase the number of airstrips available for landings by general aviation pilots in the Kantishna Hills because the Kantishna and Glen Creek landing strips are already available. Maintenance of the Glen Creek landing strip would create an improved means of increased public access into the upper Moose Creek drainage.

No impacts on subsistence uses in the area are expected because the negligible impacts of the proposed action on public access and wildlife and fish populations would not likely result in diminished subsistence opportunities.

Cumulative effects on wilderness resources would be minor. The proposed access would not be located in designated wilderness, and the Spruce Creek area was not recommended for wilderness designation. The impacts of past mining and development of centers of human activity have removed much of the Kantishna Hills from suitability as wilderness, a situation that would be reversed only by a long period of recovery following the unlikely discontinuation of all human activity in the area. The nearest designated wilderness to Spruce #4 is about 1–2 miles south of Moose Creek, in the northern portions of Backcountry Units 35 and 36, most of which are located south of the low divide marking the southern edge of the Moose Creek drainage (figure 310). Users of the northernmost portions of Backcountry Units 35 and 36 would be able to see the access road and cabins. Those areas are no longer suitable for primitive wilderness recreation because of the presence of new buildings (constructed 1998-2001) in the upper Moose Creek drainage (on the Spruce #4 and Rainy Creek parcels) and associated levels of human activity and vehicular access, including the air traffic to and from Kantishna.

4.3 Fly and Drive Alternative

4.3.1 Physical Environment

4.3.1.1 Geologic Resources

Road construction along 0.64 miles of the Spruce Creek valley would have minor effects on soil stability because the soils along most of the route have only thin, fine-grained floodplain cover deposits over alluvial gravel. Although these fine-grained cover deposits can be eroded (see below), compaction, erosion, or settlement of the underlying gravel is unlikely. Soil stability along the floodplain portions of this route would be high.

Displacement of riverbed materials caused by vehicles at 16 stream crossings likely would be minor because of the high proportion of coarse rock material in the riverbed. Flooding would consistently alter the riverbed at the numerous stream crossings on this route, however, requiring occasional maintenance repairs at some of the crossings.

Approximately 1.3 miles of the 2.7 miles of the route for this alternative would follow the floodplain of Moose Creek, which would be at moderate to high risk of being flooded. Degradation to the route

would not significantly affect its use by OHVs and a limited number of high-clearance pickups. Erosion could be minimized by bank protection at fords. Risk for slope failure along this route would be negligible because the road would be almost entirely on the flat floodplain.

Approximately 163 cu yd of gravel needed for road construction on Spruce #1 would come from the bank on the western side of the creek where the road would be constructed to bypass the stream channel. The 38 cu yd of gravel fill needed for road construction on Spruce #4 would be obtained from a gravelly bank along the route on Spruce #4. A small amount of cut-and-fill construction would occur at 3 new ramps to the floodplain along the route, and minor leveling would also occur.

Maintenance needs are estimated at 10 cu yd per year and would be provided for at former mining tailings along and within the route. Minor sedimentation would occur from runoff across the Glen Creek airstrip during heavy rainfall events, but most rainfall would infiltrate the porous gravel substrate. The airstrip would not need additional gravel but would need periodic grading to prevent erosion. The gravel resources used in this route construction and anticipated maintenance would be insignificant compared to the thousands of cubic yards that would need to be moved during future restoration of the former mining claims along Spruce Creek.

Conclusion: In summary, the fly and drive alternative would have negligible effects on soil stability, on riverbed stability, and on the adjacent floodplain. Impedance of floodwater by the road would also be negligible. Gravel extraction for road construction would require placement of approximately 200 cubic yards of gravel on the Spruce Creek floodplain and a tundra bench east of the creek. This alternative would not result in the impairment of park geological resources or values.

4.3.1.2 Natural Quiet

Vehicular sources of noise would be restricted to the road from the Glen Creek airstrip to the private property, so this alternative would not require the passage of vehicles on the road between Kantishna and the Spruce #4 parcel. Noise would be produced during construction of short sections along Spruce Creek, but the activity would be restricted to a relatively small area. Although gravel-hauling of about 200 cu yd would occur only along Spruce Creek, the necessary construction equipment would be hauled in and out the same existing mining access road as for the no-action and proposed access alternatives, resulting in temporarily increased noise levels along the route during the construction phase.

Noise levels produced by vehicles and equipment would be similar to those described for the proposed access (section 4.2.1.2), but the extent of vehicle activity would be less. The frequency of noise events from aircraft operations would likely increase with this alternative because vehicle access over the park road would be precluded. This could potentially result in nearly twice as many aircraft landings and take-offs at the Glen Creek airstrip as with the proposed access. The average hourly noise level at the Glen Creek airstrip would increase slightly, as would the disruption of natural quiet. The dBA of a Ford F-350 at 4 m is about 69, which is attenuated by riparian vegetation, access along a floodplain, and stream sounds. By contrast, airplane noise levels at the Kantishna Airstrip frequently exceed 75 dBA with a maximum of about 115 dBA. Few human receptors venture into backcountry unit 41 (147-321 people), however, where this airplane activity would take place. By contrast, about 1,600 lodge-based hikers and 400 backpackers use the first 3 miles of the proposed access road.

Conclusion: In summary, this alternative would result in minor impacts from more short-term, louder, and localized noise from an increase in airplane operations in the area immediately adjacent

to the Glen Creek airstrip. Less noise from vehicles would occur along the 6 miles between the park road and Glen Creek, where the greatest human use occurs. This alternative would not result in the impairment of natural quiet and for wilderness recreational activities to be provided in the park.

4.3.1.3 Visual Resources

The visual impacts of the fly and drive alternative would be similar to the no-action and proposed access alternatives. Visual effects would be minor because of the limited construction activity and the low frequency of traffic accessing the Spruce #4 property. The most noticeable visual impacts would be the small airplane flights to and from the lower Glen Creek airstrip (less than about 100 landings and take-offs per year), a potential storage structure at the Glen Creek airstrip, and an additional 300 feet of road construction on a tundra bench east of Spruce Creek. Level terrain and thick vegetation along the North Fork of Moose Creek and Spruce Creek would limit the visual impacts of the applicants' occasional vehicle traffic to and from the cabins at Spruce #4.

Conclusion: In summary, the effects on visual resources would be minor with a slight increase in effects from more air traffic but no effects along the first 6 miles of the existing access. The route would have minor impacts on the scenic quality of surrounding locations because of the adjacent thick vegetation and generally low position in the environment. This alternative would not result in an impairment of the scenery and wilderness forms of recreation in the park.

4.3.1.4 Water Resources

This alternative would eliminate all vehicular travel in the main fork of Moose Creek, Jumbo Creek, and Glen Creek, and would eliminate 2 crossings of the North Fork of Moose Creek. A total of 16 stream crossings (10 in the North Fork of Moose Creek and 6 in Spruce Creek) would still be needed to access the inholders' property. Vehicle passage on this route during the open-water season would result in some small, localized long-term impacts along Spruce Creek and upper North Fork Moose Creek from the chronic exposure to short-duration increases in low levels of suspended sediments and turbidity. About 800 m of stream length would be periodically affected with increased turbidity.

The direct effects of this alternative on stream discharge, flood frequency and magnitude, and flow duration would likely be minimal. The effect of vehicle passage through stream channels would be insufficient to alter these hydrologic characteristics, and the stream-flow effects of the upgraded road on the adjacent floodplain would likely be minor to negligible, given the size of the Moose Creek watershed. Discharge and flow duration, however, would constrain the ability of vehicles to ford the stream. Although discharge levels typically are low enough to allow the stream to be safely forded, there occasionally would be periods when water levels were too high for successful passage. Reductions in water quality would be expected to occur from contamination by accidental spills and leakage of fluids from vehicles using stream crossings, although these impacts would be transient and of low magnitude. Occasional strandings of vehicles in the North Fork Moose Creek crossings during high-water events would increase the potential for accidental spills of petroleum products.

Conclusion: In summary, this alternative would periodically affect water quality along 800 meters of stream reach below 16 stream crossings from increased turbidity. Impacts during the construction phase along Spruce Creek would be similar to the preferred alternative, but the long-term effects on water quality and channel morphology to Spruce Creek and North Fork of Moose Creek would be minor. These effects are not likely to lead to the impairment of the natural resources and values in the park.

4.3.2 Biological Environment

4.3.2.1 Aquatic Resources

Impacts to the biological environment in the main stem of Moose Creek would be eliminated by this alternative. Impacts to upper North Fork Moose Creek and Spruce Creek would continue, however, as mentioned above in section 4.2.2.1. About 500 meters of some of the high density grayling spawning habitat in the North Fork Moose Creek would still be affected by periodic vehicle crossings, and about 300 m of low density grayling habitat would be affected in Spruce Creek.

Grayling fall migration to over-wintering habitats farther down Moose Creek could be disrupted by instream vehicular traffic past the first week in September. Long-term effects of instream traffic, streambed modifications, and removal of riparian vegetation would reduce aquatic habitat quality. Chronic increases in turbidity and suspended sediments would result in localized loss of aquatic habitat for instream organisms and spawning habitat for fish immediately below the stream crossings (800 m). The physical disturbance and low levels of sedimentation resulting from repeated crossings would lead to small reductions of spawning habitat for salmonids.

Conclusion: In summary, below 16 stream crossings the distance of aquatic impacts (800 meters) after a short construction period would lead to improvement of water quality along Spruce Creek and the North Fork of Moose Creek. Coupled with the ADFG permit prohibiting vehicle travel and construction in streams during critical periods in the life history of grayling, the long-term adverse impacts of this alternative on aquatic resources would be minor. The low level of access across streams would not likely lead to an impairment of aquatic habitat in the park.

4.3.2.2 Vegetation and Wetlands

4.3.2.3.1 Vegetation

The Fly and Drive alternative would result in minor disturbance of vegetation. To replace instream travel in Spruce Creek, approximately 0.31 acres of tall shrub, 0.23 acres of low shrub, and 0.09 acres of white spruce forest would be removed for construction. All of these plant communities are regionally and locally common. Half of the tall shrub community to be removed is alder that have grown up in abandoned road segments and leveled tailings. Half of the ericaceous (low shrub) community is part of the existing access route that has not been bladed or received any gravel fill. A few white spruce trees would be removed near and on Spruce #4 where the road access would be routed out of the creek bed. In addition, alder and willow branches growing out over the access route would need to be trimmed on an annual basis.

The rest of this alternative uses the existing access route along the North Fork of Moose Creek and the Glen Creek airstrip and access road. The other impact of this alternative, however, would be the continued suppression of natural revegetation on 5.9 acres as long as vehicles continue to use the access road and airstrip, or as long as access maintenance is performed.

In summary, 0.63 acres of vegetation would be removed during construction activities (the same as the preferred alternative) and 5.9 acres of vegetation would be precluded from natural revegetation. The overall effects to vegetation in the area would be minor.

4.3.2.3.2 Wetlands

An estimated total of 0.37 acres of wetlands near Spruce Creek would be impacted directly by construction of the fly and drive alternative. Approximately 0.23 acres of the impact would be to palustrine scrub shrub (ericaceous) plant communities and 0.14 acres would be to riparian shrub communities. The area of wetlands directly affected is lower than expected for these valley floor locations, because of the presence of the existing mining access road and land conversion from past mining. In a number of locations along the route, mining disturbance and deposition of tailings have converted what were once seasonally flooded riparian shrub communities into tall-shrub uplands (non-wetlands).

Approximately 200 cu yd of gravel would be placed on 0.22 acres of wetlands, over 90% of which would be in the scrub shrub community. Two culverts would be required to keep crossings of minor drainages from becoming mud holes. The rest of the wetland acreage to be used provides a surface durable enough for limited use of light vehicles. Additional wetland impacts would consist of brush cutting along the existing road. Less than 10% of the estimated 10 cu yd per year future gravel maintenance needs are expected to be placed on the wetland sections of the route.

The primary wetland impacts of this route would occur in rivers and streams, which would be affected by the multiple crossings required by this route. Aquatic impacts would include direct removal of fish habitats, increased erosion, and changes in water quality from sedimentation. The riverine and riparian wetlands adversely affected by this route are ranked high for wetland functional importance. Qualitatively, the types of impacts to Moose Creek resulting from this alternative would be similar to those resulting from continued use of the existing access road under the no-action alternative. The impacts to the waters and habitats of Spruce Creek, however, would be much less because of the elimination of 1,659 feet of instream travel and the reduction in the number of crossings from 12 to 6.

In summary, the adverse effects to wetlands from construction would be minor (0.37 acres) and functional impacts to riparian and riverine wetlands would be less than the no-action alternative.

Conclusion: In summary, the proposed access alternative would result in minor disturbance of vegetation. The impacts of this alternative to wetland resources would be minimal given the small total area of projected impacts to wetland areas from road construction and the elimination of instream travel. This alternative would not result in the impairment of vegetation or wetlands in the park.

4.3.2.4 Wildlife and Habitat (Mammals and Birds)

4.3.2.4.1 Mammals

Though airplanes are the primary mode of access for this alternative and vehicles are the secondary mode of access to Spruce #4, the types and consequences of impacts are likely to be similar to the other access alternatives. Direct loss and modification of habitat due to clearing of vegetation and placement of gravel fill for road construction would be the same as for the proposed access. This alternative would affect the smallest area of wildlife habitat (5.9 acres) of any alternative. The section of Moose Creek between Rainy Creek and Glen Creek would not receive vehicle traffic from this access alternative after the minor road construction is completed along Spruce Creek.

The magnitude of temporary disturbance to wildlife from airplane noise in summer would be the highest of any alternative because of the higher frequency of flights required to access the property.

The frequency of airplane noise events would be two times higher than for any other alternative, leading to higher average noise levels in the vicinity of the private property. This disturbance would be greatest near the Glen Creek airstrip, particularly during airplane take-offs. The magnitude of truck and OHV traffic disturbance of wildlife would be the lowest for this alternative because it would require the shortest length of vehicle travel.

Conclusion: In summary, the impacts to wildlife and their habitat would be minor. The direct and indirect effects of the fly and drive alternative on wildlife would differ slightly from the no-action alternative and other alternatives. The amount of habitat lost would be lower than for any other action alternative, as would be the operational impacts of behavioral disturbance from ground vehicles. Temporary local disturbance or displacement of wildlife from airplane noise would be higher than from the other alternatives because of twice the airplane traffic. This alternative would not result in impairment of wildlife or their habitat in the park.

4.3.2.4.2 Birds

The near doubling of use of the Glen Creek airstrip would result in the highest frequency of airplane-related disturbance of birds in adjacent habitats, principally during takeoffs when noise levels are greatest. Noise and disturbance on the bird community from vehicles between the airstrip and Spruce # 4 would be minor and restricted to the 3.8 miles of access road.

Conclusion: In summary, this alternative would have the least impact on bird habitats of any action alternative because of the small acreage affected (5.9 acres total) and the concentration of human activity in the smallest geographic area. This alternative would not result in the impairment to swans, other waterfowl, or other birds in the park.

4.3.3 Social and Economic Environment

4.3.3.1 Cultural Resources

The potential for historical resources to occur in the Moose Creek and Spruce Creek valleys is generally high because mining occurred consistently in the Kantishna Hills area since 1903. Cultural resource surveys have been conducted in various parts of the Moose Creek valley and tributary drainages since 1986 in support of the Cultural Resource Mining Inventory and Monitoring Program (CRMIM). One historical site is known to be present along this access route, and no archeological sites were discovered. Those surveys focused on mining claims, so the likelihood of locating historic properties in those areas was relatively high. Other building remnants and the tailings piles that are present along the route resulted from more recent (i.e., less than 50 years old) mining activity, and thus would not yet be eligible for NRHP listing.

This alternative takes a route on the opposite side of Spruce Creek from the cabin ruins historic site, and no additional impacts to the site are anticipated. Accordingly, the principal concern would be the potential impacts of access construction and use on undiscovered resources along the access road. A cultural resource survey would need to be undertaken along the route to provide clearance for road construction. For any additional historic properties found in the project area a plan would be developed in consultation with the ACHP and SHPO to ensure adverse effects on cultural sites would be avoided or minimized. In general, however, the potential for preservation of prehistoric sites and the probability of finding undiscovered archeological resources would be low along the Moose Creek route, due to its location in and along active streambeds and to the extensive disturbance caused by more recent mining activity.

Summer would be the season of concern for impacts on cultural resources because that is when access use would primarily occur. Winter impacts would be negligible or absent, except perhaps for the unlikely possibility of minor damage from snowmobiles driving over sites covered by snow.

Mitigation of adverse effects on newly discovered cultural resources along this route would be accomplished primarily through avoidance or minimization, such as shifting the right-of-way. For sites that could not reasonably be avoided, mitigation would involve data recovery through detailed excavation and documentation of the resources present at the sites.

Conclusion: In summary, the potential impacts on historic and archeological resources from this alternative would be negligible. This alternative would not result in an impairment of historical or archeological resources in the park.

4.3.3.2 Public Use

Impacts to public use of parklands would be similar but less under this alternative than the other access alternatives because no long-term direct connection between mile 89 of the park road and Spruce #4 would occur under this alternative. Conflicts between motorized access and hikers using the first 6 miles of the mining access road would be avoided. Impacts to remote backcountry users in units 41 and 35 could be greater because of likely greater aircraft noise impacts. Other impacts would be similar to those described under the proposed access alternative (section 4.2.3.2.)

Conclusion: In summary, the impacts to public access and use from this alternative would be negligible. This alternative would have the lowest impacts on public use of all the action alternatives because the busiest part of the upper Moose Creek valley near Kantishna would be avoided. This alternative would not result in an impairment of park natural resources and the access to and public enjoyment of park values and purposes.

4.3.3.3 Subsistence

Impacts to subsistence uses in the area would be similar to the proposed access with a few minor differences. Access to Moose Creek for moose hunters on the existing mining access road would continue as it is, but no additional vehicle travel by the applicants would occur between the park road and Glen Creek. Noise disturbance would be greater from the higher frequency of airplane flights to the Glen Creek airstrip, but an increase in airplane landings and take-offs would not be expected to result in detectable effects on the distribution of moose (and thus, availability of subsistence resources) in the Moose Creek valley.

Conclusion: This alternative would have negligible impacts on subsistence uses in the project area. This alternative would not impair subsistence resources or uses in the park.

4.3.3.4 Wilderness

The effects of this alternative on wilderness would be similar to the proposed access, except a slightly greater number of airplane trips would increase local noise disturbance. The access would not be inside designated or proposed wilderness, but aircraft noise would extend into the adjacent Denali Wilderness about one mile south of the Glen Creek Airstrip. This disturbance would be temporary and intermittent. The impacts to wilderness and wilderness recreational activities in the area would be minor. The maximum estimated 100 annual airplane trips by both applicants would be far less

than the average annual 600 airplane trips by the Kantishna air taxi and flightseeing operations in the area.

Conclusion: The impacts of this alternative to wilderness would be minor, and it would not impair designated wilderness or the wilderness recreational purposes and values of the park.

4.3.4 Cumulative Impacts of the Fly and Drive Alternative

4.3.4.1 Physical Environment

The incremental impacts to gravel resources in the Kantishna area would be similar to those described for the proposed access. The gravel needed to construct a new segment of road out of Spruce Creek and to maintain the access in its present condition over the next few decades is expected to be minor, or no more than 3-4% of the available gravel tailings along Spruce Creek.

The higher volume of airplane traffic necessary to access the private property under this alternative would incrementally increase airplane noise levels in the upper Moose Creek drainage. The maximum estimated 100 annual airplane trips by both applicants for summer and winter would be far less than the average annual 600 airplane trips by Kantishna air taxi and flightseeing operations in the area. Furthermore, the applicants would use smaller, quieter airplanes like a Piper Supercub than the larger, noisier Cessna 206s used by the air taxi in Kantishna. A short-term addition of noise is likely when administrative sampling of unpatented mining claims along Moose Creek and its tributaries begins in the summer of 2002 with use of backhoes, loaders, and wash-plants.

The cumulative visual impacts of the fly and drive alternative would be nearly the same as under the proposed access alternative except the applicants would fly airplanes more frequently and they would not drive vehicles along the first 6.5 miles of the mining access road. The first 6.5 miles of access road in the Moose Creek valley would not be recovered right away, however, because access to other inholdings on Rainy Creek are needed, and access to mining claims on Glen Creek and upper Moose Creek would be needed for an unknown period of time.

As described in section 4.2.4.1, the virtual cessation of mining since the mid-1980s has greatly reduced traffic in and through, and sedimentation of, streams in the Kantishna area. Administrative sampling of unpatented mining claims held by Northwest Explorations, Inc. and the Gold King group is likely to begin in summer of 2002 to verify or correct findings in NPS validity reports that the claims along Moose Creek and its tributaries are invalid (NPS 1998-2000). This effort would likely cause additional sedimentation along the proposed access route in the upper Moose Creek drainage for one to a few years, depending on the results of the contest. Cumulative impacts from additional hydrologic changes, channeling, and local instability of the proposed access road in the floodplain would be relatively minor in a regional sense. A drawback of this alternative is the location of the road in the floodplain, but the reduction of stream fords in Moose Creek and instream travel in Spruce Creek would reduce the overall cumulative effect. Recurring problems with instability of stream crossings and the road along the North Fork and Spruce Creek, however, would continue.

The incremental impact would occur along the North Fork of Moose Creek and in Spruce Creek, where occasional minor increases in sedimentation and turbidity would affect about 0.5 miles (800 m) of stream length below the fords. This would result in an incremental increase of 1.2% over the 37.4 miles of stream length directly disturbed by past mining in the Kantishna Hills.

4.3.4.2 Biological Environment

The incremental impacts of the fly and drive alternative on the biological environment of the Kantishna area would be similar to that of the proposed action (section 4.2.4.2). No driving in the lower reaches of Moose Creek between the park road and Glen Creek, however, would reduce cumulative impacts to aquatic resources. The new impacts on vegetation types and habitats (0.63 acres) would affect less than 0.001% of the 85,735 acres in the Kantishna Hills wildlife study area, and about 0.04% of the area disturbed by past mining. The impacts of potential future activities (like claim sampling) are likely to be small in view of the strong regulatory processes that now govern mining in the parks, which processes were not in place when past mining was undertaken. Claim sampling along upper Glen Creek in 2002 by BLM is expected to affect less than 1.4 acres of vegetation, and this area is to be reclaimed after sampling is completed.

The fly and drive alternative may retard recovery of salmon spawning and full function of grayling spawning in the North Fork of Moose Creek by introducing small amounts of sedimentation and turbidity below 16 stream crossings from up to 60 roundtrip vehicle passes. This alternative would result in no cumulative impacts on aquatic ecosystems along the main branch of Moose Creek because vehicle travel would be precluded there. Compared to past mining activities, the cumulative effects of this access on aquatic resources would be negligible.

Much of the total area used by the fly and drive access alternative (5.6 acres) would fall into the “disturbance” category in the mining EIS (NPS 1990); thus, the process of natural recovery on those previously disturbed lands would be arrested. The Department of the Interior and Northwest Explorations, Inc. may access unpatented mining claims on portions of the North Fork of Moose Creek, Glen Creek, Spruce Creek, and Rainy Creek during sampling of the claims in 2002 and beyond, as needed.

As with the proposed access alternative, the incremental contribution of this alternative to wetland impacts (0.37 acres) would be negligible, especially when compared to the disturbance along 37 miles of stream courses from past mining in the Kantishna Hills and ongoing validity sampling of the mining claims. The magnitude of impacts on wetlands in the Kantishna area from additional future activities is also likely to be small, in view of the regulatory processes now in place to avoid, minimize, and compensate for such impacts.

The incremental contribution of direct loss and modification (in terms of area) of wildlife habitats resulting from the fly and drive alternative can be estimated and compared with the impacts of past mining (see page 4-21). This alternative would directly affect about 5.6 acres of habitat. In comparison with past mining, the incremental impacts of this alternative would be small, affecting 0.005%–0.02% of the primary habitats for large mammals in the Kantishna Hills area. The incremental impacts would be reduced further by the continuing natural revegetation of many of the habitats affected by past mining, including parts of the Moose Creek mining access roads.

Before mining began in the Kantishna Hills, riparian wildlife habitat, which is important to a wide variety of birds and mammals, was estimated to occur along 94.2 miles of stream courses in the Kantishna Hills wildlife study area (NPS 1990), of which 35% (33.3 miles) was disturbed by past mining. This alternative would continue disturbance to 3.5 miles of riparian wildlife habitat previously affected by mining, although the magnitude of the disturbance would be reduced because the access would mostly use existing mining access and the road would not be widened, disturbing no more riparian vegetation.

Disturbance of birds and mammals by personal recreational activities would be additive to that caused by backpackers and other existing lodge operations in the area, including hikes along the existing road from the park road to the first crossing of Moose Creek, Skyline Drive, Wonder Lake/Blueberry Hill area, and McKinley Bar. The proposed level of recreational use from the private property would be negligible compared to the level of use from backpackers and lodge guests now using the Kantishna Hills.

The fly and drive alternative would contribute no cumulative increment to impacts on sensitive species. Several species of concern (harlequin duck, olive-sided flycatcher, lynx, and chum salmon) occur in the project area, but this alternative would cause minor to negligible impacts on those species, primarily through occasional behavioral disturbance. The cumulative disturbance or loss of habitat for those species would be negligible.

4.3.4.3 Social and Economic Environment

Cumulative impacts to the social and economic environment would be minor to negligible because the fly and drive alternative would be consistent with management plans for the area and would result in few conflicts with other users in the Moose Creek drainage. Because no vehicle allocations for travel across the Denali park Road would be allotted to the inholders under this alternative, there would be no conflict with the vehicle allocations for Kantishna landowners provided for in the front-country management plan (NPS 1996) and final road regulations (*FR 37878-37879* June 19, 2000).

Past mining activity was responsible for the creation of most of the 45 historic sites in the Kantishna Hills area (NPS 1990), whereas the smaller number of the 11 known archeological sites resulted from prehistoric hunting. Additional prehistoric sites are certainly present. The concentration of most mining activity in stream bottoms minimized the impacts on archeological resources, which are mostly on higher ground. The incremental effect of the fly and drive alternative on cultural resources would be negligible, in view of the scarcity of known sites and the low probability of finding undiscovered sites along the access route and in the Spruce #4 vicinity. Also, the alternative would mostly follow the existing mining access, which reduces the probability of incurring further impacts.

The backpacker campground and backcountry campsites proposed by NPS (1996) for the Kantishna area presumably would be occupied by visitors who would have camped elsewhere and thus would not represent a cumulative increase. Nevertheless, these facilities could be located in the Moose Creek drainage between the Denali Park Road and the Glen Creek airstrip. The estimated private use of the cabins on Spruce #4 in summer and winter (500 visitor days maximum) would be minor (3%) in comparison to the estimated 16,576 annual visitor-days currently estimated for the Kantishna area in the summer. The projected use of the private cabins in winter would introduce visitation in the Kantishna area in addition to the present light use by dog-mushers, skiers, and others visiting private cabins associated with the Kantishna area lodges.

A small number of snowmobilers probably would access the private cabins for long-distance winter trips. The travelers would most likely follow the existing mushing route from the Stampede Trail via the Clearwater Fork of the Toklat River, Myrtle Creek, and Willow Creek drainages to Spruce Creek. Although that route would be difficult and fairly long, the existence of an overnight facility at the end of the trip would increase the trip's attractiveness. Some interest already has been expressed in snowmobile access into the park (Gauna 1998a, 1998b), but NPS has issued a regulation banning snowmobile use in the former Mt. McKinley portion of Denali National Park and Preserve (NPS 2000).

The road mileage for this alternative would total 2.7 miles, including 0.64 miles (3,750 feet) of new construction to avoid instream travel in Spruce Creek, and 0.2 miles of maintained landing strip at Glen Creek. The improved access road to Spruce #4 thus would constitute about 2% of the existing road network that comprises the 92-mile park road to Kantishna and approximately 75 miles of existing mining access roads and trails in the Kantishna Hills (NPS 1990). Because public access would be allowed on the entire route, including subsistence moose hunting in fall, there would be no cumulative impact on public use of the area. Vehicle access would still occur to inholdings by Rainy Creek along the first 3 miles of the mining access road. The maintenance and consistent use of the lower Glen Creek airstrip would not increase the number of airstrips available for landings by general aviation pilots in the Kantishna Hills because the Kantishna and Glen Creek landing strips are already available. Maintenance of the Glen Creek landing strip would create an improved means of public access into the upper Moose Creek drainage.

No impacts on subsistence users in the area are expected because the negligible impacts of the fly and drive alternative public access and wildlife and fish populations would not likely result in diminished subsistence opportunities.

Cumulative effects on wilderness resources would be minor. The fly and drive alternative would not be located in designated wilderness. Although the Spruce Creek area was not recommended for wilderness designation, the impacts of past mining and development of lodges have removed much of the Kantishna Hills from suitability as wilderness. This situation would be reversed only by a long period of recovery following the unlikely discontinuation of all human activity in the area. The nearest designated wilderness to Spruce #4 is about 1–2 miles south of Moose Creek, in the northern portions of Backcountry Units 35, most of which is located south of the low divide marking the southern edge of the Moose Creek drainage (figure 3.10). Users of the northernmost portions of Backcountry Units 35 would be able to see the access road, airstrip, and cabins. Areas in backcountry units 41 and 42 are no longer suitable for primitive wilderness recreation because of the presence of new buildings (constructed 1998-2000) in the upper Moose Creek drainage (on the Spruce #4 and Rainy Creek parcels), associated vehicle access, and the general proximity to Kantishna with its high levels of human activity. The airplane travel to the Glen Creek airstrip (up to 100 flights per year) would be cumulative with the existing air traffic to and from Kantishna (600 flights per year), further diminishing the wilderness character of the area.

4.4 Glen Creek Bench Alternative

4.4.1 Physical Environment

4.4.1.1 Geologic Resources

Road maintenance along the Moose Creek valley would have minor effects on soil stability because the soils along most of the route have only thin, fine-grained floodplain cover deposits over alluvial gravel. Although these fine-grained cover deposits can be eroded (see below), compaction, erosion, or settlement of the underlying gravel is unlikely. Soil stability along the floodplain portions of this route would be high.

Displacement of riverbed materials caused by vehicles fording the stream likely would be minor because of the high proportion of coarse rock material in the riverbed. Flooding would consistently alter the riverbed at the numerous stream crossings on this route, however, requiring occasional maintenance repairs at some of the crossings.

Approximately 2.9 miles of the 8.6 miles of the route for this alternative would follow the floodplain of Moose Creek, which would be at moderate to high risk of being flooded. Degradation to the route would not significantly affect its use by OHVs and a limited number of high-clearance pickups. Erosion could be minimized by bank protection at fords. Risk for slope failure along this route would be negligible because the road would be almost entirely on the flat floodplain.

New road construction on 1.3 miles of access between the Glen Creek mining road and Spruce #4 would have to contend with the occurrence of permafrost, gentle side-slopes with groundwater movement above the permafrost, and occasional steep slopes. Problems with soil instability, erosion, and sedimentation would vary with the terrain, but would mostly be minor. Placement of fill on well-drained alluvial gravels would have negligible impacts on soil stability. In contrast, fill placement would lead to minor thaw settlement in wetland areas where the silt cap is thick and permafrost is present. Thaw settlement would likely be minor due to the thinness of ice-rich, fine-grained cover deposits.

The new construction area crosses side slopes along most of the route, making it likely that surface runoff during heavy rains or spring snowmelt would cause minor erosion along the margins of the roadbed and in culvert outflow zones. Frequent culvert maintenance would be required to prevent water impoundment associated with blockage due to thaw settlement.

Approximately 3,050 cu yd of gravel needed for road construction between the Glen Creek road and the Barney parcel on Spruce #4 would come from either the ROW on Spruce #4 or from the applicants' parcels. Mining gravel from placer mine tailings and otherwise manipulated topography in the floodplain of Spruce #4 would reduce the amount of gravel available for reclamation. It is not clear that this impact would be harmful to reclamation since placer mining loosens the layers above bedrock creating a larger volume of subsoil material to restore than was originally there. Limited cut-and-fill construction would move about 240 cu yd of material to 3 low spots in the dry ridge area, and other route leveling in the dry areas would move up to 400 cu yd.

Maintenance needs are estimated at 20 cu yd per year and would be provided from the Spruce #4 ROW area. Minor sedimentation would occur from runoff across the Glen Creek airstrip during heavy rainfall events, but most rainfall would infiltrate the porous gravel substrate. The airstrip would not need additional gravel but would need periodic grading to prevent erosion. The gravel resources used in this route construction and anticipated maintenance would be much less than the thousands of cubic yards that would need to be moved during future restoration of the mining claims along Spruce Creek.

Conclusion: In summary, the Glen Creek Bench alternative would have negligible effects on soil stability, riverbed stability, and the adjacent floodplain. Gravel extraction for road construction would require placement of approximately 3,290 cubic yards of gravel on wetlands between the Glen Creek road and the applicants' parcels and another 400 cu yd would be leveled along the dry ridges, the greatest total of all alternatives. Permafrost degradation and thaw settlement would be likely in some areas of new construction on the wetlands between Glen and Spruce creeks, but effects could be mitigated through road maintenance. Proper road design and culvert placement would minimize erosion and sedimentation problems, but culvert maintenance would be required throughout the life of the project to reduce impoundment and drainage problems along the route. Nevertheless, this alternative would not result in the impairment of the geological resources in the park.

4.4.1.2 Natural Quiet

Potential noise sources associated with the Glen Creek Bench alternative include construction traffic and activities (about 325 10-yd or 650 5-yd dump-truck loads hauling gravel and building materials, for a couple weeks during the June – September construction season), vehicle traffic to the private property, and airplane landings/takeoffs (about 50 round-trips per year) at the lower Glen Creek airstrip. The levels of noise generated by vehicle passes along this route would exceed those for the other alternatives, particularly during construction, because the length of new road is greater and more gravel loads would be necessary. Noise propagation also would be greater for this alternative because the vegetation along the last 2 miles of the route is less dense and masking stream sounds are more distant. Noise levels generated by airplane operations would be identical to those described for the proposed access alternative.

Conclusion: In summary, the Glen Creek Bench alternative would result in short-term moderate to major noise impacts during the construction phase of the project. Noise impacts would be minor after construction. In relative terms, the impacts of this alternative would be the greatest of any alternative because the Glen Creek Bench route requires the greatest amount of new road construction and would traverse open country that would provide less attenuation (reduction) of equipment and vehicle noises. Because the noise impacts would be temporary during construction and sporadic after that, this alternative would not result in an impairment of the natural resources and wilderness forms of recreation in the park.

4.4.1.3 Visual Resources

This alternative would result in the greatest visual impacts within the upper Moose Creek valley. The first 6.6 miles of this alternative from the park road would be the same as for the no-action and proposed access alternatives. The newly constructed road between Glen and Spruce creeks and a potential storage shelter at the Glen Creek airstrip would be located on south-facing slopes and esker-like ridges along the north side of the upper Moose Creek valley. This area has low shrub and alpine tundra vegetation, and a road located here would be highly visible, as indicated by the high proportion of background views. Accordingly, this stretch of road would provide sweeping views (beneficial impacts) for persons traveling to and from the private property. The negative visual impacts would be greater than farther down the valley, especially from the north-facing slopes on the northern edge of Backcountry Units 35 and 36 (designated wilderness), because of the open terrain and relative lack of recognizable roads in the upper Moose Creek drainage.

Conclusion: In summary, the Glen Creek Bench alternative would result in minor to moderate visual impacts, both beneficial and adverse, because a new stretch of road would be located on sloping terraces above the valley floor. Persons traveling to and from the private property would enjoy more background views than from the other access alternatives, but the road would in turn be more visible to other park visitors (e.g., backcountry users) elsewhere in the view shed of the Moose and Spruce Creek valleys. The number of park visitors experiencing negative visual effects would be greater than the number of those benefiting from the visual quality of the route. Because of existing roads and airstrips in the area and the relatively small area of impact to the scenery, this alternative would not result in an impairment of the scenery and wilderness forms of recreation in the park.

4.4.1.4 Water Resources

This alternative would eliminate all in-stream vehicle travel upstream of Glen Creek. The number of crossings would total 16 (13 on Moose Creek, 2 on Jumbo Creek [2 braids], and 1 on Glen Creek).

Vehicle passage on this route during the open water season would result in localized long-term impacts from the chronic exposure to short-duration increases in low levels of suspended sediments and turbidity (See Section 4.2.1).

The direct effects of this alternative on stream discharge, flood frequency and magnitude, and flow duration would likely be minimal. The effect of vehicle passage through stream channels would be insufficient to alter these hydrologic characteristics, and the stream-flow effects of the upgraded road on the adjacent floodplain would likely be minor to negligible, given the size of the Moose Creek watershed. Discharge and flow duration, however, would constrain the ability of vehicles to ford the stream. Although discharge levels typically are low enough to allow the stream to be safely forded, there occasionally would be periods when water levels were too high for successful passage. Reductions in water quality would be expected to occur from contamination by accidental spills and leakage of fluids from vehicles using stream crossings, although these impacts would be transient and of low magnitude. Occasional strandings of vehicles in the Moose Creek crossings during high-water events would increase the potential for accidental spills of petroleum products.

Conclusion: In summary, this alternative would have temporary and minor impacts to water resources below 16 stream crossings resulting from low levels of increased suspended sediments and turbidity. There would be no impacts to the North Fork of Moose Creek and Spruce creek upstream of the Glen Creek access turnoff. This alternative would not result in an impairment of the water resources and associated purposes and values of the park.

4.4.2 Biological Environment

4.4.2.1 Aquatic Resources

As described in the previous section, the impacts of this alternative on instream habitats in Moose Creek and its tributaries would result in reduced quality of aquatic habitats for invertebrates and fish below 16 stream crossings (totaling approximately 800 m of stream habitat) along the length of the route. Most of those crossings would affect habitats in the portion of Moose Creek that is cataloged as an anadromous stream; however, most do not occur in the reach of North Fork Moose Creek which is categorized as having high densities of arctic grayling.

Long-term effects of instream traffic, streambed modifications, and removal of riparian vegetation would reduce aquatic habitat quality. Chronic increases in turbidity and suspended sediments would result in localized loss of aquatic habitat for instream organisms and spawning habitat for fish immediately below the stream crossings. The physical disturbance and low levels of sedimentation resulting from repeated crossings would lead to small reductions of spawning habitat for salmonids.

Lastly, grayling fall migration to over-wintering habitats farther down Moose Creek could be disrupted by instream vehicular traffic past the first week in September. In most years, this migration occurs during the second week of September (Meyer and Kavanagh 1983).

Conclusion: In summary, about 800 meters of stream habitat would be temporarily reduced in quality from increased suspended sediments and turbidity from vehicle crossings. Moderately dense grayling spawning habitat in Moose Creek would be impacted, but high-density grayling-spawning habitat in the North Fork of Moose Creek would be avoided with this alternative, resulting in minor impacts and the least adverse impact to aquatic resources of all alternatives. This alternative would not result in an impairment of the aquatic and fish resources and associated purposes and values of the park.

4.4.2.2 Vegetation and Wetlands

4.4.2.3.1 Vegetation

The Glen Bench alternative would result in direct impacts to 1.92 acres of vegetation between the Glen Creek mining road and Spruce #4. The new construction would remove 1.03 acres of ericaceous and dwarf birch low shrub, 0.50 acres of dwarf shrub/barren, 0.28 acres of willow tall shrub, 0.05 acres of forested wetlands, 0.05 acres of white spruce uplands, and 0.01 acres of alder tall shrub plant communities. All of these plant communities are regionally and locally common. Half of the alder community to be removed has grown up on the Glen Creek road edge fill slope. In addition, alder and willow branches growing out over the access route would need to be trimmed on an annual basis.

The rest of this alternative uses the existing access along Moose Creek and to the Glen Creek airstrip. Another impact of this alternative, however, would be the continued suppression of natural revegetation as long as vehicles continue to travel the access road consistently, or as long as route maintenance is performed.

The existing route up the North Fork and Spruce Creek could not be removed or restored until the unpatented mining claims above the mouth of Spruce Creek and on Spruce Creek are found to be not valid or are purchased. Additional sampling on the claims on the North Fork is likely and it is not known when the use of mining equipment along these routes would end.

Conclusion: In summary, 1.92 acres of vegetation would be removed, a minor impact overall, but the most of all of the alternatives. Nevertheless, this alternative would not result in impairment to the vegetation of the park.

4.4.2.3.2 Wetlands

An estimated total of 1.36 acres of wetlands would be impacted directly by construction of the Glen Bench route. Approximately 1.03 acres of the impact would be to palustrine scrub shrub (ericaceous) plant communities, 0.28 acres of impact would be to tall willow communities, 0.05 acres of impact would be to forested wetlands and 0.01 acres would be to tall alder communities. These wetland associations are locally common. The area of wetlands directly affected is lower than expected for the valley floor locations, because of the presence of the existing mining access road and land conversion from past mining. In a number of locations along the route, mining disturbance and deposition of tailings have converted what were once seasonally flooded riparian shrub communities into tall-shrub uplands (non-wetlands). In terms of functional importance, the shrub and forested wetlands along the alignment rank lower than the riverine and riparian wetlands on the valley floor.

Approximately 3,290 cu yd of gravel would be placed on 1.36 acres of wetlands, of which 75% would be in the scrub shrub community. Between 7-10 culverts would be required to keep from impounding surface flows. Additional wetland impacts would consist of brush cutting along the existing road. Most of the estimated 20 cu yd per year future gravel maintenance needs are expected to be placed on the wetland sections of the route.

The primary impacts would include direct loss of wetlands from placement of road fill, clearing of surface vegetation along the ROW, and obstruction or alteration of natural drainage patterns, leading to altered wetland hydrology and plant species composition. Mitigation measures to offset impacts would primarily include maintenance of natural drainage patterns through proper road design and

culvert placement and clearing of vegetation only when necessary for traffic safety. Reclamation of degraded wetlands elsewhere in the Kantishna Hills would provide opportunities for the 1:1 compensatory mitigation required by NPS policy to offset the impacts of this alternative.

A primary wetland impacts of this route would occur in rivers and streams, which would be affected by the multiple crossings required by this route. Aquatic impacts would include direct removal of fish habitats, increased erosion, and changes in water quality from sedimentation. The riverine and riparian wetlands adversely affected by this route are ranked high for wetland functional importance. Qualitatively, the types of impacts to Moose Creek resulting from this alternative would be similar to those resulting from continued use of the existing access road under the no-action alternative. The impacts to the waters and habitats of Spruce Creek and most of the North Fork, however, would be eliminated under this alternative.

Conclusion: In summary, 1.36 acres of wetlands would be directly impacted, the most of all alternatives. This would be offset with wetlands compensation elsewhere in the Moose Creek valley or Kantishna Hills. The overall impacts to wetlands in the area would be minor because a small area of locally common and low-grade wetland types would be adversely affected. Though NPS policy precludes selecting an alternative if a reasonable alternative would impact less wetlands, this alternative would not result in an impairment of the park's wetland resources.

4.4.2.4 Wildlife and Habitat (Mammals and Birds)

4.4.2.4.1 Mammals

The types and consequences of impacts likely to result from construction and operation of this alternative would be similar to those described for the proposed access alternative, differing primarily in the degree of direct effects on habitats and the types of habitats affected. Direct loss and modification of habitat due to clearing of vegetation and placement of gravel fill for road construction would total 1.92 acres. This alternative would affect more bear, caribou, and wolf habitat than the other alternatives because of the new road construction in low-shrub tundra habitat, but the percentage of habitat affected is negligible. The location of the road on terraces and slopes above the riparian vegetation along Moose and Spruce Creeks would substantially reduce the impacts (both direct and indirect) on winter moose habitat.

An estimated 325 to 650 dump-truck loads traveling between Spruce #4 and wetland sections west of there during a summer construction period would displace some wildlife from using the area. A slight increase in vehicle trips would add minor disturbance to wildlife beyond that currently resulting from the low level of temporary access permitted to the private inholdings at Spruce #4 and Rainy Creek. Disturbance from small airplanes (maximum estimate 50 per year) would occur sporadically at and near the lower Glen Creek airstrip. Disturbance of wildlife in winter, especially moose in riparian shrub stands, would be low because road access between the airstrip and Spruce #4 cabins would not be maintained. Access in winter would be overland by snowmobile when adequate protective snow cover exists, by skis, or by snowshoes. The potential for attraction of carnivores would continue around the existing cabins at the Spruce #4 parcel, but the low level of human activity would keep that potential minimal.

Conclusion: In summary, this alternative would have minor impacts on wildlife because of the temporary construction period and continued low level of human use in the area. The impacts would be slightly greater than the other alternatives because of greater construction activity and loss of habitat. This alternative would not impair the wildlife purposes and values of the park.

4.4.2.4.2 Birds

The Glen Creek Bench alternative would have a greater direct impact on bird habitats than the other alternatives because of the amount of new road construction (about 1.2 miles) and the greater total acreage of habitats affected by construction of this alternative (about 1.9 acres). On the other hand, the relative value of the habitats affected by the long-term access would be lower than the existing and proposed access because fewer acres of higher-diversity riparian habitats would be used. Low-shrub habitat has the highest relative abundance of birds in Denali National Park (Paton and Pogson 1996), but it also has lower species richness than tall shrub and forested habitats. The low-shrub type is the most abundant habitat in the Kantishna Hills area (47% of the total area mapped by NPS [1990]), so the loss of less than 2 acres along this route would result in negligible impacts on bird populations. Some breeding birds would be displaced from sections of the route where new road construction was taking place, resulting in a minor loss of eggs and young birds during construction. As with the other access alternatives, the effects of vehicle traffic on birds would result in temporary behavioral disturbances, which would be negligible because of the relatively low number of vehicle passes along the road and the short duration of noise generated by these vehicles. Other impacts on birds would be similar to those described for the proposed access.

Conclusion: In summary, the Glen Creek Bench alternative would have negligible impacts on bird populations, but the impacts would be greater than the no-action alternative and other action alternatives because of the greater length of new road that would be constructed. Effects of vehicle and aircraft access under this alternative would be similar to those described for the preferred alternative. This alternative would not result in impairment to swans, other waterfowl, or other birds in the park.

4.4.3 Social Environment

4.4.3.1 Cultural Resources

Two archeological sites were discovered on and near the areas of new construction for this alternative. One of the sites was dated at 2200 BP and they are all part of an association of sites that has had limited study and documentation. The access could be routed around the known perimeter of the sites but those sites would need to be further evaluated before those perimeters would have sufficient certainty. Because of the increased access to the sites that this route would bring, it is likely that full documentation of the sites would be necessary.

An additional concern would be the potential impacts of access construction and use on undiscovered resources along the access road. A cultural resource survey would need to be undertaken along the route to provide clearance for road construction. For any additional historic properties found in the project area a plan would be developed in consultation with the ACHP and SHPO to ensure adverse effects on cultural sites would be avoided or minimized. The potential for preservation of prehistoric sites and the probability of finding undiscovered archeological resources would be low to moderate along the Glen Creek Bench route due to its location along dry esker-like ridges commonly used by former hunting cultures.

Summer would be the season of concern for impacts on cultural resources because that is when access use would primarily occur. Winter impacts would be negligible or absent, except for the unlikely possibility of minor damage from snowmobiles driving over sites covered by snow.

Mitigation of adverse effects on newly discovered cultural resources along this route would be accomplished primarily through avoidance or minimization, such as shifting the right-of-way. For sites that could not reasonably be avoided, mitigation would involve data recovery through detailed excavation and documentation of the resources present at the sites.

Conclusion: In summary, the potential for adverse impacts to archeological resources would be the greatest under this alternative because two known sites occur near the access corridor between Glen Creek and Spruce Creek. Because these sites are known and could be avoided, this alternative would likely not result in an impairment of historical or archeological resources in the park.

4.4.3.2 Public Use

The Glen Creek Bench alternative would commence from the park road at mile 89 near Kantishna. Permission would need to be obtained from landowners of private parcels crossed by the route. Currently, the existing mining access route has no public access restrictions. Access by hikers and backcountry users would not be affected, except a new cleared road would be created between the Glen Creek Road and Spruce Creek. Public access to the Glen Creek airstrip also would not be restricted, unless the NPS follows the regulatory process in 40 CFR Part 36.11(h).

Access to the private properties at Spruce #4 in the winter season would be the same as in the proposed access alternative, however, the applicants would likely follow the cleared Glen Creek Bench road alignment from the airstrip rather than traverse open tundra on snowmobiles.

Because this route avoids 16 stream crossings in the North Fork of Moose Creek and Spruce Creek, the potential for vehicle strandings and risk of injury, hypothermia, or drowning would be reduced. The largest and deepest stream crossings of Moose Creek and the North Fork are, however, in the first 16 fords under this alternative. As noted above, the applicants would likely forego vehicle access to their property during floods. They would be able to fly to the Glen Creek airstrip and drive to their property without stream crossings.

Conclusion: In summary, improved access between the Glen Creek road and Spruce Creek would result in no significant effects on public access or safety in the area. Maintenance of the existing Glen Creek airstrip by the applicants would enhance public access to the landing strip. The reduced number of stream crossings via fords along Moose Creek would result in less exposure to vehicle strandings, but under this alternative the applicants could fly to the Glen Creek airstrip and avoid driving through any water to reach their property. This alternative would not result in the impairment of the public purposes and values of the park.

4.4.3.3 Subsistence

The impacts of this alternative on subsistence uses would depend on the degree to which access to the road corridor is restricted, both for general access and specifically for discharge of firearms (safety closure). Currently, the area within one mile of the park road in Kantishna is closed temporarily to the discharge of firearms in September, during the season of overlap between tourism and moose hunting. In 1998, the subsistence season for moose was open during September 1–30 and November 15 to December 15. Kantishna area lodge operations host fewer guests after Labor Day, and most are closed by mid-September, in anticipation of road closure by snow in the mountains to the east. Because of the projected low use of private property at Spruce #4 in September, it is unlikely that the closed area would be extended along the length of the proposed route.

The Moose Creek valley is the area of highest potential for subsistence hunting of moose in the Kantishna Hills, due to the abundance of favorable riparian habitat and the unavailability of the area within one mile of the park road near Kantishna affected by the annual temporary closure. Minor improvements to the access route between the Glen Creek road and Spruce Creek would provide an additional 1.3 miles of road for subsistence access to the area, but roads along the North Fork and Spruce creek would likely be reclaimed with lack of use over the years. If any eligible local rural residents were invited to the applicants' property, they could legally engage in subsistence activities (hunting, fishing, trapping) while staying there. The applicants are not local rural residents, and they would not be able to participate in subsistence activities. Therefore, no new subsistence use of the area is expected to occur as a direct result of access to the private property for personal uses.

Conclusion: In summary, this alternative would result in a negligible change in subsistence use compared to the no-action alternative for the small number of subsistence users who currently hunt or fish in the Moose Creek valley. This alternative would not result in an impairment of subsistence resources or uses in this area of the park.

4.4.3.4 Wilderness

The improved access road and maintained landing strip at Glen Creek would preclude future inclusion of the Moose Creek drainage as designated wilderness. The addition of 1.3 miles of new road further complicates this future option, particularly because a road in wetland low shrub tundra would be more difficult to reclaim than a road in the tall shrub riparian floodplain. This impact would be negligible, however, because the area has not been recommended for wilderness designation because of extensive historical mining activity.

Conclusion: This alternative would not impair designated wilderness or the wilderness recreational purposes and values of the park.

4.4.4 Cumulative Impacts of the Glen Creek Bench Alternative

4.4.4.1 Physical Environment

There would be minor to moderate cumulative impacts on gravel resources in the Kantishna area because the Glen Creek Bench alternative would require about 3,050 cu yd to construct a new section of road over wetlands between the Glen Creek road and Spruce Creek. Gravel resources are abundant in the Kantishna Hills, and use of gravel from the Spruce #4 parcel and along the ROW would keep the effects of gravel removal local. NPS geologists and mining specialists estimate that 70% of the volume of mining tailings would be required for reclamation of lands disturbed by past mining, and the proposed amount of gravel would be equivalent to about 30% of the estimated total gravel tailings along Spruce Creek (10,250 cu yd). Annual maintenance to keep the road and airstrip in the condition of the existing access found in August 2000 are estimated at about 20 cu yd of gravel, which could total a few hundred cu yd over the life of the access. The Glen Creek airstrip survived the August 2000 floods, so it is unlikely to require much, if any, gravel maintenance of its surface. With the anticipated future needs for mining claim reclamation, this alternative would push the limits of available local surface gravel to construct and maintain the access. The BLM plans to sample up to 1.4 acres of geological deposits in upper Glen Creek in summer 2002 for mining claim validity determinations and fair market valuations. The NPS is updating its gravel acquisition plan to

maintain park roads and parking facilities, including a significant component in the western end or Kantishna area of the park.

A short-term impact on natural quiet from the use of a bulldozer, loader, and dump truck would be sustained during construction of the 1.3 miles of new road between the Glen Creek road and Spruce Creek. Long-term incremental noise from vehicle and airplane access to the private property would be similar to the existing or proposed access. A short-term addition of noise is likely when administrative sampling of unpatented mining claims in the Glen Creek drainage and its tributaries in the summer of 2002 with use of backhoes, loaders, and wash-plants.

The cumulative impacts to visual resources would be the greatest with this alternative because 1.3 miles of new road would be constructed in an exposed and highly visible location in the upper Moose Creek valley. This would constitute, however, less than a 2% increase in access roads throughout the Kantishna Hills and less than a 1% increase in total miles of roads in the park. Other considerations about cumulative impacts to visual resources from this alternative would be similar to those described for the proposed access.

Cumulative impacts on water resources from the Glen Creek Bench alternative would be less than the existing or proposed access because 22 fewer stream crossings would be necessary than with the existing access. An incremental impact would occur along 16 stream crossings of Moose Creek, Jumbo Creek, North Fork, and Glen Creek below the airstrip, where occasional minor increases in sedimentation and turbidity would affect about 0.5 miles (800 m) of stream length below the fords. This incremental disturbance would be about 1.2% of the 37.4 miles of stream length directly disturbed by past mining in the Kantishna Hills. Cessation of use of about 2.5 miles of North Fork and Spruce Creek streambed and floodplain affected by the existing access would allow for natural recovery of formerly mined areas, thereby improving water quality.

As described in section 4.2.4.1, the virtual cessation of mining since the mid-1980s has greatly reduced traffic in and through, and sedimentation of, streams in the Kantishna area. Administrative sampling of unpatented mining claims held by Northwest Explorations, Inc. and the Gold King group is likely to begin in summer of 2002 to verify or correct findings in NPS validity reports that these claims along Moose Creek and its tributaries are invalid (NPS 1998-2000). This effort would likely cause additional sedimentation along the existing mining access route in the upper Moose Creek drainage for one to a few years, depending on the results of the contest. Cumulative impacts from additional hydrologic changes, channeling, and local instability along Moose Creek from the Glen Creek Bench alternative would be relatively minor in a regional sense. A benefit of this alternative is the location of the road out of the floodplain beyond Glen Creek and the reduction from the existing conditions of stream fords and instream travel in the North Fork of Moose Creek and Spruce Creek. Recurring problems with instability of stream crossings and the road along Moose Creek, however, would continue.

4.4.4.2 Biological Environment

The incremental impacts of the Glen Creek Bench alternative on the biological environment of the Kantishna area would generally be minor to negligible, compared with the impacts of past mining, as described by NPS (1990). No vehicle transit through the upper North Fork of Moose Creek would greatly reduce potential impacts to aquatic resources, especially grayling spawning habitat.

The new impacts on vegetation types and habitats (1.92 acres) would affect about 0.002% of the 85,735 acres in the Kantishna Hills wildlife study area, or about 0.09% of the area disturbed by past

mining. The impacts of potential future activities (like claim sampling) are likely to be small in view of the strong regulatory processes that now govern mining in the parks, which processes were not in place when past mining was undertaken.

Much of the total area disturbed by this access alternative (12.4 acres) would fall into the “disturbance” category in the mining EIS (NPS 1990); thus, the process of natural recovery on those previously disturbed lands would be arrested. The first three miles (3.6 acres) of the proposed access, however, could not be attributed solely to this request because other inholders use the first three miles of the mining roads to access their property on Rainy Creek. The Department of the Interior and Northwest Explorations, Inc. is likely to sample mining claims along Moose Creek, North Fork, Spruce Creek, Glen Creek, and Rainy Creek in summer of 2002 and beyond, as needed. About 1.4 acres of surface area and vegetation would be disturbed on the Gold King mining claims in upper Glen Creek in summer 2002.

The cumulative impacts to wetlands (1.36 acres) would be minor when compared to the disturbance to 37 miles of stream courses from past mining in the Kantishna Hills and recent mineral sampling on about 5 acres on the Martinek mining claims. The magnitude of impacts of additional future activities on wetlands in the Kantishna area is also likely to be small, in view of the regulatory processes now in place to avoid, minimize, and compensate for such impacts.

The incremental contribution of direct loss and modification (in terms of area) of wildlife habitats resulting from the Glen Creek Bench alternative can be estimated and compared with the impacts of mining (see page 4-21). This alternative would directly affect about 12.4 acres of habitat. In comparison with past mining, the incremental impacts of this alternative would be small, affecting 0.005%–0.02% of the primary habitats for large mammals in the Kantishna Hills area. The incremental impacts would be reduced further by the continuing natural revegetation of habitats affected by past mining, particularly the North Fork of Moose Creek and the lower reaches of Spruce Creek.

Before mining began in the Kantishna Hills, riparian wildlife habitat, which is important to a wide variety of birds and mammals, was estimated to occur along 94.2 miles of stream courses in the Kantishna Hills wildlife study area (NPS 1990), of which 35% (33.3 miles) was disturbed by past mining. This alternative would continue disturbance to 3.5 miles of riparian wildlife habitat previously affected by mining, although the magnitude of the disturbance would be reduced because the route would follow the existing mining access road and would not be widened, disturbing no more riparian vegetation.

Disturbance of birds and mammals by personal recreational activities would be additive to that caused by backpackers and other existing lodge operations in the area, including hikes along the existing road from the park road to the first crossing of Moose Creek, Skyline Drive, Wonder Lake/Blueberry Hill area, and McKinley Bar. The cumulative recreational activity would likely have minimal impacts on wildlife populations and habitat use in the area.

The Glen Creek Bench alternative would contribute no cumulative increment to impacts on sensitive species. Several species of concern (harlequin duck, olive-sided flycatcher, lynx, and chum salmon) occur in the project area, but this alternative would cause minor to negligible impacts on those species, primarily through occasional behavioral disturbance. The cumulative disturbance or loss of habitat for those species would be minor to negligible.

4.4.4.3 Social and Economic Environment

Cumulative impacts to the social and economic environment would be minor to negligible. Past mining activity was responsible for the creation of most of the 45 historic sites identified in the Kantishna Hills area by NPS (1990), whereas the smaller number of known archeological sites (11) resulted from prehistoric hunting. This alternative passes over or near 2 archeological sites (section 4.4.3.1). Additional prehistoric sites may be present. A plan would need to be developed in consultation with the SHPO and ACMP to avoid or minimize adverse effects to these cultural sites. This route, however, would widely avoid the historic cabin ruins on Spruce Creek #3.

This alternative would be consistent with park management plans for the area and would result in few conflicts with other users along the Moose Creek drainage. The 30 total vehicle allocations across the Denali Park Road fall easily within the estimated 100 trips per year for inholders, other than lodge operators, provided for in the front-country management plan (NPS 1996) and final road regulations (*FR 37878-37879* June 19, 2000).

The backpacker campground and backcountry campsites proposed by NPS (1996) for the Kantishna area presumably would be occupied by visitors who would have camped elsewhere and thus would not represent a cumulative increase. The projected use of the private cabins on Spruce #4 in winter would introduce visitation in the Kantishna area in addition to the light use by dog-mushers, skiers, and others visiting private cabins associated with the Kantishna area lodges. The estimated private use of the cabins in summer and winter (500 visitor days maximum?) would be minor (3%) in comparison to the estimated 16,576 annual visitor-days currently estimated for the Kantishna area in the summer.

Cumulative impacts to winter recreation would be similar under this alternative to the other action alternatives.

The road mileage for this alternative would total 8.8 miles, including 1.3 miles of new construction between Glen Creek road and Spruce Creek and 0.2 miles of maintained landing strip at Glen Creek. The access road to Spruce #4 thus would constitute about 5% of the existing road network that comprises the 92-mile park road to Kantishna and approximately 75 miles of existing mining access roads and trails in the Kantishna Hills (NPS 1990). Because public access would be allowed on the entire route, including subsistence moose hunting in fall, there would be a negligible cumulative effect on public use of the area. The maintenance and consistent use of the lower Glen Creek airstrip would not increase the number of airstrips available for landings by general aviation pilots in the Kantishna Hills because the Kantishna and Glen Creek landing strips are already available. Maintenance of the Glen Creek landing strip would create an improved means of increased public access into the upper Moose Creek drainage.

No impacts on subsistence uses in the area would be expected because the negligible impacts of the proposed action on public access and wildlife and fish populations would not likely result in diminished subsistence opportunities. The addition of 1.3 miles of new road would increase subsistence access slightly.

Cumulative effects on wilderness resources from the Glen Creek bench alternative would be minor and similar to those described for the proposed access. Though the new construction of road would be farther from the designated wilderness in backcountry units 35 and 36, this section of road would

be more visible than the existing road in the riparian vegetation along the North Fork and Spruce Creek.

5.0 CONSULTATION AND COORDINATION

5.1 Scoping

The National Park Service consulted and coordinated with pertinent agencies and organizations and the interested public in addressing the applicants requested access to a private inholding for personal, non-commercial uses. Much of the scoping information obtained for the draft EIS for the Spruce Creek access proposal (NPS 1999) is still applicable to the requested access for personal uses, but the size of the access project is much smaller. Therefore, many of the scoping issues in the draft EIS dropped away.

5.2 Coordination with the U.S. Army Corps of Engineers (USACE)

Section 404 of the Clean Water Act, as amended, requires any federal agency or person planning to discharge fill into or upon the waters of the United States, including wetlands, to obtain a Section 404 Permit from the Corps of Engineers. The NPS has kept the USACE informed of progress on the Spruce Creek access request, and an interagency coordination meeting was held in Fairbanks on August 28, 2000, which the USACE project manager attended by teleconference. The USACE will make a final jurisdictional determination (JD) on the wetlands classification and mapping in the project area, and the USACE will issue any permit required under authority of the Clean Water Act Section 404 and a memorandum of understanding with the EPA.

On September 11, 2000, the USACE sent a letter to the applicants for Permit 4-981038 for access across Moose Creek stating they would close the file in accordance with a letter sent on August 4, 2000.

5.3 Consultation with the U.S. Fish and Wildlife Service (FWS)

Section 7 of the Endangered Species Act, as amended, prohibits federal agencies such as the National Park Service from implementing any action likely to jeopardize the continued existence of a federally protected species, listed as endangered or threatened. The act requires the NPS to consult with the FWS on any action the NPS authorizes, funds, or executes with the potential to adversely affect a protected species or its habitat.

To meet its responsibilities under the act, the NPS initiated informal consultation with the FWS to identify listed plant and animal species that may occur in the project study area. At this time no critical habitat or threatened or endangered species is deemed likely to occur in the area of the requested access or its alternatives (appendix E). The FWS will submit an update, as needed, before completion of the EA.

5.4 Coordination with the U.S. Environmental Protection Agency (EPA)

The NPS informed Region 10 of the EPA of the revised requested access. The NPS learned that a Clean Water Act Section 402 Permit would be required for any project with a footprint greater than 5 acres. Because the new proposed access request and all of its alternatives would not affect more than 5 acres of surface area, the NPS determined that the EPA would not need to review this EA. A pollution prevention plan to meet the National Pollution Discharge Elimination System (NPDES) requirements for storm-water discharge would not be needed for this access project.

5.5 Consultation with Alaska Department of Fish and Game (ADFG)

NPS representatives, USACE, USFWS, and an applicant met with ADFG officials in Fairbanks on August 28, 2000, regarding fish passage considerations. ADFG provided a copy the ADFG Wildlife Notebook Series on arctic grayling. This document describes critical grayling migration and spawning periods, which would need to be considered in permitting access across Moose Creek and its tributaries. The ADFG seemed unconcerned for the proposed low use of the access to Spruce #4 for personal uses, except the period of vehicle access across streams would need to avoid critical grayling life history in the area. The ADFG would address the periods of vehicle access in a Fish Habitat Permit.

5.6 Consultation with Alaska Department of Conservation (ADEC)

The ADEC would issue a CWA Section 401 Certificate of Reasonable Assurance that water quality in the project area would not be adversely impacted.

5.7 List of Agencies, Organizations, and Businesses to Whom Copies of the EA would be Sent

5.7.1 Alaska Congressional Delegation

Senator Frank Murkowski
Senator Ted Stevens
Congressman Don Young

5.7.2 Federal Departments, Agencies, and Offices

Advisory Council on Historic Preservation
Alaska Public Lands Information Center
Department of the Interior
 Assistant to the Secretary for Alaska
 Bureau of Land Management
 National Park Service
 U.S. Fish and Wildlife Service
Environmental Protection Agency
U.S. Army Corps of Engineers

5.7.3 State of Alaska

Governor Tony Knowles	Alaska Railroad Corporation
Alaska Department of Environmental Conservation	Alaska State Historic Preservation Office
Alaska Department of Fish and Game	Alaska State Parks
Alaska Department of Natural Resources	Division of Governmental Coordination
Alaska Department of Transportation & Public Facilities	State Senator Mike Miller
	State Representative Tom Brice
	State Representative Jeannette James

5.7.4 Native Corporations and Organizations

Ahtna Development Corporation	Cantwell Village Corporation
Alaska Federation of Natives	Doyon, Limited

5.7.5 Local Governments and Agencies

Denali Borough
Fairbanks Chamber of Commerce
Fairbanks Convention and Visitors Bureau
Fairbanks North Star Borough
Greater Fairbanks Chamber of Commerce

Healy Chamber of Commerce
Matanuska-Susitna Borough
Municipality of Anchorage
Talkeetna Chamber of Commerce

5.7.6 Organizations

Alaska Center for the Environment
Alaska Citizen's Advisory Commission
Alaska Conservation Foundation
Alaska Environmental Assembly
Alaska Friends of the Earth
Alaska Lands Act Coordinating Committee
Alaska Miners Association
Alaska Natural Heritage Association
Alaska Outdoor Council
Alaska Public Interest Research Group
Alaska Visitors Association
Alaska Wilderness Recreation and Tourism Association
Alaska Wildlife Alliance
Alaska Women of the Wilderness
American Alpine Institute
American Wilderness Alliance
Anchorage Audubon Society
Commonwealth North
Denali Advisory Committee
Denali Citizens Council
Denali Foundation
Denali Visitors Association
Earth First
Greenpeace USA

Lake Minchumina Advisory Committee
Mat-Su State Park Citizen's Advisory Board
National Audubon Society
National Parks and Conservation Association
National Wildlife Federation
National Wildlife Refuge Association
Northern Alaska Environmental Center
Panguingue Creek Homeowners Association
Resource Development Council for Alaska, Inc.
Sierra Club, Alaska Chapter
Sierra Club, Alaska Field Office
Sierra Club, Denali Group
Sierra Club, Legal Defense Fund
Southeast Alaska Conservation Council
Susitna Valley Association
Talkeetna Environmental Center
Talkeetna Historical Society
Talkeetna Open Door Committee
Tanana Chiefs Conference
The Conservation Fund
The Nature Conservancy of Alaska
The Wilderness Society
Trustees for Alaska
Wildlife Federation of Alaska

5.7.7 Businesses

Air Madura
Alaska Adventures
Alaska Biological Research, Inc.
Alaska Lodging Management, Inc.
Alaska River and Ski Tours, Inc.
Alaska West Air, Inc.
Alaska Wildland Adventures, Inc.
Alpine Air Guides
ARA Leisure Services
Aurora Mining Company
Backwoods Lodging
CampAlaska Tours
Canadian Wilderness Travel, Ltd.

Cantwell Lodge
Carlo Creek Lodge
Denali Air
Denali Backcountry Lodge
Denali Bluffs Hotel, Inc.
Denali Cabins
Denali Crow's Nest
Denali Grizzly Bear Cabins
Denali Hostel
Denali National Park Wilderness Centers, Ltd.
Denali Park Resorts
Denali Raft Adventures
Denali Riverview Inn

Denali RV Park
Denali Suites
Denali Wilderness Safaris, Inc.
Dome Home Bed and Breakfast
Doug Geeting Aviation
Eastwood's Bed and Breakfast
Equinox
ERA Aviation, Inc.
Fantasy Ridge Alpinism, Inc.
Frontiersman
Gold King Mines
Grandview Bed and Breakfast
Happy Wanderer Hostel
HDR Engineering, Inc.
Healy Chevron
Healy Heights Bed and Breakfast
Holland America Line Westours
Hudson Air Service, Inc.
K2 Aviation
Kantishna Roadhouse
Kantishna Group, Inc.
Kichatna Guide Service
KLK, Inc.
Lahaie's Alaska Air Service
Lake Clark Air, Inc.
Larry's Healy Service
Maggie's Bed and Breakfast
McKinley/Denali Salmon Bake
McKinley Gold Camp
McKinley KOA
McKinley Raft Tours
Morrel Adventure Travel
Motel Nord Haven
Mountain Trip, Inc.

Mountain View Liquor and Grocery
Mount McKinley Motor Lodge
Natural Habitat Wildlife Adventures
North Star
Northwest Explorations, Inc.
Osprey Expeditions
Paragon Guides, Inc.
Parkway Gift Shop
Princess Lodge
Princess Tours
R.A. Kreig & Associates
Rainier Mountaineering, Inc.
Red Tape Mining Company
Reindeer Mountain Lodge
Speer Bed 'N Breakfast
Stampede Lodge
Talkeetna Air Taxi, Inc.
Talon Air Service, Inc.
The Perch
Thomas Air
Totem Inn
Trans-Porter Alaska, Inc.
Trek America
Tseyu Service Station
Tundra Mini Golf
Vern Humble Alaska Air Adventures
Waring & Associates
Weber Alyeska Wilderness Guides
Westmark Corporate Office
White Moose Lodge
Wilderness Ventures, Inc.
Woodsmen, Inc.
Wright Air Service
Yukon Don's B&B

5.7.8 Educational Institutions

Denali Institute
University of Alaska Anchorage
University of Alaska Fairbanks

5.7.9 Media

Alaska Magazine
Alaska Public Radio Network
Anchorage Daily News
Denali Summer Times
Fairbanks Daily News Miner
The Frontiersman

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