

4.0 ENVIRONMENTAL IMPACTS

4.1 Introduction

The analysis of environmental impacts associated with each action alternative is required by BLM planning regulations and by the Council on Environmental Quality (CEQ) regulations implementing the NEPA. Environmental impacts are described by resource or issue, and include direct, indirect, and cumulative effects of the alternatives. The type and level of effects that could result from implementing the alternatives have been identified using the information provided in Chapter 3, which provides a description of the current condition of the environment. This chapter describes the predicted consequences, or potential effects, from implementing the alternatives described in Chapter 2. Effects analysis and conclusions are based on interdisciplinary team knowledge, information provided by the BLM or other agency experts, pertinent literature review, and professional judgment.

4.2 Planning Assumptions

The BLM developed planning assumptions described in this chapter to facilitate the analysis of potential environmental impacts. These assumptions set guidelines and project, with a reasonable degree of confidence, projects, actions, or developments that could occur within the planning area during the life of the plan. Most of the assumptions explain the increase in use expected during the life of the plan, which is approximately twenty years. These assumptions should not be interpreted as constraining or redefining the management objectives and actions proposed for each alternative described in Chapter 2.

4.2.1 Climate Change

There is growing global concern, which is based on current scientific research, about the potential effects of greenhouse gas emissions on global climate. Through many complex interactions on regional and global scales, the lower layers of the atmosphere are experiencing a net warming effect. Potential effects of global climate change in Alaska include increased precipitation, decreased snow cover, rising river flows, rising sea levels, thawing of permafrost, changes in fire frequency and severity, changes in wetlands, and shifts in the distribution of wildlife (ACIA 2004). The level of effects related to climate change within the planning area during the life of the plan is unknown and will vary depending upon the specific resource of concern.

Global climate change will continue to occur during the life of the plan, and effects may be seen at localized levels that are primarily evident in changes to soils and vegetation composition, water quality, and wildlife habitat. Soils will be affected primarily as a result of decreased permafrost, with subsequent impacts on evapo-transpiration, runoff, and sedimentation. Global warming has the potential to cause land cover changes in high latitude regions through both vegetation replacement and increasing frequency of vegetation disturbance. Water quality could be impacted by thermokarst development and changes in water temperature resulting from global warming. Climate change may also result in increased stress on some species of wildlife, and habitat quality or availability may decrease slightly for some species, while other species may see an increase in the availability of habitat due to changes in vegetation associated with climate change.

4.2.2 Lands and Realty

The BLM expects to manage portions of the PLO 5150 Transportation and Utility Corridor, and future maintenance on the Trans-Alaska Pipeline System will likely occur during the life of the plan that may require additional land use authorizations for temporary staging areas or gravel pads needed for maintenance and construction activities. There will likely be an increased demand to utilize the PLO 5150 Transportation and Utility Corridor for additional utilities or infrastructure needed to support a natural gas pipeline spur route from Delta Junction to Glennallen. In addition, future mineral development on state lands adjacent to the river corridor may generate increased demand for access or right-of-way authorizations associated with road construction or powerline development.

4.2.3 Mineral Development

Exploration focused on deposits of rare metals (nickel and platinum group elements) has occurred in areas north of the Denali Highway and adjacent to the DWSR corridor. Geologic information indicates that the area has a high potential for a significant discovery of platinum group elements. Pure Nickel, Inc. is exploring for these metals within a 280-square mile area that includes both sides of the DWSR corridor. This area includes both State and Federal mineral claims. The State of Alaska completed two comprehensive land-use plans for the area. Both plans kept the area open for mining, and future large-scale mining is possible. If exploration leads to the discovery of an economically viable deposit, the deposit will likely be developed only through underground mining (not open-pit) techniques. If so, a mine could be developed in a similar manner as the Pogo Mine (about 38 miles northeast of Delta Junction). Surface disturbance will vary depending on mine design, construction of roads, power line corridors, selection of tailing disposal method, and other factors. The Pogo Mine has a permitted disturbance of 425 acres plus a 40-mile road to the site. Road building, airstrips, and associated material sites account for the largest surface disturbance followed by mine, mill, tailings disposal site, and camp facilities.

While most of these disturbances would occur on State lands adjacent to the DWSR corridor, it is possible that some road construction or power lines could place possible demands for access or right-of-way authorizations across the river corridor. In addition, overflights associated with mineral development activities will likely increase during the life of the plan. It is also possible, given the size of the exploration area, that any such development would occur without crossing or even being visible from the corridor. The minimum time between identifying a viable ore body and development is over a decade. Thus, even if exploratory drilling makes a significant find, it will be a minimum of 10 years before development would occur, assuming a mine is economically and environmentally feasible.

4.2.4 Recreation Resources

Overall demand for the recreational use of public lands within the DWSR corridor is likely to increase during the life of the plan. "Household survey data confirm that participation and consumption in outdoor recreation are an important part of life in Alaska. Rates and intensity of participation among Alaskans are higher than for residents of the lower 48, and these rates of participation can be expected to remain higher over the next 20 years. Between 2000 and 2020, the population of Alaska is expected to increase by about 28 percent. Projected increases in participation and consumption for most activities can be expected to keep pace with projected population growth in Alaska (roughly 1.5 percent per year over the 20-year period). The five activities that show the greatest growth in the absolute number of times Alaskans are likely to participate in them are scenic driving, biking, bird and wildlife viewing, recreational vehicle camping, and fishing. Roads and waterways, therefore, will continue to be heavily relied on for outdoor recreation" (Recreation and Tourism in South-Central Alaska: Synthesis of Recent Trends and Prospects, Brooks, Haynes, 2001).

In addition to potential recreation product shift as a result of increased tourism and state population, user conflicts may also increase, especially in areas with both motorized and nonmotorized opportunities. "The increase in many activities in some areas is increasing interactions among participants, which is causing conflict among resident and nonresident participants. One implication, however, is that as levels of use increase, all participants will experience crowding and some degrading of the recreation experience; for residents, this will seem to be (or will be) a conflict with tourism. There is potential for, perhaps even the likelihood of, increasing conflict among recreation users seeking widely divergent experiences" (Recreation and Tourism in South-Central Alaska: Synthesis of Recent Trends and Prospects, Brooks, Haynes, 2001).

Wilderness characteristics (naturalness, solitude, and primitive and unconfined recreation), natural quiet and natural sounds, and high quality scenic resources are expected to remain in demand from local residents and visitors who want to experience the primitive and unspoiled nature of the planning area. Businesses that depend on tourism will value natural landscapes for their excursions (e.g. ecotourism, guided hunting, and fishing) and will favor an area that possesses scenic views, undeveloped landscapes, and open spaces.

Recreational activities within the DWSR corridor that are expected to increase during the life of the plan are those related to travel management and activities associated with increased tourism and improved facilities and highway access. In addition to travel management opportunities (discussed in Section 4.2.6), changes would be most probable in the following recreational activities:

4.2.4.1 Facility Use and Developed Camping

The BLM anticipates that the demand for the use of the developed recreational facilities within the DWSR corridor will increase by approximately 30% above current use levels during the life of the plan, based on projections of future population and recreational growth in Alaska. The renovation of the Tangle Lakes Campground will account for the greatest immediate increase in facility use and developed camping opportunities. The use of BLM developed facilities would increase even higher if the Denali Highway is paved in the future. The recent addition of new State of Alaska facilities on the Denali Highway may attract increased highway tourism and tour bus use through the planning area. "The level and location of many (perhaps most) activities will depend on the development of infrastructure...a potentially large source of future use may come from changes in the transportation infrastructure and possible changes in methods and patterns of nonresident use. Capacity limits at access points, therefore, are likely to be an increasing concern for recreation management" (Recreation and Tourism in South-Central Alaska: Synthesis of Recent Trends and Prospects, Brooks, Haynes, 2001). If infrastructure and access to the Denali Highway is improved during the life of the plan, use could increase substantially higher than the projected 30% increase based on population growth.

4.2.4.2 Dispersed River/Lake Use, Undeveloped Camping and Group Sizes

Dispersed river and lake use will increase during the life of the plan, and undeveloped campsites located along the lakeshores and riverbank will receive more visitor use as a result. In 2009, estimated facility use was 24,202 total visitors, of which approximately 3,872 visitors (16% of total developed facility users) used the lakes and river for boating activities. Of these users, approximately 45% (1,742 users) are estimated to camp overnight, using undeveloped campsites in the river corridor. Assuming the same participation rate in river and lake use, projected increases in facility use over the life of the plan would result in an increase of approximately 6% (105 users) above current overnight campsite use on the lakes and river.

Group sizes for river and lake use are determined by the BLM based on voluntary registration data located in the developed facilities at the boat launches. Even though compliance rates are generally low (traffic counter results show that approximately 20% of users register), the BLM can make group size assumptions based on information from those who do register. The most recent 2009 data portrays the following results:

Year	Total Registered Groups	Groups of ≤ 8 People	Groups of 9-10 People	Groups of 11-12 People	Groups of > 12 People
2009	118	112 (94.9%)	2 (1.7%)	2 (1.7%)	2 (1.7%)

Assuming overnight use on the lakes and river increases by approximately 6% during the life of the plan, 1,847 overnight river and lake users would be expected. Using this planning assumption of overnight visitor use and the data in the above table, if a maximum group size of 8 was implemented, approximately 5.1% of overnight river and lake users (94 users) would be affected annually. If a maximum group size of 10 was implemented, approximately 3.4% of overnight river and lake users (63 users) would be affected annually. If a maximum group size of 12 was implemented, approximately 1.7% of overnight river and lake users (31 users) would be affected annually.

4.2.4.3 Fishing

"Alaskans fish at a greater rate and more often than in any other state. Many factors contribute to the overall quality of sport fishing. Certain factors, such as weather and other environmental conditions, are beyond the effective control of fishery managers. Other factors, however, such as onsite facilities, degree of congestion, and fish stocks available for harvest are controllable and can significantly influence the

fishing experience. Analysis of the demand for sport fishing in Alaska indicates that site quality is an important determinant of angler behavior” (A Nested Logit Model of Recreational Fishing Demand in Alaska, Cars, Hanemann, Wegge 2009).

Fishing as a recreational activity is expected to increase in certain areas of the DWSR corridor during the life of the plan. These increases would be proportionate to increases in developed facility use as a result of facility improvements and upgraded access to the area, web based marketing, and new roadside angler guides, particularly in RMZs 2 and 3. BLM campground registration data from 2009 displays 1119 registered groups; of which 504 groups participated in fishing. This equates to approximately 45% of registered users participating in fishing activities. As facility use increases, fishing activities will also increase accordingly. Assuming the same participation rate, projected increases in facility use would result in an increase of approximately 14% above current fishing use levels during the life of the plan.

4.2.4.4 Hiking

Hiking is a recreational activity that is projected to increase during the life of the plan. These increases would be proportionate to increases in developed facility use as a result of facility improvements and upgraded access to the area, web based marketing, and new roadside hiking guides, particularly in RMZ 2. BLM campground registration data from 2009 displays 1119 registered groups; of which 482 groups participated in hiking activities. This equates to approximately 43% of registered users participating in hiking activities. As facility use increases, hiking demand will also increase accordingly. Assuming the same participation rate, projected increases in facility use would result in an increase of approximately 13% above current hiking use levels during the life of the plan. The demand for additional developed hiking trails adjacent to the developed facilities in RMZ 2 will likely increase as a result.

4.2.4.5 Special Recreation Permit (SRP) Applications

SRP applications are primarily dependant on the health of the tourism industry in Alaska. “In the United States, demographic and economic projections suggest continued growth in demand for services related to recreation and tourism” (Neimi and Fifield 2000, World Travel and Tourism Council website). In Alaska, “Among wildlife-related activities, participation by visitors (tourists) is greater than that of residents, and is expected to increase faster (based on higher rates of projected population growth in the lower 48 states). If true, for bird and wildlife viewing, tourists will outnumber Alaskans by more than 10 to 1 by the year 2020. Although not as dramatic, the growth of tourist anglers also is expected to exceed that for in-state anglers by about 50 percent. At the same time, continuing evolution and competition in the commercial recreation and tourism sector will, itself, contribute to innovation and efforts to explore, and create, market opportunities. The result likely will be continued increases in demand for management decisions that support commercial activities. Competition within the commercial sector and competition between commercial users and the general public will continue and will increase” (Recreation and Tourism in South-Central Alaska: Synthesis of Recent Trends and Prospects, Brooks, Haynes, 2001).

On average, over the last ten years, the BLM has permitted 1-2 annual SRP applications for commercial activities within the DWSR corridor. Population and tourism growth may result in additional SRP applications during the life of the plan, especially for guided fishing and bird/wildlife viewing. Two private lodges adjacent to the river corridor are currently for sale, and the presence of newly upgraded BLM developed camping facilities with highway access and the robust health of the arctic grayling fishery in the DWSR corridor may contribute to additional SRP applications in the future. Based on these contributing factors, this growth is projected to be in the range of 2-3 additional SRP applications during the life of the plan.

4.2.5 Subsistence

Planning assumptions for subsistence include potential changes in demographics of eligible applicants. Subsistence users who have customary and traditional use of caribou in the DWSR are those users who are rural residents of Units 11, 12 (along the Nabesna Road and Tok Cutoff Road, milepost 79-110), 13, 20D (except Fort Greely), and Chickaloon. Rural residents of Units 13, 20D (except Fort Greely), Chickaloon, and Slana have customary and traditional use of moose in the DWSR. The pool of federal

subsistence permit applicants has remained relatively stable between 1998 and 2009; on average, there were 951 and 2,525 permits issued for moose and caribou, respectively. However, there are different communities that contribute to the pool of applicants.

Community demographics change over time. Delta Junction is one of these communities that contribute significantly to the pool of applicants. The US Census Bureau estimated a 13% increase in population size of Delta Junction between 2000 and 2009 (Population finder, <http://factfinder.census.gov>, accessed 29Sep2010). There is a concurrent 41% increase in the number of caribou permits issued between 2000 and 2009. However, other eligible communities are experiencing population declines due to out-migration because of poor fishing seasons, reduced state spending, and the lure of urban lifestyles and job opportunities (Copper River Knowledge System, Ecotrust, 2001). These shifts in demographics between eligible communities appear to balance out so that the pool of subsistence hunting permit applicants remains relatively stable.

4.2.6 Travel Management

It is anticipated that the demand for all types of access, both motorized and nonmotorized, will gradually increase over the life of the plan. Modes of access that will increase will depend on a variety of factors, including overall population trends statewide, design and technology improvements, economic conditions, and affordability of motorized conveyances. Nonmotorized access methods may have a more direct correlation with overall population trends and are less affected by economic conditions due to the affordability to participate in activities (hiking, biking, canoeing, etc.). Motorized access activities typically require more economic commitment due to ever-changing technology, design, and market affordability factors. Typically, in low economic climates, nonmotorized uses will increase, whereas motorized uses will increase as the economy improves.

4.2.6.1 Airplane Landings

It is anticipated that airplane landings (i.e. floatplane use) will remain relatively stable over the life of the plan. The BLM documents approximately 3-4 floatplane landings on Round Tangle Lake and 1-2 floatplane landings in the Upper Tangle Lakes annually.

4.2.6.2 Animal Powered Recreation

Animal powered recreation occasionally occurs within the DWSR corridor. In most cases, this involves the use of horses and pack stock to explore the surrounding hills and countryside, and dog sled teams that are used in the winter, primarily on the Denali Highway. There is no relevant data to suggest that these types of uses will increase, as the use of pack animals and dog teams typically have historical family ties and the nature of these activities require more time, involvement and expense than other access options.

4.2.6.3 Mechanized Use

Mechanized travel refers to the use of mountain bikes, wheelchairs, and other modes of non-gasoline powered assisted travel. Mechanized travel occurs primarily in the developed facilities and on the Denali Highway, and has rarely been documented in the uplands or backcountry areas. Mechanized travel would be difficult on designated OHV trails due to degraded trail conditions, but would be possible on more developed trails, such as those that are located adjacent to the Denali Highway. It is anticipated that mechanized uses would increase in the developed facilities in accordance with increased tourism, commercial ventures, and overall statewide population, but the inaccessibility of the upland areas and the proposed trail restrictions would effectively limit mechanized travel outside of the developed facilities.

4.2.6.4 Motorized Boating

A report from the National Survey on Recreation and the Environment (NSRE) found that approximately 28.6% of Americans aged 16 and older participated in motorized boating activities in the years 1999-2000 (U.S. Department of Agriculture, US Forest Service, 2000). Motorized boating use levels in the DWSR corridor are relatively consistent with this National average. BLM overflight information obtained from 78

overflights of the river corridor during the years 2000-2010 displays 1051 total watercraft observed; of which 264, or 25%, were motorized.

There are a variety of factors that may affect the future growth rate of motorized boating in the DWSR corridor. Changes in design and technology (i.e. shallow tunnel hull designs) may enable users to range into areas that were once thought of as inaccessible due to shallow water. Two stroke engines will continue to be replaced by the more fuel efficient, powerful, and quieter 4 stroke engines. Changing economic conditions may affect use levels; motorized users who live in local communities near the planning area will likely be less affected by economic conditions when compared to users who must travel longer distances.

In estimating the future growth rate of motorized boating use levels in the DWSR corridor, the BLM factors projected increases in facility use and the current percentage of motorized boating use in the DWSR corridor. An increase in motorized boating use would likely be proportionate to increases in developed facility use as a result of improvements and upgraded access to the area, web based marketing, and new roadside travelling guides, particularly in RMZ 2, where facilities are available to launch motorized craft. Participation rates in various recreational activities are determined by the BLM based on voluntary registration data located in the developed facilities. Even though compliance rates are generally low (traffic counter results show that approximately 20% of users register), for the purposes of this planning assumption, the BLM will assume that activity participation rates would remain constant, regardless of the number of overall users.

Using the most recent voluntary registration data from 2009, approximately 16% (3,872 visitors) of the total campground and wayside users (24,202 total visitors from traffic counters) participated in boating activities. Of this 16% of registered boating users, overflight data from 2005-2010 shows that approximately ¼ of these boaters (or 4% of total campground and wayside users) are motorized boating users (968 visitors). As facility use increases in the future, boating activities will be assumed to increase proportionately. Assuming the boating participation rate remains constant at 16% overall, the projected increases in facility use of 30% over the life of the plan would result in 31,462 total visitors, of which 1258 visitors would participate in motorized boating (4% of total campground and wayside users); an increase of 290 motorized users compared to 2009. This represents 5.2% of the 2009 total campground and wayside users. The net result is a 1.2% increase in motorized boating participation based on 2009 total user visitation. In addition to this increase of 1.2% based on population growth, other factors previously discussed (technological improvements, affordability factors, societal changes, etc.) may also contribute to additional motorized boating use, but exact estimates are difficult to quantify. As a management planning assumption, overall growth of 2%-5% in motorized boating use from current levels would be expected during the life of the plan.

4.2.6.5 Nonmotorized Boating

Nonmotorized boating, in particular canoeing, constitutes the majority of all boating in the DWSR corridor. "Paddle sports have been a growing boating activity for several years; with an estimated 48-52 million Americans participating in paddle sports and their various forms annually" (National Survey on Recreation and the Environment, US Forest Service 2004). A study by the Outdoor Industry Foundation found that "...the 2005 National population participating in canoeing was 9.3%. Canoe participation rates were generally higher than other non-motorized boating activities. Canoeing is the most popular non-motorized boat activity nationally; the average national canoeist participated between 4 and 8 days per year" (Active Outdoor Recreation Participation Study, 2005).

Using the same methodology and 2009 campground registration data displayed above for motorized boating, overflight data shows that approximately ¾ of these boaters (or 12% of total campground and wayside users) are nonmotorized boating users (2,904 visitors). As facility use increases in the future, boating activities will be assumed to increase proportionately. Assuming the boating participation rate remains constant at 16% overall, the projected increases in facility use of 30% over the life of the plan would result in 31,462 total visitors, of which 3775 visitors would participate in nonmotorized boating (12% of total campground and wayside users); an increase of 871 nonmotorized users compared to 2009. This represents 16% of the 2009 total campground and wayside users. The net result is a 4% increase in nonmotorized boating participation compared to 2009 total user visitation. In addition to this increase of 4% based on population growth, other factors previously discussed (technological improvements,

affordability factors, societal changes, etc.) may also contribute to additional nonmotorized use, but exact estimates are difficult to quantify. As a management planning assumption, overall growth of 5%-10% in nonmotorized boating use from current levels would be expected during the life of the plan.

4.2.6.6 Nonmotorized Winter Use

Nonmotorized winter use within the DWSR corridor is relatively low; documented uses include snowshoeing and cross-country skiing. Skiing primarily occurs on the Denali Highway, but with difficult access and marginal conditions (windblown, shallow snow cover, open water leads between the lakes), future use increases are not anticipated and nonmotorized winter use is projected to be stable throughout the life of the plan.

4.2.5.6.7 OHV Use

Documented OHV use within the DWSR corridor has been relatively stable. Most of the planning area is closed to OHV use under TLAD OHV trail regulations, and the few designated OHV trails within the river corridor have been used primarily during the fall hunting season. Documented recreational OHV use outside of hunting season has been low, and future projections of OHV use on these designated trails would be primarily based on statewide OHV growth statistics and the emergence of motorized OHV advocacy groups throughout the state, including military members of the US ARMY Morale, Welfare, and Recreation Program, which may contribute to more localized OHV use in the area. Most of the increased OHV use statewide during the life of the plan will occur in other areas with more OHV trails, but the Top of the World Trail within the DWSR corridor would likely see a portion of this increased use, primarily from residents of the Copper River Valley, Delta Junction and Fairbanks. The BLM estimates that OHV use will increase in the planning area by approximately 5%-10% during the life of the plan, primarily as a result of trail improvements to the Top of the World Trail. Without continued trail maintenance and OHV use limitations, this trail may deteriorate through braiding and rutting, eventually becoming impassible and likely causing OHV users to seek alternate routes that will increase surface disturbance in the area.

4.2.6.8 Snowmachine Use

Snowmachine use primarily occurs on the Denali Highway, as snow conditions in the uplands are marginal (windblown, shallow snow cover) and open water leads exist between many of the lakes in the river corridor. The DWSR corridor is not a destination for snowmachine use because of these limiting factors, and most of the use that does occur in the area is related to subsistence caribou hunting when the Nelchina Caribou Herd is wintering in the river corridor. Snowmachine use is not anticipated to increase from current levels during the life of the plan.

4.3 Direct and Indirect Impacts

Direct effects result from activities planned or authorized by the BLM and occur at the same time and place. Indirect effects are caused by these actions and occur later in time, or farther removed in distance, but are still reasonably foreseeable. Effects will be described as having a beneficial effect (the resource or condition is enhanced/benefitted, or the user group's activity and/or experience is enhanced), no change (no change or little to no effect), or not a beneficial effect (adverse effect).

4.3.1 Climate Change

4.3.1.1 Effects of recreation management decisions to contributing causes of climate change within the DWSR corridor.

Alternative 1 (No Action Alternative):

Recreational activities that produce greenhouse gas emissions result from the operation of gasoline powered engines; and include activities such as the use of OHVs, snowmachines, aircraft, generators, and motorized boats. At current visitor use levels, it is not expected that the overall contribution of greenhouse gas emissions related to these activities would adversely affect climate, resulting in either local or global warming or climate change, when compared to total greenhouse gas contributions

worldwide. Furthermore, anticipated increases in motorized recreational activities during the life of the plan would not be enough to adversely affect climate within the planning area.

Alternatives 2 (Proposed Action), 3 and 4:

The effects from all of these alternatives are substantially similar related to the contributing causes of climate change. Because Alternatives 2 and 4 target recreational management toward nonmotorized experiences in RMZs 1 and 4 and have more restrictions on OHV use, the greenhouse gas emissions in these alternatives are expected to be less than the emissions in Alternative 3. However, on both a local and global scale, while any greenhouse gas emissions are considered to have a negative effect on climate (resulting in global warming and climate change), these incremental emissions are considered extremely minor and would not adversely affect climate within the planning area.

4.3.2 Cultural Resources

4.3.2.1 Effects to cultural resources from recreational facility development and campsite management decisions.

All Alternatives:

All planned ground disturbing activities, including facility development, require compliance with Section 106 of the National Historic Preservation Act of 1966. This compliance reduces the possibility of impacting sensitive cultural resources. If a National Register of Historic Places listed or eligible site has been or is likely to be impacted by any planned or unplanned activities, then the BLM will determine the appropriate mitigation strategy for that site in consultation with the Alaska State Historic Preservation Officer as well as any affected Federally Recognized Tribes.

Alternative 1 (No Action Alternative):

Archaeological sites, or Ahtna culturally important locations, that could be impacted by unmanaged campsite and social trail growth, are more likely to have their National Register significance or traditional importance adversely affected under this alternative because there are fewer management actions aimed at curbing campsite or social trail growth and proliferation. There are sixteen archaeological sites and one culturally important location that co-occur with known campsites in the river corridor. The average group size for the Delta River through-trip is 4 people; Upper Tangles is 3 people. Even with the current average group sizes being relatively low, archaeological impacts at campsites can occur. It is possible to have these seventeen locations, some of which are listed on the National Register of Historic Places as contributing properties for the Tangle Lakes Archaeological District, irreparably impacted through the loss of vegetation and consequent soil erosion. Pedestrian trampling, fire pit construction and cathole digging can lead to vegetation loss and soil erosion, which can damage or destroy stratigraphic context. Pedestrian trampling and erosion can also result in crushing or breaking of artifacts, as well as exposing fragile organic artifacts or cultural features to weathering or decomposing organisms.

There are also many known, as well as undiscovered, cultural resource locations in areas along the river, which may be attractive to modern campers because of gentle slopes, favorable aspects, and access to water. These sites haven't yet been affected by modern camping because of the availability of more obvious campsites. However, more competition for campsites may result in increased impacts from new campsite development and erosion on previously undisturbed archaeological or culturally important sites.

Alternatives 2 (Proposed Action), 3 and 4:

Compared to Alternative 1, Alternatives 2, 3, and 4 will reduce adverse impacts to buried archaeological resources or culturally important locations that co-occur with campsites because these alternatives designate campsites and control campsite expansion and soil erosion through campsite management actions that are based on the monitoring of bare ground standards.

Alternative 2 limits group sizes to 10 people per campsite and closes developing satellite sites and social trails, limiting negative effects to associated cultural resources. During the life of the plan, a group size

limitation of 10 people would exclude approximately 6 larger groups annually, reducing the potential for adverse archeological impacts that are associated with campsite expansion as a result of large groups.

Alternative 3 would be more likely to adversely impact cultural resources that co-occur with existing campsites, since heavily and moderately used campsites would be developed, hardened and expanded to accommodate increased use and a larger group size of 12. Additional satellite campsite and social trail development under this alternative would also have a greater likelihood for eroding soils and negatively impacting archaeological sites, when compared to Alternatives 2 and 4. During the life of the plan, a group size limitation of 12 people would exclude approximately 3 larger groups annually, resulting in a higher potential for adverse archaeological impacts when compared to Alternatives 2 and 4 that have smaller group size limitations.

Alternative 4 would have the highest probability of protecting cultural resources since additional campsites would not be expanded or hardened, satellite campsites and social trails would be closed and prescribed group sizes (8 people per site) would be less than Alternative 2. During the life of the plan, a group size limitation of 8 people would exclude approximately 12 larger groups annually, having the highest potential among all alternatives to reduce adverse archaeological impacts associated with campsite expansion as a result of large groups.

4.3.2.2 Effects to cultural resources from OHV management decisions.

All Alternatives:

For all alternatives, OHVs are required to stay on designated trails in the TLAD. There are no designated OHV trails in the portions of the TLAD that occur within the planning area, and the use of OHVs is only allowed during periods of adequate snow cover or ground frost. Thus, potential adverse impacts to cultural resources from OHV use are not expected in the TLAD under any alternative.

Alternative 1 (No Action Alternative):

Unauthorized OHV trails have the potential to adversely impact cultural resources, and at least one known archaeological site at Mile 22 Denali Highway North Trail and two known archaeological sites at the confluence of Eureka Creek are currently being impacted. OHV use on unauthorized trails causes rutting, which strips protective vegetation and mechanically disturbs soils, resulting in soil deflation and loss of stratigraphic context for buried archaeological remains. This is likely to negatively affect the National Register significance of these sites and result in the loss of irreplaceable information important to the knowledge of the area's prehistory. OHV use also allows the public to more easily access the backcountry which may lead to looting and vandalism of more obvious cultural resources.

Alternatives 2 (Proposed Action) and 4:

Under Alternatives 2 and 4, the requirement to stay on designated trails, a 2000 lb. GVW limit on OHVs, and the closure of unauthorized trails will reduce adverse effects to archaeological resources by protecting soils and vegetation that covers both known and unknown archaeological sites. The closure of two unauthorized OHV trails in RMZ 5 and one unauthorized OHV trail in RMZ 2 will protect three known archeological sites that are currently being adversely impacted by OHV use.

Alternative 3:

Under Alternative 3, the designation of two additional OHV trails near the confluence of Eureka Creek in RMZ 5 and the Mile 22 Denali Highway North Trail in RMZ 2 is likely to adversely impact three known archaeological sites, as well as an unknown number of undiscovered cultural resources. OHV traffic at current levels in these areas is likely to adversely affect the National Register significance of these sites and result in the loss of irreplaceable information important to the knowledge of the area's prehistory. This activity can also contribute to additional adverse impacts, including looting and vandalism of more obvious cultural resources. OHV use is expected to increase approximately 5-10% during the life of the plan. Most of this increased use would likely occur on the Top of the World Trail in RMZ 5, increasing the potential for adverse impacts to two known archaeological sites in the Eureka Creek drainage.

4.3.2.3 Effects to cultural resources from identifying ORVs.

Alternative 1 (No Action Alternative):

ANILCA did not identify ORVs for the DWSR. It is a purpose of this planning effort to do so. The specific effects of not identifying ORVs to cultural resources are difficult to quantify, but would be primarily the same as the effects described for Alternative 1 throughout Chapter 4.3.2.

Alternatives 2 (Proposed Action), 3 and 4:

Proposing Cultural resources as an ORV in the *Wild* and *Scenic* river classification segments will have a beneficial effect by increasing public awareness about the ancient human use of the river corridor and the sensitivity of archaeological resources. Cultural resources will also be given extra protection beyond existing cultural resource laws since the WSRA requires all authorizations to be compatible with protecting the ORVs.

4.3.3 Fisheries

4.3.3.1 Effects to fisheries habitat from OHV trails and OHV river crossings.

Alternative 1 (No Action Alternative):

OHV trails that parallel the river and stream crossings can adversely affect riparian vegetation, rate of erosion and sedimentation, and streambank stability in sensitive riparian areas that are vital fisheries habitat. Unauthorized OHV trails that parallel the river and stream crossings typically have insufficient drainage structures and sometimes negotiate steep slopes, resulting in physical impacts to streambanks and riparian vegetation, uncontrolled run-off, and sedimentation. Damage to riparian areas from OHVs can last for years and sedimentation in streams can damage fish habitat downstream from the original disturbance. Direct threats to Arctic grayling from sediment include changes to physical habitat, subsequent decreased reproductive success, and loss of rearing habitat. Physical habitat changes from sediments are most often attributed to finer size particles. Developing eggs can be smothered and newly hatched fry can be killed by deposited sediment that prevents emergence from spawning gravels and interferes with respiration. Developing fish eggs and larvae need a constant supply of cold, oxygen-rich water which flows through the interstitial spaces in stream gravels. Embedded sediments can fill these interstitial spaces, limiting essential winter habitat used by juvenile and adult fish for cover from predators, ice scour, and high-velocity stream flows.

Under Alternative 1, trails would continue to be managed under the EARMP, which limits OHV use to two designated OHV trails (Top of the World and Rainy Creek Trails). Alternative 1 allows users to travel off designated trails for game retrieval and does not establish GVW restrictions or close unauthorized OHV trails. This would lead to a potential for adverse effects caused by streambank destabilization, riparian vegetation loss, erosion, and sedimentation from unauthorized and unpermitted trails that parallel or cross clear water portions of the Delta River. However, a recent Delta River Arctic grayling study in this area showed that the density of Arctic grayling (between 240 and 270 mm in fork length) to be the greatest population ever observed among published density estimates for Alaskan riverine Arctic grayling (Gryska 2009). This study suggests that OHV use under current management has had no effect on the population of Arctic grayling in the Delta River. Based on the planning assumption of a 5-10% increase in OHV use over the life of the plan, the BLM does not expect a significant impact to fisheries habitat from OHV use under Alternative 1.

Alternatives 2 (Proposed Action) and 4:

Alternatives 2 and 4 would close and rehabilitate four unauthorized OHV trails in the DWSR corridor. Closing and rehabilitating unauthorized OHV trails will help to prevent the unmanaged proliferation of trails crossing and paralleling the river. Limiting OHV use to designated trails and river crossings would ensure that trails and crossings are located in appropriate, sustainable locations to minimize damage to sensitive fisheries habitat. Additionally, a GVW restriction of 2000 lbs. would reduce the potential for soil compaction and the development of mud holes and rutting caused by larger OHVs. Alternatives 2 and 4

would have the highest potential among all alternatives to reduce stream destabilization, riparian habitat degradation, erosion and sedimentation that could potentially be deposited into the river during heavy rainfall or during spring run-off.

Alternative 3:

Under Alternative 3, there would be four additional designated OHV trails, no GVW limitations on OHV use, and OHVs would be allowed to travel off designated trails for game retrieval. This would increase the potential for streambank destabilization, riparian habitat degradation, erosion, and sedimentation into the river when compared to Alternatives 2 and 4, with possible adverse effects to fish habitat from increased OHV use on four additional designated OHV trails.

4.3.3.2 Effects to fisheries habitat from motorized boating decisions.

Alternative 1 (No Action Alternative):

Under Alternative 1, motorized boating is managed under the 1983 DWSR Management Plan, which recommended a limitation of 15 horsepower motors within the scenic classification segment and no other limitations on motorized boating throughout the rest of the river corridor. The erosion of streambanks and lake shorelines caused by excessive boat wakes pose a number of harmful effects on the aquatic environment. Wakes, or the waves generated by passing boats, strike streambanks and shorelines with surprising force and wash away the soil and vegetation as wave energy is dissipated on the beach. A number of factors contribute to the size of a wake or wave generated by a moving boat. Among these are the size of the channel being traversed, distance from the shore, vessel speed, the condition and shape of the propeller, passenger load, and hull shape. The absence of restrictions or targeted management actions to reduce or limit the use of motorized boats would increase the potential for adverse effects to fisheries habitat relative to Alternatives 2 and 4. However, impacts to fisheries habitat under current management practices have not risen to the level of resource concern, nor does the BLM expect it to during the life of the plan, based on the anticipated increases in motorized boating use discussed in Chapter 4.2 (Planning Assumptions).

Alternative 2 (Proposed Action):

Alternative 2 proposes to manage RMZs 1 and 4 for nonmotorized experiences. Periodic assessments of fishery resource values would be performed in RMZ 4 to determine if motorized boating is detrimentally affecting fishery resource values. Upon a finding that fishery resource values are being adversely affected, an ANILCA closure procedure would be considered to limit motorized boating use in RMZ 4. Although the increase in motorized boating use during the life of the plan is only expected to be approximately 2-5% above current levels, periodic assessments will allow the BLM to protect the fishery resource while refining motorized boating use estimates. The implementation of these management actions will help to protect fisheries habitat in RMZ 4, where concentrations of Arctic grayling occur at record densities. This would have an overall beneficial effect to fisheries resources.

Alternative 3:

Alternative 3 emphasizes motorized boating use with no restrictions, allowing for similar levels of motorized boating as Alternative 1. Alternative 3 would have a greater potential for adverse effects to fisheries habitat caused by streambank destabilization, erosion, and sedimentation from unrestricted motorized boating when compared to Alternatives 2 and 4.

Alternative 4:

Alternative 4 proposes the greatest restrictions on motorized boating within all RMZs by limiting certain types of uses altogether and by establishing horsepower restrictions. This would result in the greatest protection of fisheries habitat compared to all other alternatives.

4.3.3.3 Effects to fisheries resources from identifying ORVs.

Alternative 1 (No Action Alternative):

ANILCA did not identify ORVs for the DWSR. It is a purpose of this planning effort to do so. The specific effects of not identifying ORVs to the fisheries resource are difficult to quantify, but would be primarily the same as the effects described for Alternative 1 throughout Chapter 4.3.3

Alternatives 2 (Proposed Action), 3 and 4:

The effects of proposing Fisheries as an ORV in the *Wild* river classification segment will be beneficial by protecting a world-class Arctic grayling fishery and habitat. Few rivers anywhere in the world can match the quality and quantity of the Arctic grayling fishery in the DWSR. The Fisheries ORV and WSRA management objectives will help to protect sensitive riparian areas, the river's free-flowing character, instream flow, water quality, and important fisheries habitat. The Fisheries ORV is consistent with the National Fish Habitat Action Plan because it is designed to contribute to maintaining or restoring the watershed over the long term.

4.3.4 Lands and Realty

4.3.4.1 Effects of recreation decisions on access to State lands, private land parcels, and mining operations that are located adjacent to the DWSR corridor.

All Alternatives:

Authorized rights-of-way include the PLO 5150 Transportation and Utility Corridor, which is primarily identified with the Trans Alaska Oil Pipeline System (TAPS), but is also reserved as a utility and transportation corridor for future pipeline or electrical transmission needs. In accordance with the provisions of the WSRA and Title XI of ANILCA, new transportation and utility systems may be permitted within WSR corridors. ANILCA Sections 1104 and 1105 provide applicable standards for granting such authorizations. In addition to the consideration of the factors set forth in Section 1104 (g) (2), such an authorization would be granted if (1) it is in the public interest; and (2) it would be compatible with WSR values for which the subject river involved was established. This procedural review would mitigate potential adverse effects from authorizing future transportation and utility systems proposals within the DWSR corridor, and would apply to all alternatives.

Alternative 1 (No Action Alternative):

Current management under Alternative 1 provides for access to state lands, private land parcels, and mining operations adjacent to the river corridor. There are no motorized boating restrictions, and the only restriction to OHV use is the requirement to use designated trails (Top of the World and Rainy Creek Trails) within the river corridor. These trails provide access to state lands and mining operations that are located adjacent to the river corridor.

Alternatives 2 (Proposed Action) and 4:

Alternatives 2 and 4 provide management actions to promote nonmotorized recreational experiences within RMZs 1 and 4, but this does not affect access to state lands, private lands, or mining operations because there are no active mining claims, state lands, or private land within RMZs 1 and 4. Lands adjacent to RMZs 1 and 4 are state-selected lands and current access via foot and the Landmark Gap OHV trail will not change. OHV management actions in RMZ 5 will not limit access to state lands or mining operations because trails that have been traditionally used to access these areas will remain open to OHV use. The closure of four unauthorized OHV trails (Round Tangle Lake Trail, Mile 22 Denali Highway North Trail, and two Eureka Creek Trails) will not adversely affect access to state lands, private lands, or mining operations because they are not trails that have been traditionally used to access these areas.

Alternative 3:

Same as Alternative 1, except four additional OHV trails would be designated open to OHV use. Two new OHV trails in the Eureka Creek drainage would increase access to state lands west of the DWSR corridor. The other two trails in the vicinity of the Denali Highway are short, user created spur trails off the Denali Highway, and would not substantially benefit access to state or private lands if designated open to OHV use.

4.3.4.2 Effects of potential property acquisition by BLM in the DWSR corridor.*All Alternatives:*

The EARMP specified that the DWSR would be an emphasis area for the acquisition of private lands through purchase or exchange for the purposes of long-term Federal management and retention. Under all alternatives, property acquisition within the river corridor would be considered by the BLM when private lands are available for purchase. This would have a beneficial effect on recreation resources, as all private lands within the river corridor are located adjacent to the Denali Highway, and if acquired by the BLM, would be managed consistent with the objectives prescribed for RMZ 2. Adverse effects of property acquisition include a negative public perception of the BLM acquiring more land for long term federal ownership that would otherwise be available for private ownership, as these parcels are the only parcels not owned by the BLM, and are located adjacent to the Denali Highway, providing easy access for private development.

4.3.5 Natural Quiet and Natural Sounds**4.3.5.1 Effects of recreation decisions on natural quiet and natural sounds present within the DWSR corridor.***Alternative 1 (No Action Alternative):*

Under Alternative 1, artificial noise sources associated with recreational use would persist due to the lack of management actions that would reduce contributing causes of noise. Without any limitations on group size, user capacity, chainsaw use, recreational shooting, and the operation of gasoline powered engines, artificial noise will increase commensurate with increases in visitor use. Anticipated increases in visitor use during the life of the plan would result in additional artificial noise, particularly in RMZs 2 and 3, where most of the projected increased visitor use is likely to occur. As a result, some users in RMZs 2 and 3 may be displaced to other RMZs, thereby reducing user expectations to experience natural quiet and natural sounds in those RMZs as well. This would have an overall adverse effect on natural quiet and natural sounds within the river corridor when compared to all other alternatives, since the other alternatives would prescribe various management actions that would reduce some aspects of artificial noise.

Alternative 2 (Proposed Action):

Alternative 2 will manage for nonmotorized recreational experiences in RMZs 1 and 4, having a beneficial effect of reducing artificial noise sources when compared to Alternatives 1 and 3, which provide for higher levels of motorized boating and airplane landings. Artificial noise associated with OHV use would decrease with the closure of four unauthorized OHV trails in RMZs 2 and 4. Implementing a group size limitation, user capacity limitations, and restrictions on recreational shooting and chainsaw use would have a beneficial effect of preserving natural quiet and natural sounds in all RMZs, as compared to Alternatives 1 and 3, which do not limit the use of chainsaws and allow for larger group sizes and a higher threshold for user capacity limitations.

Alternative 3

Alternative 3 would not prescribe limitations on the use of motorized boats or airplane landings, and OHV use would be allowed on four additional trails, having the overall effect of producing more artificial noise when compared to Alternatives 2 and 4. A larger group size limitation of 12, higher user capacity

thresholds and no restrictions on the use of chainsaws in this alternative would result in more artificial noise in all RMZs, adversely affecting natural quiet and natural sounds. Cumulatively, the anticipated increases in motorized uses during the life of the plan would result in more artificial noise when compared to Alternatives 2 and 4.

Alternative 4

Effects would be the same as Alternative 2, except Alternative 4 proposes more limitations on motorized boating within the river corridor, a smaller group size limitation of 8, and lower user capacity thresholds. Consequently, Alternative 4 would have the greatest beneficial effect on preserving natural quiet and natural sounds when compared to all other alternatives.

4.3.6 Recreation Resources

4.3.6.1 Effects of proposed recreational facility developments on the natural and primitive character of the DWSR.

All Alternatives:

In all alternatives, the Tangle Lakes Campground will be renovated, reducing adverse impacts (ground compaction, creation of satellite campsites, cut trees, etc.) to vegetative resources by establishing designated campsites. The designation of campsites at the campground will also benefit the natural and primitive character of the river corridor. Anticipated increases in facility use of 30% during the life of the plan would be mitigated with the redesign of the Tangle Lakes Campground. The number of available, designated campsites will nearly double, and the campground layout will be designed to accommodate this anticipated increased visitor use.

Alternative 1 (No Action Alternative):

Under Alternative 1, the overall scope and a long term plan for future facility developments within the river corridor would not be identified. Facility developments (campsites, outhouses, boater registration kiosks, etc.) tend to attract increased use, exacerbating impacts associated with ground compaction, creation of new satellite sites and social trails and vegetation trampling. Without any group size limitations or river campsite management standards, the potential exists for increased impacts to river campsites. Heavy use sights and signs of human impacts detract from the natural and primitive character of the river corridor.

Alternative 2 (Proposed Action):

Alternative 2 identifies the scope and a long term plan for future facility developments, with the primary goal of preserving natural setting characters that have been prescribed for each RMZ. Proposed facility management actions in Alternative 2 include removing the outhouse, river survey box, and boater registration kiosk at the river portage in RMZ 4. These facilities tend to attract increased use, exacerbating impacts from ground compaction, creation of satellite sites and social trails, and vegetation trampling. Group size limitations and campsite management actions will reduce the potential for campsites to grow larger, and as a result, bare ground expansion and riverbank erosion will decrease. Campsites with substantial riverbank erosion will be rehabilitated, improving the natural and primitive character throughout the river corridor. In RMZ 5, new facilities will be added at the river takeout, including a river survey box, takeout warning signs, and a boater registration kiosk. These facilities will reduce the naturalness and primitive character of this area when compared to the absence of any facilities, but these facilities will be located next to the parking area where signage and user facilities are generally expected for convenience and safety.

Alternative 3:

Under Alternative 3, one new outhouse and boater registration kiosk would be constructed in the Upper Tangles (RMZ 2), and a river survey box, boater registration kiosk, and increased river warning signage would be installed at the Delta River portage (RMZ 4) and Mile 212.5 Richardson Highway takeout (RMZ

5). These types of sites tend to attract concentrated visitor use, resulting in vegetation trampling, ground compaction, and increased social trails and satellite sites. These impacts may be highly visible and detract from the natural and primitive character. In addition, the placement of permanent fire rings and picnic tables is proposed at heavy use sites throughout the river corridor. Permanent metal fire rings encourage the building of larger fires, which on upland sites can lead to additional tree cutting. Larger group size limitations and campsite management actions under this alternative will increase the potential for river campsites to grow larger more quickly, and bare ground compaction, vegetation trampling, and riverbank erosion will be greater when compared to Alternatives 2 and 4.

The installation of river survey boxes, takeout warning signs, and boater registration kiosks will reduce naturalness and primitive character, but would also be beneficial by increasing visitor safety and visitor use data collection. These facilities will be located in areas already impacted by concentrated use, and are generally expected for convenience and visitor safety. This alternative would provide for more comprehensive river use data collection, and increased river user safety when compared to all other alternatives.

Alternative 4:

Alternative 4 seeks to preserve natural and primitive character by limiting future facility developments to the Tangle Lakes Campground renovation and by removing all signs and existing river facilities in RMZs 1, 2, 4, and 5. The removal of the outhouse and facilities at the river portage and the potential for rehabilitation or closure of heavily impacted campsites would have a beneficial effect of reducing associated impacts (ground compaction, damaged vegetation, litter, etc.). No other facilities would be proposed, and consequently, this alternative is most beneficial in maintaining natural and primitive character when compared to all other alternatives. The elimination of all river signage, boater registration kiosks, and river survey boxes would enhance natural and primitive character, but would also have the adverse effect of reducing the collection of important visitor use information and reducing visitor safety with the removal of river warning signs.

4.3.6.2 Effects of the proposed user capacity management decisions on a user's ability to have positive recreational experiences within the DWSR corridor.

Alternative 1 (No Action Alternative):

Alternative 1 offers no strategies to reduce social impacts from increased visitor use. Data discussed in Chapter 3 (Figure 3) shows that current visitor use levels have resulted in encounter levels that are approaching, or have already exceeded, preferred encounter rates. Table 5 shows that on some segments of the river, the preferred setting is more primitive than the available setting that currently exists. Anticipated increases in visitor use during the life of the plan would primarily be associated with the developed facilities (RMZ 3), but a portion of this increased use will be evident on the lakes and river system (RMZs 1, 2, 4, and 5). As unmanaged visitor use levels increase, social impacts that exceed user preferences, and possibly user tolerances, can be expected. This would result in a lower visitor experience quality rating, and would change the type of experience offered on some river segments and during some visitor use seasons, particularly within RMZs 1 and 4. Lower quality or a change in expected recreational experiences may displace users to other river segments, visitor use seasons, or other areas entirely. Higher use levels will also create increased social conflicts among users, particularly between motorized and nonmotorized users.

Alternative 2 (Proposed Action):

Alternative 2 would manage increased visitor use on the lakes and river by implementing an adaptive management approach, based on the level of camp encounters, camp sharing, and camp competition for overnight use. An encounter standard of "less than 20% of user days that groups are required to camp within sight and sound, pass up occupied designated campsites, or shared designated campsites due to campsites being occupied" is the preferred encounter rate, based on the 2005 Delta River User Survey (Whittaker and Shelby, Delta National Wild and Scenic River, 2005, pg.64). Survey data shows that river users are willing to pass up campsites approximately 20% of the time before it begins to negatively affect their recreational experience. Encounter rates have not been documented on the Delta River, but given

the relatively low use levels and number of available campsites, it is believed that the encounter rate for overnight use is currently less than 5%.

The prescribed adaptive management approach would be implemented in phases, requiring two consecutive years of exceeding the standard before the next phase is implemented. Phase I includes designating campsites, providing a campsite map, and a group size limitation of 10 people per campsite (larger groups would still be allowed with written authorization). Designating campsites and providing a campsite map would allow users to choose campsites to reduce camp encounters and camp competition and would help to control the development of user-created campsites. A group size limitation would help reduce social impacts (noise, congestion at portages, appearance of “tent cities”, etc.) commonly associated with large groups. Considering the current low use levels and assuming an encounter rate of 5%, it would require an increase of at least four times (400%) as many users over two consecutive years to proceed to Phase II (voluntary registration system), eight times (800%) to proceed to Phase III (mandatory registration system), and twelve times (1200%) to proceed to Phase IV (mandatory permit system).

An adaptive management approach based on encounter standards would benefit a user’s ability to have positive recreational experiences while addressing increased use levels within the river corridor that are anticipated during the life of the plan. Adverse effects of implementing a user capacity management system would be primarily associated with the displacement of users who are not willing to participate in voluntary registration systems and who would perceive a mandatory permit system as limiting their right to guaranteed access to public lands.

Alternative 3:

Alternative 3 allows for higher encounter standards (less than 40% of user days) and larger groups sizes (group size limitation of 12), and delays efforts to implement management actions that would address encounter impacts. Allowing higher encounter standards would begin to degrade some recreational experiences, and may result in the displacement of users who are seeking more primitive recreational experiences, particularly in RMZs 1 and 4. With higher encounter standards, use levels on the river would continue to rise until they leveled off at a point where users were being displaced due to overcrowding and encounter impacts exceeding user tolerances. This would have an adverse effect on some user’s ability to have positive recreational experiences and for the BLM to meet prescribed setting characteristics. Users who are not seeking primitive recreational experiences would be more likely to use the river corridor, as the experience setting would shift towards the semiprimitive and roaded natural recreational opportunity spectrum experiences.

Alternative 4:

Management actions proposed in Alternative 4 are primarily the same as Alternative 2, except that Alternative 4 prescribes lower encounter standards (less than 10% of user days) and smaller group sizes (group size limitation of 8), and accelerates efforts to implement management actions that would address encounter impacts. The lower encounter standard and smaller group sizes would reduce overall users within the river corridor, resulting in fewer impacts to campsites and less displacement of users who are seeking more primitive recreational experiences when compared to all other alternatives. Adverse effects of implementing a user capacity management system would be primarily associated with the displacement of users who are not willing to participate in voluntary registration systems and who would perceive a mandatory permit system as limiting their right to guaranteed access to public lands.

4.3.6.3 Effects of proposed recreation management decisions regarding litter, human waste, fire rings, and educational/interpretational information on a user’s ability to have positive recreational experiences within the DWSR corridor.

Alternative 1 (No Action Alternative):

Under Alternative 1, there is no specific strategy to address the management of litter, human waste, and fire rings. As a result, social impacts continue to occur within the river corridor. Campsites with excessive litter, human waste, and multiple fire rings detract from the natural and primitive character of the river corridor, and adversely affect a user’s ability to have positive recreational experiences. The lack of a

clearly defined educational and interpretational emphasis has made it difficult to increase LNT educational awareness, resulting in behaviors that approach or have exceeded user tolerances for these impact issues.

Alternative 2 (Proposed Action):

Alternative 2 would manage litter by implementing an adaptive management approach, with actions that include increased education (Phase I), additional cleanup patrols (Phase II), and the requirement to use firepans and the removal of ash and unburned litter (Phase III), if standards are exceeded for two consecutive years between each phase. Almost all of the litter found within the river corridor is partially burned material left behind in fire rings, which can be greatly reduced by implementing a firepan requirement. Users will be less likely to burn waste in a firepan, resulting in cleaner campsites and a more positive recreational experience. Increased education and cleanup patrols are methods that are less intrusive and are generally well received by users. A firepan requirement may displace some users who are not willing to pack out their own litter and ash to other areas that do not have firepan requirements. Preliminary monitoring conducted from 2006-2009 has shown that approximately 24% of campsites monitored have had litter present. At current visitor use levels, the proposed litter standard of 20% has already been exceeded, and it is likely that additional cleanup patrols (Phase II) will need to be implemented in the near future if increased education is not effective.

Human waste is an issue that has obvious health and safety considerations and a majority of respondents in the 2005 Delta River User Survey rate the presence of human waste and toilet paper as having the greatest impact to their recreational experience. Past monitoring of human waste shows that current levels already exceed user tolerances (10%), resulting in potential health and safety considerations and reducing positive user experiences. Alternative 2 would manage human waste by implementing an adaptive management approach, with actions that include increased education and requiring commercial guides to use portable toilets (Phase I), additional cleanup patrols (Phase II), and a portable toilet requirement (Phase III), if standards are exceeded for two consecutive years between each phase. Management actions are designed to reduce levels of human waste, all of which would have a beneficial impact to recreational experiences. Increased education and cleanup patrols are generally well received by users. A portable toilet requirement and the eventual removal of the outhouse at the river portage may displace some users who are not willing to pack out their own wastes to other areas that do not require portable toilets. Preliminary monitoring conducted from 2006-2009 has shown that approximately 15% of campsites monitored have had human waste present. At current visitor use levels, the proposed human waste standard of 10% has already been exceeded, and it is likely that additional cleanup patrols (Phase II) will need to be implemented in the near future if increased education is not effective.

Alternative 2 would manage multiple fire rings by implementing an adaptive management approach, with actions that include dismantling all but one fire ring per site and increased education (Phase I), and the eventual requirement to use portable firepans (Phase II), if standards are exceeded for two consecutive years between each phase. Rock fire rings promote the cutting of larger fuels than would be required with the use of portable firepans, and leave unsightly scars in campsites that are nearly impossible to rehabilitate. Firepans use smaller pieces of wood, resulting in less vegetation damage, ground scarring, blackened rocks, and litter left behind in fire rings. Wildfire potential is higher with rock fire rings than with firepans, since fires must be completely extinguished before packing away the firepan and leaving camp. Increased education and cleanup patrols are generally well received by users. A firepan requirement may displace some users who are not willing to carry a firepan to other areas that do not have firepan requirements. Preliminary monitoring conducted from 2006-2009 has shown that approximately 5% of campsites monitored have had multiple fire rings. At current visitor use levels, it is likely that increased education would be effective to maintain the proposed fire ring standard of 20%, and that a firepan requirement would be unlikely in the future unless visitor use levels increase significantly during the life of the plan.

The implementation of a well defined educational/interpretational program will have a beneficial effect of increasing LNT educational awareness throughout the river corridor. This will help to reduce behaviors that threaten to exceed user tolerances for these impact issues, and will help to promote a better understanding of the archaeological significance and subsistence lifestyle opportunities that are present within the river corridor.

Alternative 3:

Actions to address litter in Alternative 3 are the same as same as Alternative 2, except that firepans would not be required, and educational efforts would be used to reduce impacts. Increased education and cleanup patrols are methods that are less intrusive and are generally well received by users, but if education is not effective, litter would continue to accumulate at campsites, having an adverse effect on recreational experiences.

Actions to address human waste in Alternative 3 emphasize education, but portable toilets would not be required. One outhouse would be added in RMZ 2. This additional outhouse would help to alleviate human waste concerns in RMZ 2, but would not address human waste at other locations in the river corridor. Outhouses are very difficult to maintain and result in additional adverse impacts to vegetation, including trampling, social trails, and satellite sites in the vicinity of the outhouse. Fewer users would be displaced by not having a portable toilet requirement, but if education is not effective, the presence of human waste at river campsites would persist, having an adverse effect on recreational experiences.

Actions to address multiple fire rings in Alternative 3 emphasize education, but do not require the use of firepans, and allow chainsaws and the cutting of standing dead trees. Wildfire potential will be higher with rock fire rings than with firepans, and rock fire rings will lead to increased vegetation damage, ground scarring, blackened rocks, and litter left behind in fire rings. Fire scarring will continue to persist at campsites if education is not effective, and more trees will be cut within the river corridor, leaving stumps that will reduce scenic qualities. Fewer users would be displaced without a firepan requirement, but negative impacts would still occur at campsites, having an adverse effect on recreational experiences.

The effects of implementing a well defined educational/interpretational program are the same as Alternative 2.

Alternative 4:

Methods used to address litter, human waste, and fire rings in Alternative 4 are the same as Alternative 2, except that management actions will occur sooner if monitoring shows that standards are being exceeded. Effects would be the same as Alternative 2. It is likely that more users would be inconvenienced by the requirements for portable toilets and fire pans.

The effects of implementing a well defined educational/interpretational program are the same as Alternative 2, except that interpretive displays would not be installed on nonmotorized trails. This would have a beneficial effect of creating the most primitive and pristine environment, but users would not be able to gain an awareness and understanding of archaeological resources and subsistence lifestyles in the river corridor.

4.3.6.4 Effects of proposed BBM decisions on preserving a diversity of recreational experiences within the DWSR corridor.

Alternative 1 (No Action Alternative):

The absence of BBM recreation decisions in Alternative 1 does not satisfy current BLM recreational planning requirements. BBM is a recreational planning approach that the BLM used to guide the Delta River SRMA planning process. The effects of not using the BBM planning approach are approximately the same as Alternative 1 for the various resource areas throughout Chapter 4.

Alternatives 2 (Proposed Action), 3 and 4:

Alternatives 2, 3 and 4 would maintain a diversity of recreational experiences in the Delta River SRMA by implementing the proposed BBM decisions and creating five distinct RMZs. The creation of RMZs helps to ensure that specific activities, experiences and benefits are targeted for management and that specific ROS classes are applied to each RMZ, providing for a diversity of recreational opportunity spectrum experience settings that include the primitive, semiprimitive nonmotorized, semiprimitive motorized and roaded natural settings. Without the designation of RMZs, there is nothing to guide management

activities towards beneficial outcomes, possibly leading to user displacement due to the loss of recreational diversity.

4.3.6.5 Effects to recreation resources from identifying ORVs.

Alternative 1 (No Action Alternative):

ANILCA did not identify ORVs for the DWSR. It is a purpose of this planning effort to do so. The specific effects of not identifying ORVs to recreational resources are difficult to quantify, but would be primarily the same as the effects described for Alternative 1 throughout Chapter 4.3.6.

Alternatives 2 (Proposed Action), 3 and 4:

Proposing Recreation as an ORV throughout all river classification segments will be beneficial by ensuring that recreational management is based on clearly defined objectives; providing a foundation for future planning, management, and monitoring of recreational activities within the DWSR corridor. Management objectives will seek to provide a diversity of recreational experiences, while preserving the river in its immediate, natural environment. Protections provided by the WSRA will ensure that ORVs are maintained and enhanced for future generations.

4.3.7 Scenic Resources

4.3.7.1 Effects of the proposed recreational facility developments on scenic resources.

All Alternatives:

Under all alternatives, the Tangle Lakes Campground will be renovated to address resource impacts to soils and vegetation and to meet the current demand of recreational use. Areas with impacted vegetation and soils will be revegetated, campsites and gravel travel routes will be defined for vehicular travel, and facilities will harmonize with the surrounding environment. All of these actions will benefit scenic resources.

Alternative 1 (No Action Alternative):

Alternative 1 would not establish group size limitations or river campsite management objectives, and the potential would be high for unmanaged river campsites to grow larger, increasing bare ground disturbance and riverbank erosion. The average group size for the Delta River through-trip is 4 people; Upper Tangles is 3 people. Even with the current average group sizes being relatively low, impacts at campsites are evident. Heavy use sights with substantial riverbank erosion can detract from scenic qualities due to the visibility of impacts from the river.

Alternative 2 (Proposed Action):

Under Alternative 2, actions identified for river campsite management and a group size limitation (10) would reduce the potential for light and moderate impacted sites to become heavy impacted sites, and would provide actions to reduce riverbank erosion, bank trampling, social trail development, satellite sites, and bare ground expansion within campsites, benefitting scenic resources. During the life of the plan, a group size limitation of 10 people would exclude approximately 6 larger groups annually, reducing the potential for adverse scenic impacts associated with campsite expansion as a result of large groups. The potential for impacts to scenic resources would be less than Alternatives 1 and 3, but slightly higher than Alternative 4, due to differences in campsite management actions and a larger group size limitation in this alternative.

Alternative 3:

Alternative 3 would also identify management actions for river campsite management and group size limitations, but the group size would be larger (12) and campsite management actions would allow for the creation of additional campsites. Existing heavy and moderate impact sites would be hardened and

expanded to accommodate larger groups and increased use. Light and moderate impact sites may develop into heavy impact sites, adversely affecting scenic resources. During the life of the plan, a group size limitation of 12 people would exclude approximately 3 larger groups annually, resulting in a higher potential for adverse scenic impacts associated with large groups when compared to Alternatives 2 and 4 that have smaller group size limitations. One additional outhouse in RMZ 2 is proposed. This outhouse could be located out of sight of the river; however, secondary effects of outhouses include increased use adjacent to the outhouse, with associated impacts resulting in ground compaction, social trails and satellite sites, and vegetation trampling. These secondary effects are highly visible and would adversely impact scenic resources.

Alternative 4:

Under Alternative 4, actions identified for river campsite management and a smaller group size limitation (8) would minimize the potential for light and moderate impacted sites to become heavy impacted sites, and would provide actions to reduce riverbank erosion, bank trampling, social trail development, satellite sites, and bare ground expansion within campsites. During the life of the plan, a group size limitation of 8 people would exclude approximately 12 larger groups annually, having the highest potential among all alternatives to reduce adverse scenic impacts associated with campsite expansion as a result of large groups. Elimination of the outhouse at the river portage and associated visual impacts (bare ground, trampled vegetation, social trails), combined with the potential for the rehabilitation or closure of heavy use campsites would have a beneficial effect on scenic resources. The elimination of all river signage, boater registration kiosk, and river survey boxes would enhance scenic resources along the river, resulting in a more primitive viewshed, but would also have the adverse effect of reducing the collection of important visitor use information and decreasing visitor safety with the removal of river warning signs.

4.3.7.2 Effects of travel management decisions on scenic resources.

Alternative 1 (No Action Alternative):

Under Alternative 1, the only designated OHV trails within the river corridor are the Top of the World and Rainy Creek Trails. All other OHV trails existing within the river corridor are unauthorized. The unauthorized proliferation of OHV trails has the potential to adversely impact scenic resources because trail braiding results in large areas of erosion and vegetation disturbance that was not present before these trails were pioneered, particularly on hillsides where trails access the river. In addition, the absence of designated nonmotorized trails has resulted in numerous user-created hiking trails adjacent to the developed facilities. Rather than having defined, designated nonmotorized trails that tend to concentrate use to one particular area, the current situation of spur trails accessing many of the ridges within the viewshed has resulted in adverse impacts to scenic resources.

Alternatives 2 (Proposed Action) and 4:

Alternatives 2 and 4 propose the closure and rehabilitation of four unauthorized OHV trails. The amount of area that would be protected by closing four unauthorized trails totals approximately 2 acres (1 acre each in RMZs 2 and 5). This will benefit scenic resources by protecting the viewshed from further visual impacts, while allowing these unauthorized trails to rehabilitate to their natural condition. Limiting OHV use to designated trails would ensure that OHV trails are located in appropriate, sustainable locations to minimize damage to scenic resources. A GVW restriction of 2000 lbs. would reduce potential impacts to scenic resources, as soil compaction and the shear forces caused by larger OHVs can alter hydrologic patterns and increase erosion and sedimentation. This alternative reduces the potential for stream destabilization, riparian habitat degradation, and a reduction in erosion and sedimentation from OHV use, benefiting scenic resources. The designation of nonmotorized trails will concentrate use to established trails that are designed in a sustainable manner, with consideration for protecting scenic resources. Trail spurs will be closed and rehabilitated, improving overall scenic qualities within the viewshed.

Alternative 3:

Alternative 3 provides increased opportunities for OHV use by designating four additional OHV trails, not establishing GVW restrictions, and allowing travel off of designated trails for game retrieval. The amount of area affected by the four unauthorized trails totals approximately 2 acres (1 acre each in RMZs 2 and

5). These actions would adversely affect scenic resources by creating additional impacts commonly associated with OHV use, such as trail scarring, rutting, and braiding, altering the scenic viewshed. Anticipated increases in OHV use of 5-10% during the life of the plan would compound these effects, particularly on the Top of the World Trail in RMZ 5, where most of the projected increased OHV use is likely to occur. The designation of nonmotorized trails will benefit scenic resources by concentrating use to established trails that are designed in a sustainable manner, with consideration for protecting scenic resources. Trail spurs will be closed and rehabilitated, improving overall scenic qualities within the viewshed.

4.3.7.3 Effects to scenic resources from identifying ORVs.

Alternative 1 (No Action Alternative):

ANILCA did not identify ORVs for the DWSR. It is a purpose of this planning effort to do so. The specific effects of not identifying ORVs to scenic resources are difficult to quantify, but would be primarily the same as the effects described for Alternative 1 throughout Chapter 4.3.7.

Alternatives 2 (Proposed Action), 3 and 4:

The effects of proposing Scenic Resources as an ORV in all river classification segments will be beneficial by ensuring that scenic values are considered in future proposed developments within and adjacent to the river corridor. Site-specific NEPA analysis would address the potential effects to scenic resources when a proposed development actually occurs, and mitigation measures would be identified that protect and enhance the Scenic Resources ORV.

4.3.8 Soil Resources

4.3.8.1 Effects of OHV management decisions on soil resources.

Alternative 1 (No Action Alternative):

Under Alternative 1, the only designated OHV trails within the river corridor are the Top of the World and Rainy Creek Trails. All other OHV trails currently present within the river corridor are unauthorized trails. Unauthorized OHV trails have a high potential to adversely impact soil resources as a result of erosion, sedimentation, and compaction. The most serious and permanent impact from OHVs is soil erosion, with water being the primary displacement mechanism. While soil compaction may recover to some degree during periods of non-use, erosion usually continues once started. Most OHVs have powerful motors and deeply treaded tires. When the tires spin, they displace large amounts of soil quickly, removing vegetation and soils that can create or accelerate rutting. This is especially evident on steep slopes and wetland crossings. The displaced soil often finds its way into waterways, resulting in increased turbidity and sedimentation. This can negatively impact water quality and numerous aquatic organisms. Alternative 1 does not formally identify and rehabilitate unauthorized OHV trails, and consequently, would adversely impact soil resources.

Alternatives 2 (Proposed Action) and 4:

Alternatives 2 and 4 propose the closure of four unauthorized OHV trails, OHV limitations of 2000 lbs. GVW, and the requirement to stay on designated OHV trails. The amount of area that would be protected by closing four unauthorized trails totals approximately 2 acres (1 acre each in RMZs 2 and 5). Limiting OHV use to designated trails would preserve existing OHV access while ensuring that trails are located in appropriate, sustainable locations to minimize damage to soil resources. A GVW restriction of 2000 lbs. would reduce potential impacts to soil resources, as soil compaction and the shear forces caused by larger OHVs can create mud holes that alter hydrologic patterns and increase erosion and sedimentation. Adverse impacts to soils under this alternative would be less than under Alternatives 1 and 3.

Alternative 3

Alternative 3 provides increased opportunities for OHV use by designating four additional OHV trails, not establishing GVW limitations, and allowing travel off of designated trails for game retrieval. Effects to soils would be the same as Alternative 1. The amount of area affected by the four unauthorized trails totals approximately 2 acres (1 acre each in RMZs 2 and 5). Since there would be more trails open to OHV use, it is anticipated there would be the greatest adverse impacts to soils under this alternative. Anticipated increases in OHV use of 5-10% during the life of the plan would compound these effects, particularly on the Top of the World Trail in RMZ 5, where most of the projected increased OHV use is likely to occur.

4.3.8.2 Effects of campsite management decisions on soil resources.*Alternative 1 (No Action Alternative):*

Alternative 1 would not establish group size limitations or river campsite management actions, and the potential would be high for bare ground disturbance, soil compaction, riverbank erosion, and the development of social trails and satellite sites within unmanaged river campsites. The average group size for the Delta River through-trip is 4 people; Upper Tangles is 3 people. Even with the current average group sizes being relatively low, soil impacts at campsites are evident.

Alternative 2 (Proposed Action):

Under Alternative 2, actions identified for river campsite management and a group size limitation (10) would minimize the potential for light and moderate impacted sites to become heavy impacted sites, and would provide actions to reduce riverbank erosion, bank trampling, social trail development, satellite sites, bare ground disturbance and soil compaction within campsites. During the life of the plan, a group size limitation of 10 people would exclude approximately 6 larger groups annually, reducing the potential for adverse soil impacts associated with campsite expansion as a result of large groups. The potential for adverse impacts to soil resources would be less than Alternative 3, but slightly higher than Alternative 4, due to differences in campsite management actions (creation of additional campsites) and a larger group size limitation in this alternative.

Alternative 3:

Alternative 3 would also identify actions for river campsite management and a group size limitation, but the group size would be larger (12) and campsite management actions would allow for the creation of additional campsites. Existing heavy and moderate impact sites would be hardened and expanded to accommodate larger groups and increased use. Light and moderate impact sites may develop into heavy impact sites, leading to increased adverse soil impacts including bare ground disturbance, soil compaction, and trampling as a result of larger groups and additional campsites. During the life of the plan, a group size limitation of 12 people would exclude approximately 3 larger groups annually, resulting in a higher potential for adverse soil impacts when compared to Alternatives 2 and 4 that have smaller group size limitations.

Alternative 4:

Under Alternative 4, actions identified for river campsite management and a smaller group size limitation (8) would minimize the potential for light and moderate impacted sites to become heavy impacted sites, and would provide actions to reduce riverbank erosion, bare ground disturbance and soil compaction. Additional campsites would not be created under this alternative, and associated soil impacts (bare ground, compaction, and trampling), combined with the potential for rehabilitation or closure of heavy use campsites, would have a beneficial effect on soil resources. During the life of the plan, a group size limitation of 8 people would exclude approximately 12 larger groups annually, having the highest potential among all alternatives to reduce adverse soil impacts associated with campsite expansion as a result of large groups.

4.3.9 Subsistence

4.3.9.1 Effects of the proposed recreation management decisions to subsistence use of fish and wildlife in the DWSR corridor.

Subsistence use of fish and wildlife is a protected activity within the DWSR corridor (ANILCA Title VIII, 50 CFR §100.3.c). The BLM Glennallen Field Office has delegated authorities to implement regulations and manage permits for subsistence uses within the DWSR corridor. The BLM is required by ANILCA Title VIII, Section 810 to consider any potential impacts to subsistence activities, resources, or impacts to access for subsistence activities from the alternatives. These impacts are discussed in a Section 810 Evaluation Report. The complete Section 810 Evaluation for this plan can be found in Appendix 8.2.

4.3.10 Travel Management

4.3.10.1 Effects of travel management decisions on the natural and primitive character of the DWSR corridor and on preserving a diversity of recreational experiences.

All Alternatives:

Management regarding the use of pack animals, mountain bikes (mechanized travel), snowmachines, and dog mushing will not change in any of the alternatives. These uses rarely occur within the river corridor and current impacts are low, offset by the positive benefit of maintaining a diversity of recreational experiences. As discussed in Chapter 4.2 (Planning Assumptions), these uses are not expected to increase significantly during the life of the plan. If the use of snowmachines, mechanized travel, pack animals or dog mushing becomes a natural resource or social conflict problem, these uses may be limited through site-specific trail restrictions developed in the future.

Alternative 1 (No Action Alternative):

Under Alternative 1, the continuation of current OHV management practices would have adverse impacts to the natural and primitive character of the river corridor. Trail braiding, erosion, and vegetation damage is occurring on the Top of the World Trail and at the confluence of Eureka Creek; evidence of OHV use that is inconsistent with protecting the natural and primitive character of the river corridor.

Motorized boating is limited by the existing BLM recommendation of 15 horsepower motors on the Tangle Lakes. Otherwise, motorized boating in the DWSR corridor is only limited by natural barriers in the river. Technological advancements in motorized watercraft during the life of the plan may lead to increased access in areas that are currently limited by shallow water and natural barriers. This alternative does not regulate motorized boating use, leading to increasing social conflict issues and adversely affecting the opportunity for a diversity of nonmotorized recreational experiences.

Airplane landings within the river corridor occasionally occur on some of the larger lakes and are primarily associated with the transportation of hunters and fisherman. Noise caused by airplane landings may adversely affect some users seeking solitude and natural quiet, and those expecting a nonmotorized experience may be disrupted by airplane landings. Airplane landings rarely occur in the narrow river channel since there are few areas suitable for airplane landings.

Travel by foot has potential impacts to vegetation and soils, occurring primarily in pristine areas when groups do not spread out and disperse, and when social trails develop within and around river campsites. These adverse impacts have occurred on hillsides adjacent to the developed facilities and at river campsites throughout the river corridor. Impacts to vegetation and soils include erosion, increased sedimentation, and trail scarring, adversely affecting natural and primitive character.

Alternative 2 (Proposed Action):

Alternative 2 will limit the use of OHVs to two designated trails (Top of the World and Rainy Creek Trails), except during periods of adequate snow cover or ground frost. Alternative 2 proposes the closure of four unauthorized OHV trails, OHV limitations of 2000 lbs. GVW, and the requirement to stay on designated

OHV trails. The amount of area that would be protected by closing four unauthorized trails totals approximately 2 acres (1 acre each in RMZs 2 and 5). Limiting OHV use to designated trails will help prevent unauthorized trails while maintaining existing traditional access routes for recreational and subsistence users, resulting in less adverse impacts to the surrounding primitive and natural character. The 2000 lb. GVW limitation is unlikely to affect recreational or subsistence users since vehicles larger than 2000 lbs. GVW have rarely been observed within the river corridor.

Alternative 2 proposes to manage RMZs 1 and 4 for nonmotorized experiences. Targeted management for nonmotorized uses would help to maintain the natural and primitive character found within these RMZs, and would provide additional opportunities for solitude and a greater diversity of recreational experiences. These management actions would also help to mitigate possible adverse social effects caused by the anticipated increased motorized boating use during the life of the plan. Although this increased use is expected to be low (approximately 2-5%), and aircraft landings are expected to be stable throughout the life of the plan, targeting nonmotorized experiences in RMZs 1 and 4 will allow the BLM to promote a diversity of experiences while refining visitor use estimates. The allowance of motorized boating and airplane landings in RMZs 2 and 5 will not have adverse effects to recreational user experience and expectations due to the close proximity of the Denali and Richardson Highways and developed facilities. Users seeking solitude and natural quiet are less likely to be displaced due to associated noise and motorized activity in areas where this is the general expectation.

Alternative 2 will manage foot travel by designating four nonmotorized trails. Formal, maintained hiking trails will provide sustainable routes of travel, with easy access from the Denali Highway and developed facilities. Duplicate and parallel routes will be reduced, enhancing the natural and primitive character of the river corridor. Possible adverse effects from the designation of nonmotorized trails may include increased use levels in these areas, reducing the remote nature and sense of adventure for some people if use levels exceed their expectations. Social trails associated with designated river campsites will be monitored and management actions will help to limit the proliferation of additional social trails at river campsites, having a beneficial effect on natural character and primitive recreational experiences.

Alternative 3:

Alternative 3 will designate four additional OHV trails. The amount of area affected by the four unauthorized trails totals approximately 2 acres (1 acre each in RMZs 2 and 5). OHVs would be allowed to travel off designated trails for game retrieval, and there would be no GVW limit on OHV use. Allowing OHV use on more trails would adversely impact natural and primitive character through increased trail activity. Anticipated increases in OHV use of 5-10% during the life of the plan would compound these effects, particularly on the Top of the World Trail in RMZ 5, where most of the projected increased OHV use is likely to occur.

Alternative 3 does not restrict motorized boating use. Unlimited motorized boating throughout the river corridor will impact the natural and primitive character of the river corridor, particularly in RMZs 1 and 4. Nonmotorized boaters seeking natural quiet and solitude will become displaced, and the available diversity of recreational experiences will be less than Alternatives 2 and 4. Expected increases in both nonmotorized and motorized boating use during the life of the plan, while relatively minor, would further increase these social conflict issues.

Under Alternative 3, airplane landings will not be restricted. Although aircraft landings are expected to remain stable throughout the life of the plan, short-term adverse effects on users seeking solitude, natural quiet, and nonmotorized primitive experiences may occur, temporarily reducing the diversity of recreational experiences within the river corridor for these users.

Effects caused by foot travel will be the same as Alternative 2, except that social trails associated with designated river campsites would increase because management actions to limit social trail development would not be implemented unless resource damage is occurring. This would lead to increased adverse impacts to natural and primitive character when compared to Alternatives 2 and 4.

Alternative 4:

OHV proposals in Alternative 4 are the same as Alternative 2, except that OHV users would be required to park out of sight of the river. This would maintain a more primitive experience along the lower river corridor, benefiting nonmotorized users who are seeking solitude and wilderness characteristics. Adverse effects would include the potential for increased impacts to vegetation and soils where OHVs would be required to park off the trail, particularly in designated river campsites.

Alternative 4 proposes the greatest restrictions on motorized boating within all RMZs by limiting certain types of uses altogether, and by establishing horsepower restrictions. Some motorized boaters would feel excluded from the ability to have any positive recreational experiences because of motorized boating restrictions proposed under this alternative. Conversely, other motorized boaters might feel that the quality of their experience would improve because of the elimination of airboats, hovercraft, and jetskis, and through additional horsepower restrictions. Nonmotorized boaters would realize their full expectations regarding natural quiet and solitude in RMZs 1 and 4.

Prohibiting airplane landings for both recreational and subsistence purposes will limit the ability to access these areas, particularly during hunting season. This would result in a loss of recreational diversity within the DWSR corridor. Users seeking natural quiet, solitude, and a nonmotorized primitive experience would fully realize their expectations with regards to airplane landings within the river corridor. Airplane landings in RMZ 3 have never been observed by BLM due to the lack of suitable landing areas, therefore there would be no effect.

Alternative 4 proposes the designation of only one nonmotorized trail. This would help to maintain a more primitive experience, benefiting users who are seeking solitude and remoteness, but the overall footprint of trail impact areas would increase as use levels increase, adversely affecting natural and primitive character. Effects from the management of social trails in designated river campsites would be the same as Alternative 2.

4.3.11 Vegetation

4.3.11.1 Effects of OHV management decisions on vegetative resources.

Alternative 1 (No Action Alternative):

In Alternative 1, the only designated OHV trails within the river corridor are the Top of the World and Rainy Creek Trails. All other OHV trails **currently present** within the river corridor are unauthorized trails. The use of OHVs on unauthorized trails can adversely impact pristine upland and riparian vegetation. Impacts may include crushing, breaking, and trampling of vegetation, reducing the capacity to naturally regenerate, increased soil compaction that will stress plants and associated roots, resulting in impaired growth and/or die back. **Unauthorized trails under this alternative would continue to exhibit degradation of vegetative resources from continued use and proliferation.** Erosion, especially on steep slopes, can prevent the natural reestablishment of vegetation. OHV use on unauthorized trails can also disturb natural conditions in soils and vegetation, facilitating the introduction and spread of noxious weeds. OHVs not only create the disturbance conditions favoring the introduction of non-native invasive weeds, they also act as a vector to carry and spread the weed seeds themselves. **A 2008/09 Non-native plant survey of established campsites, trail crossings and river access/egress points determined that the DWSR corridor remains largely weed free, and the few infestations that exist are discrete and belong to weakly invasive species, or species that are widespread in Alaska for which eradication is no longer a realistic goal.**

Alternatives 2 (Proposed Action) and 4:

Alternatives 2 and 4 propose the closure of four unauthorized OHV trails, which will protect vegetative resources from additional adverse impacts, while allowing these unauthorized trails to rehabilitate to their natural condition **by facilitating re-growth and recovery.** The amount of area that would be protected by closing four unauthorized trails totals approximately 2 acres (1 acre each in RMZs 2 and 5). OHV limitations of 2000 lbs. GVW and the requirement to stay on designated OHV trails will further limit

adverse impacts to vegetation and potentially limit the spread of invasive weeds to existing authorized trails. Adverse impacts to soils under this alternative would be less than under Alternatives 1 and 3.

Alternative 3:

Alternative 3 provides increased opportunities for OHV use by designating four additional OHV trails, not establishing GVW limitations, and allowing travel off designated trails for game retrieval. The amount of area affected by the four unauthorized trails totals approximately 2 acres (1 acre each in RMZs 2 and 5). Effects to vegetation would be similar to Alternative 1. This alternative would result in the continued proliferation of unauthorized OHV trails, and has the highest potential for the spread of invasive weeds. Since there would be more trails open to OHV use and travel would be allowed off designated trails for game retrieval, it is anticipated there would be the greatest adverse impacts to vegetation under this alternative. Anticipated increases in OHV use of 5-10% during the life of the plan would compound these effects, particularly on the Top of the World Trail in RMZ 5, where most of the projected increased OHV use is likely to occur.

4.3.11.2 Effects of campsite management decisions on vegetative resources.

Alternative 1 (No Action Alternative):

Alternative 1 would not establish group size limitations or river campsite management actions, and the potential would be high for adverse impacts to vegetative resources. Impacts may include crushing, breaking, and trampling of vegetation, reducing the capacity to naturally regenerate, as well as increased soil compaction that will stress plants and associated roots, resulting in impaired growth and/or die back. The average group size for the Delta River through-trip is 4 people; Upper Tangles is 3 people. Even with the current average group sizes being relatively low, vegetation impacts at campsites are evident.

Alternative 2 (Proposed Action):

Under Alternative 2, actions identified for river campsite management and a group size limitation (10) would minimize the potential for light and moderate impacted sites to become heavy impacted sites, and would provide actions to reduce adverse impacts to vegetation described in Alternative 1. During the life of the plan, a group size limitation of 10 people would exclude approximately 6 larger groups annually, reducing the potential for adverse vegetation impacts that are associated with campsite expansion as a result of large groups. The potential for impacts to vegetation would be less than Alternative 3, but slightly higher than Alternative 4, due to differences in campsite management actions (creation of additional campsites) and a larger group size limitation in this alternative.

Alternative 3:

Alternative 3 would also identify management actions for dispersed river campsites and a group size limitation, but the group size would be larger (12) and campsite management actions would allow for the creation of additional campsites. Existing heavy and moderate impact sites would be hardened and expanded to accommodate larger groups and increased use. Light and moderate impact sites may develop into heavy impact sites, leading to increased adverse vegetation impacts (described in Alternative 1) as a result of larger groups and the creation of additional campsites. During the life of the plan, a group size limitation of 12 people would exclude approximately 3 larger groups annually, resulting in a higher potential for adverse vegetation impacts when compared to Alternatives 2 and 4 that have a smaller group size limitation.

Alternative 4:

Under Alternative 4, actions identified for dispersed river campsite management and a smaller group size limitation (8) would minimize the potential for light and moderate impacted sites to become heavy impacted sites, and would provide actions to reduce adverse impacts to vegetation described in Alternative 1. Additional campsites would not be created under this alternative, and associated vegetation impacts, combined with the potential for rehabilitation or closure of heavy use campsites, would have a beneficial effect. During the life of the plan, a group size limitation of 8 people would exclude approximately 12 larger groups annually, having the highest potential among all alternatives to

reduce adverse vegetation impacts associated with campsite expansion as a result of large groups. This alternative would have the least adverse impacts to vegetative resources of all alternatives.

4.3.11.3 Effects of decisions regarding the use of firewood gathering on vegetative resources.

Alternatives 1 (No Action Alternative) and 3:

Alternatives 1 and 3 contain no actions to manage the use of vegetative resources for campsite firewood. The cutting of standing dead trees and the use of chainsaws would continue to be allowed, leading to an increase in number of visible tree stumps and a gradual reduction of vegetative canopy cover immediately adjacent to river campsites.

Alternative 2 (Proposed Action):

Alternative 2 would require the use of only dead and down trees for campsite fires and the use of chainsaws would be prohibited for campsite firewood in RMZs 1, 2, and 4. This would likely reduce the number of visible tree stumps adjacent to river campsites, reduce adverse effects to natural quiet, and maintain the over-story vegetative cover immediately adjacent to river campsites. The use of chainsaws would be permitted in RMZ 3 to cut firewood brought from outside the river corridor. This may adversely affect natural quiet for some users, although unlikely given the frequent use of generators and motorized vehicles within the developed facilities. The use of chainsaws in RMZ 5 would be allowed for the cutting of dead and down wood and standing dead at least 200 feet from river's edge. This would benefit users in RMZ 5 by having more access to campsite firewood, but would likely have an adverse effect over time as increased visitor use may ultimately reduce the availability of dead and down wood, leading to increased cutting of live trees once dead and down wood supplies have been exhausted.

Alternative 4:

Alternatives 4 would prohibit the use of chainsaws within the developed facilities in RMZ 3. This would likely benefit users by reducing adverse effects to natural quiet, but would have no effects on visible stumps and vegetative cover immediately adjacent to the developed facilities because of the lack of existing vegetation within RMZ 3. Alternative 4 would require the use of only dead and down trees for campsite fires and the use of chainsaws would be prohibited for campsite firewood in RMZ's 1, 2, 4, and 5. This would likely reduce the number of visible tree stumps adjacent to river campsites, reduce adverse effects to natural quiet, and maintain the over story vegetative cover immediately adjacent to river campsites.

4.3.12 Water Quality

4.3.12.1 Effects to water quality from potential contaminants as a result of motorized boating and human waste disposal decisions.

All Alternatives:

Effects to water quality from motorized boating are difficult to quantify because of the relatively low use levels in the DWSR corridor. Numerous studies have documented the effects of outboard motor exhaust and related pollution from fuel leakage, although most apply to contained water environments, (e.g. lakes and marinas) and were conducted in controlled experimental settings. Considerably less work has examined the impacts of these pollutants in rivers. Even in existing, "closed system" studies, toxic effects on aquatic organisms are generally minimal because 1) the amount of pollution is often small compared to the volume of water; and 2) most hydrocarbons are volatile and quickly disperse (The Effects of Motorized Watercraft on Aquatic Ecosystems, Asplund, 2000). Actual hydrocarbon levels in river systems such as the Delta River depend on many factors: number of powerboats, locations used, timing of use, engine types, engine sizes, engine speeds, river flow rates during usage, etc.

However, a study in Alaska (Kenai River Hydrocarbon Assessment Final Report, 2004) found that powerboat releases caused petroleum hydrocarbons in the Kenai River to approach, and sometimes exceed, state water quality standards. Measureable petroleum hydrocarbons in the Kenai River were

observed whenever over 100 powerboats were present, and levels approached or exceeded state water quality standards when approximately 400 motorboats were present. In documented overflights between 1995 and 2010, the highest number of motorized craft in the DWSR corridor on any recorded day was 22; even on the busiest days (holiday weekends, hunting season), the number of motorized craft rarely exceeds 8-10 boats.

Periodic water quality assessments have been conducted within the river corridor and current levels of motorized boating have not resulted in detectable impacts to water quality. Figure 7 in Chapter 3 shows that the highest average number of motorized craft per day to be 3.4 craft, far below peak use levels documented in the "Kenai River Hydrocarbon Assessment Final Report". Motorized boating use levels for 2009 were estimated at approximately 968 users, or 387 craft (average group size of 2.5 people per group obtained from voluntary registration data). Anticipated increases in motorized boating use during the life of the plan are estimated at approximately 1-5% and would not likely result in adverse impacts to water quality, although periodic assessments and continued recreational monitoring proposed in Alternative 2 would be beneficial to ensure that these planning assumptions have not been exceeded.

Under Alternatives 1 and 3, motorized boating would only be limited by natural constraints within the river (rock gardens, low water, narrow and shallow channels) and by continuing the current BLM recommendation of a 15 horsepower limitation on the Tangle Lakes, likely producing similar motorized boating use levels, although not anticipated to be enough to adversely affect water quality. Alternative 2 proposes to manage RMZs 1 and 4 for nonmotorized experiences, likely resulting in less motorized boating use than Alternatives 1 and 3. Compared to the other alternatives, petroleum hydrocarbons released into the water and associated adverse effects would be less under Alternative 2 than Alternatives 1 and 3, but more than Alternative 4. Alternative 4 proposes the greatest restrictions on motorized boating by limiting certain types of uses altogether, and by establishing seasonal limitations and horsepower restrictions. As a result, petroleum hydrocarbons released into the water would be less under Alternative 4 than all other alternatives.

Alternative 1 (No Action Alternative):

Human waste impacts would be largest under Alternative 1. Use increases are likely to be slightly higher than all other alternatives due to the absence of user capacity limitations and group size limitations. The potential for increased human waste and associated water quality impacts (presence of fecal coliform) is higher, although still expected to remain within state water quality standards.

Alternative 2 (Proposed Action):

Alternative 2 would set standards for human waste management at designated campsites, based on user tolerances. When standards are exceeded, management actions would be implemented, including increased education, requiring guides to carry portable toilets, and ultimately requiring all users to carry portable toilets. Beneficial effects of this proposal would be a decrease in the amount of improperly disposed human waste. Consequently, the potential for human waste (fecal coliform) to enter the river and adversely affect water quality would decrease, thereby benefitting water quality.

Alternative 3:

Alternative 3 would also set standards for human waste management at designated campsites, but does not require river users to utilize portable toilet systems if standards are being exceeded. In addition to one existing outhouse, another outhouse would be installed in RMZ 2. As a result, the occurrence of improperly disposed human waste on the river would be higher than Alternatives 2 and 4, especially in areas without any outhouses nearby.

Alternative 4:

Effects of human waste disposal are generally the same as Alternative 2, except that portable toilets would be required sooner if standards are exceeded. Relatively, the potential for adverse effects to water quality resulting from contaminants would be less under this alternative than all other alternatives.

4.3.12.2 Effects to water quality from potential sedimentation sources including designated campsites, OHV trails and OHV river crossings.

Alternative 1 (No Action Alternative):

Erosion and sedimentation contributions from campsites would be greatest under this alternative (which has no substantial management actions to limit those impacts). In addition, OHV crossings would continue to proliferate, with substantial potential for point source sedimentation during runoff or heavy rainfall. These sediment sources could adversely impact water quality, at least in localized parts of the river (e.g. Top of the World Trail river crossing).

Alternative 2 (Proposed Action):

Alternative 2 manages campsites based on levels of impact at campsites. Over time, these management actions would help to prevent active erosion and sedimentation into the river caused by bank trampling, benefiting water quality. This alternative develops a management strategy for OHV trails and OHV river crossings. Crossings would be permitted based on the location of the crossing in a “hardened” area that would help to minimize sedimentation. The requirement for OHVs to stay on designated trails and a 2000 lb. GVW limitation would help to minimize unauthorized trail development and the potential for sedimentation from poorly located trails and larger vehicles accessing the river column. Four unauthorized trails would be closed and allowed to revegetate. The amount of area that would be protected by closing four unauthorized trails totals approximately 2 acres (1 acre each in RMZs 2 and 5). These actions would help to reduce sedimentation into the river, thereby benefiting water quality.

Alternative 3:

Alternative 3 prescribes campsite management actions that would allow for the creation of additional campsites and the proposed group size limit is larger (12) than Alternatives 2 and 4. Existing heavy and moderate impact sites would be hardened and expanded to accommodate larger groups and increased use. These actions would result in a higher potential for bank trampling and point source sedimentation, thereby increasing potential adverse effects to water quality. Four additional trails in the DWSR corridor would be open for OHV use, with no GVW restrictions and an allowance to travel off designated trails for game retrieval. Under this alternative, it is likely that unauthorized trail proliferation would continue to occur, including unauthorized river crossings, with a high potential for point source sedimentation during runoff or heavy rainfall. The absence of GVW restrictions would allow larger vehicles to cross through the clear water river corridor, increasing sedimentation. These sediment sources would have a high potential to adversely impact water quality. Anticipated increases in OHV use of 5-10% during the life of the plan would compound these effects, particularly on the Top of the World Trail in RMZ 5, where most of the projected increased OHV use is likely to occur.

Alternative 4:

Alternative 4 prescribes many of the same campsite rehabilitation measures as Alternative 2, except that some heavy use sites would potentially be closed, and group sizes would be smaller (8). Closure of heavy use sites and smaller group sizes would minimize sedimentation caused by bank trampling. These actions would help to reduce sedimentation into the river, thereby benefiting water quality. Effects related to OHVs would be the same as Alternative 2.

4.3.13 Wilderness Characteristics

4.3.13.1 Effects of management actions on wilderness characteristics, including naturalness, solitude, and primitive and unconfined recreational opportunities that are found within the DWSR corridor.

Alternative 1 (No Action Alternative):

Under Alternative 1, visitor use within the river corridor would be allowed to increase without any user capacity or group size limitations. Increased visitor use would lead to additional resource impacts

throughout the river corridor, including vegetation trampling, bare ground disturbance, social trails, and satellite sites, adversely impacting naturalness and opportunities for solitude. Social conflicts related to increased visitor use would persist, especially between motorized and nonmotorized users, and opportunities for solitude and primitive and unconfined recreational experiences would decrease as visitor use increases over time. Under Alternative 1, the absence of motorized use restrictions, including unrestricted motorized boating and airplane landings, would adversely affect opportunities for solitude and unconfined recreational experiences. OHV use would continue on unauthorized trails, and users who are seeking areas with wilderness characteristics would likely be displaced to other areas.

Alternative 2 (Proposed Action):

The proposed management actions in Alternative 2 would seek to preserve two specific areas within the DWSR corridor that would be managed for a primitive and semiprimitive nonmotorized experience. RMZs 1 and 4 have been identified as possessing wilderness characteristics, and a targeted nonmotorized management approach in these RMZs would help to preserve the identified wilderness characteristics. The remaining RMZs would be managed for different activities, experiences, and benefits, providing a greater diversity of recreational experiences throughout the river corridor. Both motorized and nonmotorized users would have specific areas targeted for these different opportunities, reducing social conflicts associated with this user conflict pattern.

A group size limitation and encounter standards to address user capacity would help to ensure that visitor use does not exceed tolerable limits, allowing for continued opportunities for solitude and a primitive unconfined recreational experience in RMZs 1 and 4. Chainsaw use would not be allowed in RMZs 1 and 4, where expectations for solitude are the highest among all management zones. Unauthorized OHV trails would be monitored, and if discovered, closed and rehabilitated to preserve the high level of naturalness that is present in RMZs 1 and 4. Public use cabins would not be considered anywhere within the river corridor, and limited facility and portage trail development would harmonize with the natural surroundings. As a result, the proposed implementation actions in Alternative 2 would benefit the wilderness characteristics identified in RMZs 1 and 4.

Alternative 3:

Under Alternative 3, the adverse effects to wilderness characteristics in RMZs 1 and 4 are the greatest, primarily due to the absence of OHV use restrictions. OHV's would be allowed to operate off designated trails and there would be no weight restrictions for OHV use. Unrestricted OHV use would adversely affect opportunities for solitude and unconfined recreational experiences in these areas. Naturalness would be adversely impacted by unrestricted OHV use as OHV trails would likely be pioneered into RMZs 1 and 4 from adjacent management zones, negatively impacting vegetation and soils. Users who are expecting to find wilderness characteristics in RMZs 1 and 4 would likely be displaced to other areas.

Group sizes would be the largest under this alternative, and encounter standards would be relaxed to a 40% encounter rate, allowing for higher encounter levels before management actions to address user capacity are initiated. Anticipated increases in visitor use during the life of the plan, combined with increased marketing of the area to a wider audience, would further intensify this effect, particularly in RMZs 1 and 4, thereby reducing opportunities for solitude. There would be more facility development in RMZs 1 and 4 under Alternative 3, including developed day use facilities, public use cabins, new campsites, and increased development at the river and lake portages. Increased facility development would adversely affect naturalness and solitude when compared to all other alternatives. Chainsaw use would be allowed in Alternative 3 in RMZs 1 and 4, adversely impacting solitude.

Alternative 4:

The proposed implementation actions in Alternative 4 would provide the most beneficial effects to the identified wilderness characteristics in RMZs 1 and 4 when compared to all other alternatives. Motorized boating, airplane landings, and OHV limitations are the most restrictive in Alternative 4; consequently, Alternative 4 would preserve more opportunities for solitude and primitive and unconfined recreational experiences in RMZs 1 and 4 when compared to all other alternatives. Group sizes would be the smallest under this alternative and the user capacity encounter standard would be the most restrictive at a 10% encounter rate, initiating management actions that would address user capacity sooner than the

other alternatives. Chainsaw use would not be allowed within RMZs 1 and 4, where expectations for solitude are the highest among all management zones. OHVs would not be allowed to park within sight of the river, and unauthorized OHV trails would be monitored, and if discovered, closed and rehabilitated to preserve the high level of naturalness that is present in RMZs 1 and 4. Public use cabins would not be considered anywhere within the river corridor, and all existing facility developments in RMZs 1 and 4 would be removed, thereby increasing naturalness.

4.3.14 Wildlife

4.3.14.1 Effects of OHV travel management decisions to moose and caribou.

All Alternatives:

OHV restrictions within the Tangle Lakes Archaeological District (TLAD) limit OHV travel to designated trails. Approximately 45% of the planning area is located within the TLAD; this portion of the TLAD has no identified designated OHV trails, therefore there would be no effect to moose and caribou from OHV use within this portion of TLAD within the river corridor.

Alternative 1 (No Action Alternative):

Under Alternative 1, OHVs would still be allowed to travel off designated trails for game retrieval outside of the TLAD. Approximately 18,800 acres (55%) of the planning area is affected, most of which is in RMZ 5 (16,065 acres). As a result, unauthorized trail proliferation may continue in these areas outside of the TLAD. The effects of OHV use on vegetation and soils increase with the amount of use, especially on active trails; <50 passes per year causes loss of vegetation and soils subsidence (Happe et. al. 1998). Two authorized, designated trails currently access RMZ 5. These trails are the Top of the World Trail and Rainy Creek Trail. The Top of the World Trail accesses the southern portion of RMZ 5, while the Rainy Creek Trail accesses the middle portion of RMZ 5. The northern half of RMZ 5 parallels the Richardson Highway for approximately 27 miles; access to this area could be directly from the highway. Impacts of OHV use to moose and caribou in RMZ 5 include potential habitat fragmentation, disruption of their activity, and disturbance during movement from one area to another. Wildlife utilizes different areas of the DWSR as refugia. Increased disturbance from OHV use may result in site abandonment and increased stress. At current use levels this impact may be negligible, but may increase with additional OHV use on unauthorized trails.

Alternatives 2 (Proposed Action) and 4:

Under Alternatives 2 and 4, four unauthorized OHV trails will be closed and OHVs will not be allowed to travel off designated trails for game retrieval, except during periods of adequate snow cover. The closure of unauthorized trails and the requirement to stay on designated trails may reduce potential habitat fragmentation in RMZs 4 and 5. These management actions would also help to mitigate possible adverse effects caused by anticipated increased OHV use during the life of the plan. In the TLAD, where RMZs 1, 2, 3, and portions of 4 are located, OHVs are already limited to designated trails due to archaeological resource impacts. Within these RMZs, there are no designated OHV trails, and impacts to moose and caribou will have no effect.

Alternative 3:

Under Alternative 3, four additional trails would be designated for OHV use and OHVs would be allowed to travel off designated trails for game retrieval. Under this alternative, unauthorized trail proliferation would continue, increasing the potential for habitat fragmentation. At current use levels this impact is negligible, but may increase with additional OHV use on unauthorized trails. Anticipated increases in OHV use of 5-10% during the life of the plan would compound these effects, particularly on the Top of the World Trail in RMZ 5, where most of the projected increased OHV use is likely to occur.

4.3.14.2 Effects of motorized boating and airplane landing decisions to land birds and waterfowl.

Alternatives 1 (No Action Alternative) and 3:

In general, research has shown the potential for prolonged disturbances to adversely impact nesting or fledgling success of a variety of land birds. Waterfowl and land birds are susceptible to disturbances from human activity, and prolonged disturbance can lead to nest abandonment. The DWSR corridor provides excellent nesting habitat, especially in RMZs 1 and 4 because of the abundance of small lakes, emergent vegetation and low visitor use levels. Bald eagle nest monitoring shows a stable trend in nesting sites throughout the DWSR watershed. Trumpeter swans, considered a sensitive species by BLM, and other waterfowl are known to nest in the Tangle Lakes area.

Current disturbance levels from motorized boating and airplane landings may not have adverse effects on these birds. However, population increase, technological advancements, economic pressure, and other societal changes may result in increased river use. Increased motorized boating and airplane landings may increase the number and the quality of interactions between humans and land birds and waterfowl. Wakes from motorized boats can disturb shore nesting birds. Noise from motorized boats and airplanes may also disturb nesting birds. Because Alternatives 1 and 3 have no limitations on motorized boating and airplane landings, the potential exists for increased disturbance to nesting waterfowl and land birds with increased human visitation, especially in RMZ 1 in the Upper Tangles where large concentrations of waterfowl and trumpeter swans are known to nest.

Alternative 2 (Proposed Action):

Alternative 2 would potentially benefit nesting land birds and waterfowl by managing for nonmotorized experiences in RMZs 1 and 4. Within these RMZ, trumpeter swans and other waterfowl are known to nest. Motorized boating creates larger wakes and more noise than nonmotorized boating, potentially causing nest abandonment and disruption of feeding and fledging activities. Managing for nonmotorized experiences and discouraging motorized boating and airplane landings may help to lessen potential disturbances to young chicks as they emerge from the nest.

Current recreational uses do not show an apparent negative impact on nesting waterfowl. Even with the projected increase in recreational use, it is still unlikely to have a significant effect on nesting waterfowl. However, as a scenario, if we saw order of magnitude increases in motorized boating and floatplane landings in RMZ 1, we would expect nest disturbance to be of such a magnitude that we would observe a marked decrease in nesting pairs or in productivity of trumpeter swans and other waterfowl. Periodic assessments of wildlife resources would be performed in RMZs 1 and 4 to determine if motorized boating and airplane landings are detrimentally affecting wildlife in this area. Upon a finding that wildlife is being adversely affected, an ANILCA closure procedure would be considered to prohibit motorized boating and airplane landings in RMZs 1 and 4. Although this increased use is expected to be minor, monitoring of motorized boating and floatplane landings use will allow BLM to protect wildlife resources while refining use estimates.

Alternative 4:

Alternative 4 proposes the greatest restrictions on motorized boating and airplane landings by limiting certain types of uses altogether, and by establishing seasonal limitations and horsepower restrictions on these activities. Consequently, Alternative 4 would do the most to reduce potential disturbances to land bird and waterfowl nesting activity when compared to all other alternatives. Disturbance of nesting waterfowl from large wakes and loud noise will be avoided. Nest abandonment from these disturbances will likely be minimized.

4.3.14.3 Effects of recreation management decisions on human and bear interactions.

Alternative 1 (No Action Alternative):

Relationships between visitor use levels and human-bear encounters are unknown, but may exist. Human-bear interactions, when involving groups of three or more humans, generally result in fewer injuries and fatalities. This is because bears are more likely to flee when they encounter a large group of people. However, human-bear encounters are unpredictable and the results of these encounters can depend on several factors such as whether a sow and her cubs are involved, or whether a bear was defending a kill. In developed sites, bears are less likely to be seen unless attracted to trash and other human waste. Increased recreational use of the river without a concomitant increase in human waste and litter cleanup patrols in Alternative 1 may result in increased bear visitations in campsites.

Alternative 2 (Proposed Action):

Alternative 2 would implement proactive measures to decrease human-bear encounters by emphasizing education (Leave No Trace, bear safety) and awareness. This alternative proposes potential use limits and management actions for litter and human waste. Human-bear interactions, when involving groups of three or more humans, generally result in fewer injuries and fatalities. In developed sites, bears are less likely to be seen unless attracted to trash and other human waste. Group size limitations, more education, and management actions to control human waste may reduce bear visitations in campsites along the DWSR.

Alternative 3

Alternative 3 also emphasizes increased education, but this beneficial effect could be offset by the potential for increased recreational users on the river, larger group sizes, and the development of additional campsites, thus increasing the likelihood of adverse human-bear encounters.

Alternative 4

Under Alternative 4, education regarding minimum impact camping and bear safety would be similar to Alternative 2; however, through the potential limitation of total users on the river and smaller group sizes, the probability for negative human-bear encounters would be less than all other alternatives.

4.3.14.4 Effects to wildlife resources from identifying ORVs.

Alternative 1 (No Action Alternative):

ANILCA did not identify ORVs for the DWSR. It is a purpose of this planning effort to do so. The specific effects of not identifying ORVs to wildlife resources are difficult to quantify, but would be primarily the same as the effects described for Alternative 1 throughout Chapter 4.3.14.

Alternatives 2 (Proposed Action), 3 and 4:

Wildlife is an important part of the river's ecosystem. Adopting wildlife as an ORV for the *Scenic* river classification segment will provide focused management and protection of the river's immediate environments, and will positively impact wildlife resources because of the added protections provided by the WSRA.

4.4 Cumulative Impacts

The Council for Environmental Quality defines cumulative impacts as “ the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such actions” (BLM NEPA Handbook H-1790-1). The goal of identifying potential cumulative effects is to provide for informed decisions that consider the total effects (direct, indirect, and cumulative) of alternative management actions. This section characterizes the incremental cumulative effects that potentially arise from external factors, in combination with the direct and indirect effects.

4.4.1 Climate Change

Past, present, and reasonably foreseeable future actions that incrementally contribute to the emission of greenhouse gases within the planning area are produced by the operation of gasoline powered engines. Motorized recreational activities, including the use of OHVs, snowmachines, motorized watercraft, vehicles, aircraft, and generators contribute minor levels of carbon dioxide (CO₂) to the atmosphere. Mining operations adjacent to the river corridor would also contribute to the emission of greenhouse gases from power and fuel consumption related to mineral development activities.

Cumulatively, the magnitude of potential greenhouse gas emissions contributed by mineral exploration activities and from the proposed recreational activities in all alternatives would be minor when compared to total greenhouse gas contributions worldwide. It is nearly impossible to estimate the local contribution of greenhouse gas emissions from these activities as changing science regarding climate change and global warming is still being debated. Even though the anticipated emissions of greenhouse gases from the proposed activities are projected to be relatively minor on both a local and global scale, the BLM will need to be particularly sensitive to changes in vegetation, riparian areas, and areas underlain by permafrost, and how these changes affect wildlife habitat. The BLM will also need to be aware of and adjust to changing permafrost and soils conditions within the river corridor through site specific considerations primarily in trails management, but also for any ground disturbing activity that may be proposed within the river corridor.

4.4.2 Cultural Resources

Cumulative actions that most affect cultural resources are related to past and potential future access activities associated with mining development and OHV use, within and adjacent to the DWSR corridor. Past human-induced erosion has included damage to sites covered by thin and fragile layers of windblown sediments. Current or increased levels of OHV use, combined with potential mining development access, may lead to erosion and soil impacts that could impact both known and unknown archaeological sites. One archaeological site at Mile 22 Denali Highway North is currently being impacted by unauthorized OHV use. Two archaeological sites along the Top of the World Trail have been impacted in the past by heavy equipment for the purposes of mining access. Additional OHV use is likely to continue erosion along these trails. This would reduce the potential to yield information that is significant to our understanding of the region's prehistory, and may degrade any eligibility these sites have for the National Register of Historic Places. It is also possible that previously recorded and undiscovered archaeological sites in other portions of the river may be similarly adversely impacted through past and future OHV use, combined with natural erosion processes.

In Alternatives 2 and 4, the closure of unauthorized OHV trails that are currently impacting three known archaeological sites, combined with the past, present and future actions of mining development access and OHV use, would have the least potential of the alternatives to adversely impact these sites and other unknown archaeological sites. This would increase the potential of yielding information significant to our understanding of the region's prehistory and eligibility these sites have for the National Register of Historic Places.

In Alternative 3, the designation of additional OHV trails in areas having known archaeological sites, combined with the past, present and future actions of mining development access and OHV use, has more potential than Alternatives 2 and 4 to adversely impact these sites and other unknown archaeological sites. This would reduce the potential to yield information significant to our understanding

of the region's prehistory and degrade any eligibility these sites have for the National Register of Historic Places.

4.4.3 Fisheries

Past, present, and future actions that have affected aquatic resources and habitat quality throughout the DWSR corridor are primarily related to recreation and placer mining activities. The demand for fisheries resources will increase during the life of the plan, resulting in more pressure on fish populations and fish habitats in the DWSR corridor. Aquatic resource disturbance from mining activities will vary depending on mine design, construction of roads, power line corridors, selection of tailing disposal method, and other factors. Most of these disturbances would occur on State lands, but possibly within the adjacent Delta River watershed.

Future activities associated with mineral development may have adverse effects on drainage patterns, water quality, and riparian vegetation, although this would depend upon the location and area of activity. Disturbance and displacement due to mineral development could be long-term. The removal of streamside riparian-wetland vegetation during mining would result in a loss or degradation of aquatic habitat until proper functioning condition could be reestablished. In general, the time required for riparian-wetland areas to attain proper functioning condition would be dictated by natural processes and may require decades to centuries before it approximates the structure and function of the original aquatic habitat (NCSU 1998; BLM and Montana Dept. of Environ. Quality 1996; BLM 1988).

If road density increases commensurate with mineral development, adverse cumulative impacts may affect fish migration and bedload movement. Bridges, culverts, and low-flow crossings are integral features to road development associated with surface mining. These features can also interfere with stream bedload (substrate) movement, migrations to spawning, feeding, rearing, and overwintering sites if improperly designed. Current concerns related to surface mining and road placement include diverting or eliminating flow from small tributaries that connect lakes and rivers. Fish species that are present in the river that move between these habitat types are vulnerable to impact.

The cumulative impact of unauthorized OHV trails and unrestricted motorized boating activities under Alternatives 1 and 3 may change stream morphology, cause riparian loss or damage, and increase sedimentation into streams. Recreation and travel management actions under Alternatives 1 and 3, combined with past, present, and future actions, may have an overall adverse cumulative effect on fish and fish habitat within the DWSR corridor, although these effects would be localized and unlikely to extend to the regional level.

Under Alternatives 2 and 4, OHV use would be limited to designated trails, unauthorized trails would be closed and rehabilitated, and the use of motorized boats would either be discouraged (Alternative 2) or limited altogether (Alternative 4), contributing to a reduction in cumulative adverse effects to fish habitat through alterations in drainage patterns, degradation of water quality, and riparian loss and/or damage, especially in heavy use areas. Therefore, adoption of the management actions under these alternatives, combined with past, present, and future actions, may have an overall beneficial effect on fish and fish habitat within the DNWSR corridor.

4.4.4 Lands and Realty

Designated trails (Top of the World and Rainy Creek Trails) within the river corridor provide access to state lands and mining operations that are located adjacent to the river corridor. Authorized rights-of-way include the PLO 5150 Transportation and Utility Corridor, which is primarily identified with the Trans Alaska Oil Pipeline System (TAPS), but is also reserved as a utility and transportation corridor for future pipeline or electrical transmission needs. Future development proposals on adjacent State lands would likely result in additional requests for land use authorizations for facilities such as roads, utilities, and operation sites related to mineral development. This depends entirely on the results of exploratory drilling, which are ongoing at this time. Increased mineral development would likely result in new requests for additional mining access routes across the river corridor. Additional rights-of-way may also be requested for the possible development of a natural gas pipeline spur from Delta Junction to Glennallen.

Under all action alternatives, these requests would only be authorized after a thorough review and conformance with Title XI of ANILCA, which provides procedural requirements for new transportation and utility systems within Conservation System Units. This review would mitigate potential adverse effects from authorizing future transportation and utility systems proposals within the DWSR corridor. Therefore, there would be no cumulative effects.

4.4.5 Natural Quiet and Natural Sounds

Past, present, and reasonably foreseeable future actions that may affect natural quiet and natural sounds include recreation development projects, mineral development adjacent to the river corridor, transportation and utility development projects (Alaska Natural Gas Pipeline), and overflights associated with mineral development and military flight operations.

Cumulative adverse impacts to natural quiet and natural sounds would be greatest under Alternatives 1 and 3. RMZs 1 and 4 would not be managed to promote nonmotorized uses, adversely impacting natural quiet and natural sounds. Short term loss of the area's naturalness and solitude from impacts related to motorized activities would likely increase. Alternatives 2 and 4 would be managed to promote nonmotorized recreational opportunities in RMZs 1 and 4, contributing to the preservation of natural quiet and natural sounds, while also providing for a greater diversity of nonmotorized recreational experiences.

4.4.6 Recreation Resources

The DWSR corridor currently provides a diversity of recreation opportunities, conditions that are expected to continue over the life of the plan, regardless of the alternative selected. Historically, the major social conflict issue affecting recreational experiences within the DWSR corridor has been motorized versus nonmotorized uses. As the overall population in the State of Alaska continues to increase, recreation use is expected to increase, especially in road accessible areas like the DWSR corridor. Generally, recreation settings would shift to less primitive recreation classifications with increasing development and desire for motorized access. Future actions that may affect recreation resources include anticipated increases in recreational demand, mineral development, and transportation and utility corridor development projects. All of these reasonably foreseeable future actions have the potential to change recreation settings, recreation access, and availability of recreation resources.

Cumulative effects to recreation resources would be greatest under Alternative 1, which does not have any management actions to address recreational impacts. Loss of the area's naturalness from unmanaged recreational impacts, combined with the potential for increased access from the development of transportation and utility corridors, would adversely impact the natural and primitive character of the river corridor. Alternative 3 allows for higher levels of recreational use and impact levels than Alternative 2 and 4, and when combined with the potential for increased access from the development of transportation and utility corridors, adverse cumulative effects would be greater than Alternatives 2 and 4, but less than Alternative 1. Alternatives 2 and 4 provide a more restrictive approach to managing levels of recreational use and impact levels, and when considered with past, present and reasonably foreseeable actions, Alternatives 2 and 4 would result in reduced adverse cumulative impacts to recreation resources.

4.4.7 Scenic Resources

Past and present actions impacting scenic resources are primarily related to the unauthorized development and proliferation of motorized and nonmotorized trails within and adjacent to the river corridor. Unauthorized trails impact scenic resources because trail braiding results in large areas of erosion and vegetation disturbance that was not present before these trails were pioneered. It is conceivable that mining development will occur adjacent to the DWSR corridor in the future, potentially impacting scenic resources with the increased need for transportation and utility corridor development.

The past, present and future development of mining and utility transportation networks, combined with current and future impacts from OHV use, may lead to changes in existing scenic resources by altering basic visual elements of form, line, color, and texture at the landscape level. While Alternative 1 does provide mitigation measures to protect scenic resources through the development of Required Operating

Procedures for VRM management, it does not directly address the management of unauthorized OHV trails and resulting trail proliferation.

Cumulative impacts to scenic resources as a result of future potential transportation and utility corridor development and increased OHV use will be greatest in Alternatives 1 and 3. Because Alternative 3 provides for the highest number of OHV trails within the planning area, this alternative would have the greatest adverse cumulative impact to scenic resources compared to Alternatives 2 and 4. Alternatives 2 and 4 would not designate any additional OHV trails and would close unauthorized OHV trails that are currently impacting scenic resources. Implementing Alternatives 2 or 4 would result in less potential for trail proliferation, erosion and trail braiding, and when combined with past, present and reasonably foreseeable actions, would result in reduced adverse cumulative impacts to scenic resources.

4.4.8 Soil Resources

Past and present actions impacting soil resources are primarily related to the unauthorized development and proliferation of motorized trails within and adjacent to the river corridor. Unauthorized trails impact soil resources because trail braiding results in large areas of erosion and soil disturbances that were not present before these trails were pioneered. It is conceivable that additional mining development will occur adjacent to the river corridor on state lands and OHV use will slightly increase during the life of the plan. Additional impacts to soil resources may occur with the increased need for transportation networks related to future mining development and unauthorized trail proliferation, leading to changes in existing soil resources.

The cumulative impact of OHV trail management under Alternatives 1 and 3, combined with past, present, and future actions, may have an overall adverse cumulative effect on soil resources. Under Alternatives 2 and 4, OHV use would be limited to designated trails and unauthorized trails would be closed and rehabilitated. This would contribute to a reduction in cumulative adverse effects to soil resources. Therefore, adoption of the management actions under these alternatives, combined with past, present, and future actions, may have an overall cumulative beneficial effect on soil resources in the DWSR corridor.

4.4.9 Subsistence

The BLM is required by ANILCA Title VIII, Section 810 to consider any potential impacts to subsistence activities, resources, or impacts to access for subsistence activities from the proposed action and alternatives. Cumulative impacts are discussed in the Section 810 Evaluation Report. The complete Section 810 Evaluation for this plan can be found in Appendix 8.2.

4.4.10 Travel Management

State lands located adjacent to the river corridor are open to OHVs, subject to conditions for generally allowable uses³. Restrictions on the use of OHVs in BLM and State of Alaska managed portions of the TLAD have been implemented to protect archaeological resources. Although there are OHV restrictions on State and Federal lands in the TLAD, the less restrictive OHV use on State lands adjacent to the river corridor may result in additional OHV related impacts, including unauthorized trail proliferation, soil and vegetation damage, loss of primitive and natural character and introduction and establishment of invasive plants within the adjacent river corridor. Reasonably foreseeable future actions associated with

³ Using a highway vehicle with a curb weight of up to 10,000 pounds, including a four-wheel-drive vehicle and a pickup truck, or using a recreational-type vehicle off-road or all-terrain vehicle with a curb weight of up to 1,500 pounds, including a snowmobile (or other tracked vehicle), motorcycle or ATV, on or off an established road easement, if use off the road easement does not cause or contribute to water quality degradation, alteration of drainage systems, significant rutting, ground disturbance, or thermal erosion. (Curb weight means the weight of a vehicle with a full tank of fuel and all fluids topped off, but with no one sitting inside or on the vehicle and no cargo loaded. Most highway rated sport utility vehicles are within the weight limit as are most small ATVs, including a basic Argo.) Use of larger off-road vehicles over 1,500 pounds curb weight, and the off-road travel of construction and mining equipment require a permit from DNR. An authorization is required from the ADF&G-Habitat for any motorized travel in fish bearing streams.

transportation and utility corridor development for mining activities, combined with expected increases in OHV use, would compound and expedite these effects.

In Alternative 1, an increase in OHV users and improvements in OHV technology will lead to easier accessibility of remote areas that were previously inaccessible. As this occurs, users searching for a primitive recreation experience will have to venture further into the backcountry to fulfill their expectations. Additional impacts to natural resources including trail braiding, rutting, scarring, and the potential for the introduction of invasive and noxious weeds will increase as OHV use increases. Recent mining exploration and core drilling has been conducted adjacent to the DWSR corridor. Foreseeable future actions associated with overland transportation for mining activities, combined with expected increases in motorized surface transportation, would compound and expedite these effects. Recent increases in aerial operations associated with mining activities and exploration, combined with military or civilian flights, may adversely affect users seeking solitude and natural quiet in all RMZs.

Alternative 2 provides a balanced approach to travel management planning. In the past 5 years, extensive trail rehabilitation and maintenance has taken place on high use trails within the TLAD and lands bordering or accessing the DWSR corridor. These actions, combined with the closure of unauthorized trails, will help to ensure a responsible travel management system while restoring the scenic viewshed to a more natural setting. The designation of formal hiking trails will have a beneficial effect. Dispersed travel will be reduced by designating and maintaining foot trails, and the overall health and appearance of the impacted areas will be improved. Adverse impacts will be reduced by designating motorized and nonmotorized trails, managing RMZs 1 and 4 for nonmotorized recreation and through increased educational efforts related to travel management.

Under Alternative 3, unlimited motorized boating access, aircraft landings, and the designation of four additional OHV trails, combined with potential overland mining access and aerial operations in support of military, civilian, and mining activities will adversely affect natural quiet, solitude, and wilderness characteristics found within the DWSR corridor. Cumulative effects will be the same as Alternative 1.

The cumulative effects of Alternative 4 are the same as Alternative 2, except that Alternative 4 would allow for the implementation of more restrictions on motorized boating and aircraft landings, further reducing potential adverse cumulative effects.

4.4.11 Vegetation

Past and present actions impacting vegetation are primarily related to recreation, mining, and the unauthorized development and proliferation of motorized trails within and adjacent to the river corridor. Impacts to vegetation resources will likely occur with the increased need for transportation and utility corridor development related to future mining and pipeline related development, leading to changes to existing vegetation resources and increased potential for establishment of invasive species.

Cumulatively, the likelihood of invasive species establishment increases as the areas that are open to vehicular access increases. Additional access may provide a means for more invasive plants to enter and colonize within the river corridor, negatively impacting the landscape. The cumulative impacts of vegetation change in Alternatives 1 and 3 are greater than Alternatives 2 and 4 due to the designation of four additional OHV trails and the absence of OHV limitations. The more proactive and intensive OHV management actions in Alternatives 2 and 4, such as limiting OHV use to designated trails and closing and rehabilitating unauthorized trails, will help to mitigate undesirable vegetation changes and may have an overall beneficial effect on vegetation resources in the DWSR corridor.

4.4.12 Water Quality

Past, present, and future actions that may affect water quality throughout the planning area are primarily related to recreational and placer mining activities. The demand for mineral exploration may increase during the life of the plan, resulting in increased pressure on water resources in the planning area. Future development activities associated with mineral development would likely have adverse effects on drainage patterns and water quality, although this would depend upon the location and area of activity. Areas adjacent to the DWSR corridor that are disturbed due to mineral development could have long term impacts to water quality in the DWSR corridor. Depending on the level of disturbance, it could take

decades to centuries before the structure and function of the original aquatic habitat could be reestablished (NCSU 1998; BLM and Montana Dept. of Environ. Quality 1996; BLM 1988). If road density increases over time with mineral development or pipeline activities, resulting sedimentation would affect water quality. In addition to increased sedimentation, bridges, culverts, and low-flow crossings can act as source points for potential contaminants to enter the watershed.

The cumulative impact of OHV trail management and unrestricted motorized boating activities under Alternatives 1 and 3 may increase contaminants within the water column and increase sedimentation into streams. Alternatives 1 and 3 have the least restrictions on OHV access and motorized boating, and when combined with past, present, and future actions, may have an overall adverse cumulative effect on water quality, although these effects would be localized and unlikely to extend to the regional level.

Under Alternatives 2 and 4, OHV use would be limited to designated trails, unauthorized trails would be rehabilitated, and the use of motorized boats would be discouraged or limited through the targeted management of nonmotorized experiences. This may contribute to a reduction in possible adverse cumulative effects to water quality. Therefore, adoption of the management actions under these alternatives, combined with past, present, and future actions, may have an overall beneficial effect on water quality within the DWSR planning area when compared to all other action alternatives.

4.4.13 Wilderness Characteristics

Past restoration and rehabilitation projects to trails and campsites have helped to maintain wilderness characteristics by improving naturally appearing conditions. Adverse cumulative effects to wilderness characteristics would be greatest under Alternative 1. There would be no RMZs identified that would lead to maintenance of wilderness characteristics. The construction of long term or permanent mining facilities such as power lines, permanent roads, gravel pads, material sites, or other structures related to mineral development would result in adverse cumulative impacts to solitude, naturalness, or primitive/unconfined recreational opportunities. Loss of wilderness characteristics would likely occur within and adjacent to the planning area, with reduced opportunities for solitude and adverse impacts to naturalness.

The remaining alternatives all identify the creation of RMZs that would help to maintain wilderness characteristics in two areas (RMZs 1 and 4). The cumulative effects of increased recreational use and mining that are incompatible with wilderness characteristics would be mitigated with the creation of RMZs 1 and 4. User capacity systems developed for each action alternative vary the threshold by which user capacity would be restricted. Alternative 3 generally has the highest threshold (meaning a higher level of camp encounters could be reached before restrictions are implemented). In contrast, Alternative 4 has the lowest threshold; and the threshold for Alternative 2 falls between Alternatives 3 and 4. Therefore, Alternative 4 would be the alternative that best maintains wilderness characteristics, considering the cumulative impacts to those characteristics from increased mining and recreation.

4.4.14 Wildlife

Past and present actions affecting wildlife resources in the planning area generally involve subsistence and sport hunting, recreation, and mining. Moose and caribou hunting in the DWSR corridor is regulated by both state and federal regulations, and current access for hunting and recreation include the use of OHVs and motorboats on the river. Recent mining explorations in adjacent lands will likely result in increased mining activities if sufficient mineral resources are discovered and extraction is economically feasible, leading to potential road construction and power lines across the river corridor.

Under Alternative 1, continued OHV use on unauthorized trails may cause adverse impacts to wildlife by potentially fragmenting wildlife habitat. Disturbance via increased motorized boating and aircraft landings will likely have adverse impacts to nesting waterfowl and trumpeter swans in the Tangle Lakes area. Future roads and power lines associated with potential mining activities may contribute to further habitat fragmentation, although such actions are subject to ANILCA §810 review for compliance with subsistence stipulations. There is also a likely increase in human-bear interactions in this alternative. When combined with past, present, and future actions, this alternative would have an overall adverse cumulative effect on wildlife resources in the DWSR corridor when compared to Alternatives 2 and 4.

Under Alternative 2, OHV use would be limited to designated trails, four unauthorized OHV trails would be closed and rehabilitated, and nonmotorized recreational experiences would be targeted in RMZs 1 and 4. These measures would likely reduce potential adverse cumulative impacts of habitat fragmentation to moose and caribou. Nesting waterfowl may benefit from reduced disturbances in RMZs 1 and 4. Human-bear interactions may still increase with increased visitation, however, combined with past, present, and future actions, this alternative would have an overall beneficial cumulative effect on wildlife resources in the DWSR corridor.

Under Alternative 3, OHV use will still be limited to designated trails, but there would be no restrictions to motorized boating use and aircraft landings. Cumulative impacts of habitat fragmentation to moose and caribou from OHV use would likely increase with the designation of four additional OHV trails, and disturbances to nesting waterfowl from motorized boating use and aircraft landings may also increase. Human-bear interactions may increase due to increased visitation, but would be mitigated by increased educational awareness. When combined with past, present, and future actions, this alternative would have an overall adverse cumulative effect on wildlife resources in the DWSR corridor when compared to Alternatives 2 and 4.

Under Alternative 4, OHV use would be limited to designated trails, four unauthorized OHV trails would be closed and rehabilitated, and motorized boating and aircraft landings would be seasonally limited or prohibited altogether. These measures would likely reduce the cumulative impacts of habitat fragmentation to moose and caribou. Nesting waterfowl may benefit from reduced disturbances from motorized boating and aircraft landings. Human-bear interactions may still increase with increased visitation, however, combined with past, present, and future actions, this alternative would have the greatest beneficial cumulative effect on wildlife resources in the DWSR corridor.