

3.0 AFFECTED ENVIRONMENT

A description of the affected environment provides a baseline for the comparison of environmental impacts presented in Chapter 4.

3.1 River Corridor Description and General Setting

The Delta River watershed is located in the heart of the Alaska Range, draining an area of about 150,000 acres, and contains a network of 160 miles of streams and more than 20 lakes. The Tangle River flows through and connects several lakes in the Tangles Lakes system, then drains into the Delta River, running clear until its confluence with Eureka Creek where it becomes a braided, glacial river. The Delta River then flows north through the Alaska Range and joins the Tanana River, which ultimately flows into the Yukon River and Bering Sea.

The terrain around the Tangle Lakes is predominantly tundra-covered rolling hills with glacial features that include moraines, esker ridges, and numerous kettle ponds. Gravel benches above many of the lakes indicate that the lake was at one time about 50 feet higher than the current level. The land adjacent to the lower Delta River corridor includes steep alluvial slopes, rock cliffs, and spectacular geologic features. Elevations average 2,800 feet at the Tangle Lakes, after which the drainage falls 650 feet in 51 river miles. The planning area is located within the continental climate zone of interior Alaska. The seasons are characterized by long, severe winters and short, mild summers. Winter temperatures generally range from -40° F to +30° F, with summer temperatures ranging from 35° F to 70° F, with occasional highs exceeding 80° F. Mean annual snowfall is approximately 110 inches. Short summer showers occur frequently in the area. The autumn freeze usually occurs in October, and the spring thaw normally comes in late May or early June.

The Richardson Highway parallels the Delta River from Phelan Creek to the northern river corridor boundary which terminates just downstream of Black Rapids. The highway is within site from the river throughout this portion. The utility corridor paralleling the Delta River in this portion was established as a route for the Trans Alaska Pipeline System (TAPS). Subsequent uses of the utility corridor may include additional pipelines and power transmission lines.

3.2 Affected Resources and Issues for Analysis

The following is a list of resources and issues that have been identified as possibly being affected by the proposed action and alternatives. Affected resources and issues will be analyzed if they are potentially significant and if they lead to a basis for a choice among the alternatives. The following discussion of the affected environment is based on the issues identified in Chapter 1. The impacts of the proposed action and alternatives, including cumulative effects related to these issues, are discussed in Chapter 4.

3.2.1 Climate Change

The Intergovernmental Panel on Climate Change (IPCC) recently concluded that “warming of the climate system is unequivocal” and “most of the observed increase in globally average temperatures since the mid-20th century is very likely due to the observed increase in anthropogenic greenhouse gas concentrations” (IPCC 2007). Evidence is emerging that climate warming in Alaska can be linked to changes occurring in the structure and function of terrestrial ecosystems throughout the State of Alaska. Long term datasets indicate increasing annual mean temperature and annual precipitation (Hinzman et al. 2005). Through many complex interactions on a regional and global scale, the lower layers of the atmosphere experience a net warming effect. From 1954 to 2003, the average annual atmospheric surface temperatures in the Alaska region have risen, ranging from 2 to 3 degrees Celsius. Observed changes include warming of permafrost, increased water temperature, altering of the ranges of some species, and changes in disturbance regimes like fire and insect outbreaks in Alaska (McGuire 2003). Other observations include an increase in river discharge with the spring runoff occurring earlier and a decrease in snow cover by 5-10% since 1972. All of these changes are attributed to an increase in overall global temperature (ACIA 2005).

Much of the discontinuous permafrost in Alaska is both warm and ice-rich, making it highly susceptible to thermal degradation if regional warming continues. In the slightly warmer regions of the subarctic, the

permafrost is thinner or discontinuous. As permafrost becomes even thinner, proportions of groundwater input to streams will increase, and the proportion of surface runoff will decrease, increasing river and lake temperatures and altering chemical properties (Hinzman et al. 2005). On a localized scale, changes to permafrost and increasing groundwater input may lead to increased river bank erosion and increased impacts to trails due to permafrost melting. In permafrost free areas, surface soils can be quite dry because infiltration is not restricted, impacting ecosystem dynamics and increasing fire frequency.

Climate change may contribute to changes in stream systems, such as flow, temperature, and turbidity. Climate change affects the water cycle through variation in snow pack, runoff timing, and changes to total runoff volumes. Hydrological processes impacted by degrading permafrost include gradual or catastrophic drainage of lakes (Yoshikawa and Hinzman, 2003), increased winter stream flows (Bolton et al., 2000), decreased summer peak flows (Bolton et al., 2000), and changes in stream water chemistry (Petroni et al., 2000). Changes in runoff volumes and timing may result in an increase of surface soil erosion beyond current levels, increasing stream sedimentation, erosion, or alteration of stream channels. Changes in climate can also influence the timing and length of seasons, including changes in ranges, abundances, phenology (timing of an event such as breeding), morphology and physiology, community composition, biotic interactions and behaviors. Changes are being seen in all different types of taxa, from insects to mammals, in North America as well as on many other continents.

3.2.2 Cultural Resources

The Native Alaskan and Euro-American prehistory and history of the Northern Copper River Basin, specifically the Tangle Lakes and the DWSR corridor, has been archaeologically and historically investigated by a variety of researchers since the late 1950's. The result has been a relatively rich picture of the area's prehistory and history based upon one of the largest and densest cluster of archaeological sites in this part of Alaska. Many of these sites, and almost all of those within the Tangle Lakes Archaeological District (TLAD), are considered to be eligible for the National Register of Historic Places as contributing properties to the archaeological district. That portion of the DWSR within the TLAD is one of the densest areas for late Pleistocene and early Holocene archaeological sites in the North American Subarctic, making the area significant for answering questions about the poorly known early peoples who migrated to Alaska (Bowers 1989).

The Tangle Lakes and the DWSR corridor have several commonly recognized Ahtna Athabascan placenames, some of which are significant to the Ahtna as trail and travel markers, as well as ties to their ancestors (Kari and Tuttle 2005). Because of the extensive use of the area by the Ahtna historically, as well as the commonly recognized prehistory of the area, the region remains important to the Ahtna as a place that is a tie to some of their most distant ancestors. For example, the southern portions of the Tangle Lakes are understood as the origin place for one of their oldest clans, and has a frequently told clan origin story associated with the area. Any organized use of, or development of the Tangle Lakes and upper DWSR corridor, could affect areas that have religious and cultural importance to the Ahtna.

Cultural resource sites in the planning area include prehistoric and historic trails, temporary camps, habitation sites, game spotting vantage points, butchering sites and stone procurement locations. These sites include a variety of stone tools from several time periods, including wedge shaped microblade cores, core tablets, microblades, leaf shaped biface knives, notched cobbles, and side notched projectile points. Other common stone implements found in the area include end scrapers, large bifaces, exhausted cores and lithic reduction debitage.

3.2.2.1 Cultural Resources Concerns Related to Recreational Activities

Although the Delta River and Tangle Lakes region has received a large portion of the archaeological work conducted by the BLM, the area also has large inventory gaps. Little is known about prehistoric subsistence and travel patterns between the Copper River Basin and the Tanana Valley to the north. Archaeological surveys within the Tangle Lakes and along the upper Delta River in 2007 and 2008 (Jangala et al 2009) yielded a large number of newly discovered sites that hint at the importance of the region for past subsistence and long distance travel.

Beyond gaps in inventories and archaeological knowledge, there are three major threats and one minor threat to cultural resources within the planning area. Since the addition of the TLAD to the National Register of Historic Places in 1972, there has been an increase in both OHV use and trail impacts to

archaeological sites in this area. These increases have removed some of the vital vegetative cover from the thin, fragile soils covering several recorded sites spanning virtually the entire Holocene. In response to this problem, the BLM has used experimental trail hardening materials in those areas with wet soils that are not able to withstand the weight and traffic to which they have been exposed. The trail hardening would also attempt to discourage the user-created braided trail patterns that have developed in these wet areas. The BLM has also increased signage along both designated and non-designated trails.

The second threat to heritage resources within the region is the natural decay and disturbance of sites. There are several cabins and cabin remains that have naturally decayed and collapsed, with no possibility of reconstruction. Other prehistoric archaeological sites along bluff faces are threatened by natural erosion and calving of large portions of unstable bluff faces.

The third threat to cultural resources in the region is vandalism and looting. There have been two known looting incidents in the TLAD. The BLM is attempting to lessen the risk of looting and vandalism through periodic monitoring.

The fourth threat to cultural resources has been the unintentional disturbance of archaeological sites by recreational camping. Several archaeological sites along Long Tangle and Lower Tangle Lakes are used as camping spots by river users. The majority of these users do not recognize the archaeological remains beneath these camps, and there has not been a problem with artifact collecting. However, the expansion of these campsites has the potential to uncover sites that are currently buried and covered by vegetation, exposing them to soil erosion and loss of archaeological context and National Register significance.

3.2.3 Fisheries

The clear water of the Delta River from the Upper Tangle Lakes to the confluence with Eureka Creek supports only resident fish species. Resident fish species use this section of the Delta River for migration, spawning and rearing. Species include: arctic grayling (*Thymallus arcticus*); lake trout (*Salvelinus namaycush*); round whitefish (*Prosopium cylindraceum*); burbot (*Lota lota*); and long nosed suckers (*Catostomus catostomus*) (Carlton, 1976). Arctic grayling are considered the most widespread and prevalent species within the drainage. Arctic grayling constitute the majority of the sports catch (BLM 1983).

The high quality of the fish habitat of the clear water Delta River is a basic factor contributing to the productivity of the river's fisheries. The river drainage contains a good mixture of gravelly riffles for spawning, rocky bottom runs for summer arctic grayling habitat, deep water areas for overwintering, and pools, backwaters, and lakes for rearing. The productivity of the river's fisheries creates excellent fishing opportunities for recreationists and anglers who use the river.

3.2.3.1 Resident Fish Populations

The arctic grayling (*Thymallus arcticus*) is common throughout Alaska. According to a preliminary survey by the Alaska Department of Fish and Game, the Delta River supports a very healthy, world class, resident arctic grayling population. The arctic grayling is widespread throughout the clear water system focusing on free flowing reaches of runs and riffles. It has been observed that large arctic grayling typically take up positions just below the falls in the swifter moving currents. Arctic grayling spawn early in the spring, immediately after breakup (James E. Morrow, 1983). Arctic grayling eggs hatch in two to four weeks and immediately migrate into deep pools and protected areas for rearing (Vincent-Lang, et al, 1990).

The lake trout (*Salvelinus namaycush*) are widely distributed in Alaska and northern North America. On the Delta River clear water system, the lake trout spawns in the lakes in the fall starting in early September (ADF&G biologist, professional judgement). Eggs hatch in early spring (March) and most growth of the young fry occurs during the summer when food sources are abundant. Lake trout are not considered to be migratory.

The round whitefish (*Prosopium cylindraceum*) are found throughout mainland Alaska (James E. Morrow, 1983). On the clear water of the Delta River, spawning occurs in late September through October (ADF&G biologist, professional judgement). Eggs hatch in the early spring and growth rates of the fry

vary depending on location and food conditions. It is not known if round whitefish are migratory, but it is suspected that they are not.

The burbot (*Lota lota*) are abundant through most of Alaska. Burbot are winter spawners, laying their eggs in early February. Fry are hatched in May, with variable growth rates during the summer. Migration for burbot is unknown.

The longnose sucker (*Catostomus catostomus*) are present throughout Alaska (James E. Morrow, 1983). Spawning for the longnose sucker begins in early May and eggs are laid in late May and early June. Fry are hatched starting in the middle of June and growth rates correlate with available food supply. Migration of the longnose sucker is unknown.

None of these species are commercially used. Arctic grayling and lake trout are a specific target sport fish species for fishing guides and recreational fishermen. Lake trout and burbot may be vulnerable to potential overharvesting.

3.2.3.2 Fisheries Concerns Related to Recreational Activities

The primary management concerns related to fisheries are sedimentation caused by OHV trails and river crossings, and bank erosion and river bed disturbance caused by motorized boating. The Top of the World Trail is the only designated OHV trail accessing and crossing the Delta River directly through the river channel in the clear water portion of the river corridor. It is primarily used by OHVs during hunting season, and crosses the river a few miles above Eureka Creek. OHV trails that parallel the river and OHV river crossings can adversely affect riparian vegetation, rate of erosion and sedimentation, and streambank stability in sensitive riparian areas that are vital fisheries habitat. Damage to riparian areas from OHVs can last for years and sedimentation in streams can damage fish habitat downstream from the original disturbance. Unauthorized 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 runoff, and are a point where sediment from the trail is introduced into the river.

Removing the vegetative cover, altering the natural topsoil, or changing the shape of the slope can increase the potential for erosion, increase runoff, and create more sediment in waterbodies. The main factors influencing erosion rate include the volume and velocity of runoff from precipitation, the rate of precipitation infiltration through the soil, the amount of plant cover, the slope length or the distance from the point of origin of overland flow to the point of deposition (EPA 1997). Accelerated erosion occurs whenever the soil surface is disturbed. Sediments created by accelerated erosion clog streams and fill lakes and impair the water holding capacity. Erosion decreases the productive value of the soil as well as reducing the quality of the waters that receive the sediment. These changes can lead to decreased survival of fish in the egg and alevin stages; decreased density, biomass, and diversity of aquatic insects; and decreased primary production (Cordone and Kelley 1961; Cooper 1965; Van Nieuwenhuysse 1983; Webber and Post 1985; Lloyd and others 1987; Buhl and Hamilton 1990).

Riparian vegetation condition directly influences the condition, quality, and maintenance of aquatic habitat. Riparian plants filter sediments and nutrients, provide shade, stabilize streambanks, provide cover in the form of large and small woody debris, produce leaf litter energy inputs, and promote infiltration and recharge of the alluvial aquifer (Orth and White 1993; Wesche 1993). As a result of these functions, spawning beds for fish and microhabitats for macroinvertebrates remain relatively free of damaging fine sediment deposits. Riparian vegetation reduces sedimentation of pools, thereby maintaining water depths and structural diversity of the channel. Base flow levels are augmented throughout the year by the slow release of water stored in aquifers. Complex off-channel habitats, such as backwaters, eddies, and side channels, are often formed by the interaction of streamflow and riparian features such as living vegetation and large woody debris. These areas of slower water provide critical refuge during floods for a variety of aquatic species and serve as rearing areas for juvenile fish.

Increased turbidity and sedimentation from erosion can inhibit site-feeding capacity and spawning success of Arctic grayling. All members of the biotic community have the potential to be affected. Potential effects of sedimentation on benthic macroinvertebrates, which are prey species for Arctic grayling, include: interference with respiration, and interruption of filter-feeding insect's capability to secure food. A more important impact to benthic invertebrates would be smothering of physical habitat by

increased sediment loads. A loss of interstitial space in the substrate would be highly detrimental to burrowing species. A decrease in abundance could be expected in these situations. In subarctic environments, where fish depend on summer food sources to grow and reproduce, a reduced prey base may preclude fish from directing energy towards spawning.

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 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 fill these interstitial spaces and limit essential winter habitat used by juvenile fish for cover from predators, ice scour, and high velocity stream flows. The filling of pools with sediment further limits overwintering sites for juvenile and adult fish.

Motorized boating increases have the potential for bank erosion and sedimentation into the river, resulting in a reduced quality of fisheries habitat. The bank stabilizing function of streamside vegetation not only helps reduce erosion and influence channel morphology, but also acts to supplement instream cover by the development of undercut streambanks and by providing overhanging vegetation. Well vegetated stream channels and stable streambanks help reduce turbidity and channel scouring resulting from high runoff rates and, in turn, can enhance primary production. In cold regions, well vegetated stream channels help reduce the formation of aufeis (ice formed by the overflow of water onto existing ice). Aufeis can decrease primary productivity, delay riparian plant growth, increase erosion, tie up water in the form of ice during critical low flow periods, and cause the formation of new stream channels due to channel blockage (Churchill 1990; Michel 1971; Slaughter 1990).

Motorized boat usage on the DWSR is believed to be low, of the 560 boats observed on overflights from 2000 to 2004, 25% were motorized. However, the majority (71 %) of boating occurring in RMZ 5 is motorized; additionally the highest densities of Arctic grayling (≥ 270 mm length) ever recorded were recently documented in RMZs 4 and 5 (Gryska, in preparation). The erosion of streambanks and lake shorelines caused by excessive boat wakes may pose a number of harmful effects on the aquatic environment. Wakes or 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.

Damage caused by a wake is directly related to its height. Boat wakes are found to increase in amplitude with increasing boat size. Comparisons of streamflow and boat wake energy suggest that, in larger channels, boat wakes only make up 2-5% of the total energy dissipated annually against the banks. In smaller channels, the roles are reversed, and streamflow makes up only 2-5% of the annual energy dissipated, demonstrating that boat wakes in smaller channels may constitute far greater energy on smaller channels than larger channels. Turbidity measurements clearly demonstrate that boat wakes are capable of dislodging sediments from the banks. Peak values of suspended sediment concentrations far outweigh the ambient load of the river and are found to increase with increasing wake height (Hill et al., 2002). Currently there is no data available for bank erosion rates and sedimentation from motorized boating on the DWSR.

3.2.4 Lands and Realty

3.2.4.1 Access

Access issues discussed in this section apply to minerals access and right-of-way authorizations for the transportation and utility corridor (PLO 5150). Access issues related to travel management and subsistence are discussed under their own general headings.

3.2.4.1.1 Mineral Access

The area has a history of mining beginning with the discovery of gold in Valdez Creek in 1903. Historic mining activities and associated trails dating from circa 1900 have been documented in the planning area. Mining interest has continued to this day, as there are federal and state mining claims on Rainy Creek

and further west in the Eureka Creek drainage and Broxson Gulch. For a description of trails in the DWSR corridor that have been historically used for mining access, refer to the Travel Management description for the Top of the World/Yost Trail and Rainy Creek Trail in Chapter 3.2.10.2.

3.2.4.1.2 Transportation and Utility Corridors

The Transportation and Utility Corridor, withdrawn by PLO 5150 in December of 1971, is primarily identified with the Trans Alaska Oil Pipeline System (TAPS), but is also reserved as a utility and transportation corridor in aid of programs for the U.S. government, as well as the State of Alaska. Future pipeline needs (such as a natural gas pipeline) could be accommodated along this existing route. Application for a right of way in the Transportation and Utility Corridor would require the appropriate level of site-specific analysis, and would be considered using the criteria described in Title XI of ANILCA.

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. Any road crossings of the river would be subject to an evaluation consistent with Section 7 of the WSRA.

3.2.4.2 Property Acquisition

There are approximately 30 acres of private lands within the DWSR corridor. If these parcels become available for sale, the BLM may submit funding requests through the Land and Water Conservation Fund (LWCF) to acquire lands. The LWCF program provides funding for the acquisition and development of public outdoor recreation areas and facilities. The program is intended to create and maintain a nationwide legacy of high quality recreation areas and facilities, and stimulate investments in the protection and maintenance of recreation resources throughout the United States. The EARMF specified that the DWSR corridor 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. The only private parcels located within the DWSR corridor are in the vicinity of the Tangle Lakes Campground and DWSR Wayside, adjacent to the Denali Highway. In the past, these parcels have been available for sale and the BLM has considered purchasing these parcels through the LWCF program, but formal LWCF proposals have not been submitted.

3.2.5 Natural Quiet and Natural Sounds

By definition, noise is a human-caused sound and may be considered unpleasant, depending on the individual "listening" to the sound, and what the individual is doing when the sound is heard (i.e., working, playing, resting, sleeping). While performing certain tasks, people expect and accept certain sounds. For instance, if a person works in an office, sounds from printers, copiers, and typewriters are generally acceptable and not considered unpleasant or unwanted. By comparison, when resting or relaxing, these same sounds are not desired. The desired sounds during these times are referred to as "natural quiet," a term used to describe ambient (outdoor) natural sounds, without the intrusion of human-caused sounds. Natural quiet can be essential in order for some individuals to achieve a feeling of peace and solitude.

3.2.5.1 Existing Noise Sources

Noise resulting from human activities primarily occurs during the summer months in the developed facilities, but also in areas where OHV use and motorized boating are common throughout the river corridor. Noise associated with visitor use typically involves talking or yelling, setting up camp, the use of chainsaws, rifles, and other camp amenities (generators, radios, etc.), OHV use, aircraft use, and motorized boating. Noise of this type varies greatly depending on group size and group demographics. Noise from motor vehicles is "loudest" immediately adjacent to the roadways, but due to generally low background sound levels, can be audible a long distance from these areas. Atmospheric conditions (such as wind, temperature, humidity, rain, fog, and snow) and topography can significantly affect the presence or absence of motor vehicle noise. Logically, noise levels will be "loudest" where and when activity levels are the greatest and nearest to the area.

Noise associated with aircraft occurs from different types of aircraft that are used within and adjacent to the river corridor. Occasionally, floatplanes will land on the larger lakes within the river corridor for the purpose of transporting fishermen and hunters. The BLM uses fixed wing airplanes to monitor visitor use and wildlife. Helicopters are occasionally used by State agencies and the BLM for logistical support in various resource projects; and helicopter use related to mining activities located adjacent to the river corridor has been increasing in recent years. The US Air Force conducts military flight operations in the FOX Military Operations Area (MOA), which is located adjacent to the river corridor, for military flight activities such as air combat tactics, transition, formation training, and aerobatics.

3.2.5.2 Existing Natural Sounds

Natural sounds within the DWSR corridor result from natural sources such as waterfalls, flowing water, animals, and rustling leaves. Some people seek this type of solitude, and are concerned that additional sources of noise may change this experience, and that certain areas should be managed to preserve existing natural quiet and natural sounds.

3.2.6 Recreation Resources

The Record of Decision for the EARMP identified specific management decisions for recreation resources in the planning area. These management decisions will serve as a guideline for new decisions that will be made to ensure conformity with the EARMP. These decisions can be found in Chapter 1.7 **Land Use Plan Conformance**.

3.2.6.1 General Recreation Setting

The Tangle Lakes Campground at Mile 21 on the Denali Highway provides developed camping facilities and boat launch access to the lower Tangle Lakes and Delta River. A day use area and boat launch is also located at the DWSR Wayside at Mile 22 on the Denali Highway. This boat launch provides access to the Upper Tangle Lakes and Tangle River. A one mile portage from Upper Tangle Lakes to Dickey Lake provides access to the floatable headwaters of the Gulkana River drainage. Two commercial lodges in the area provide food, gas, and lodging.

Aside from the developed facilities that are located adjacent to the Denali Highway, there are no other developed facilities within the river corridor. The BLM maintains only one outhouse on the entire river system, located at the Delta River portage. Dispersed campsites can be found along the river and lakes; a BLM inventory in 2005 identified 66 dispersed campsites. With the exception of a few campsites on the Tangle Lakes and lower Delta River, campsites are infrequently used, and traces of use are minimal. Within the river corridor, the BLM manages two designated OHV trails. Floatplanes occasionally land on some of the larger lakes in the Tangle Lake system.

3.2.6.2 Recreation Activities and Use

Prior to construction of the Denali Highway in the early 1950's, the DWSR corridor was not easily accessible to highway vehicles. Recreation use of the area began in earnest in 1952, with the construction of the Denali Highway, and after the development of two private lodges and the Tangle Lakes Campground. Use increased substantially in the 1970's in response to the nearby construction of the TAPS. Recent use is primarily by Alaska residents, although out-of-state visitation has increased. Local community dependence on lands within the DWSR corridor has strong ties to the utilization of the region's hunting and fishing resources. In addition to the resident population, regional urban populations also depend on river resources to pursue recreational activities.

Common recreational activities include fishing, hunting, trapping, berry picking, wildlife viewing, photography, boating, hiking, camping, snowmachining, and OHV travel. Hiking and camping opportunities are abundant, as relatively sparse vegetation and gravelly soils along exposed esker ridges help to facilitate dispersed hiking and camping opportunities. The majority of recreational use occurs near the lakes and on the river, with smaller numbers entering the lower river corridor by OHV.

The Delta River and Tangle Lakes provide exceptional fishing opportunities for arctic grayling and lake trout. Wildlife and bird habitat are also an important aspect within the river corridor, providing abundant hunting, trapping, and wildlife viewing opportunities. Some commonly sought after species include

moose, caribou, bear, grouse and ptarmigan, ducks, beaver, fox, wolf, marten, lynx, muskrat, and mink. Migratory birds, waterfowl, and raptors are found throughout the lakes and river, providing visitors with opportunities for viewing and photography. Primary subsistence uses of the area include moose and caribou hunting, spearing whitefish, and gathering berries.

The Delta River and Tangle Lakes provide opportunities for both motorized and nonmotorized boating. Motorized boating occurs primarily on the lakes adjacent to the developed facilities, and to a lesser extent on the lower river between Phelan and Garrett Creeks. Nonmotorized boating occurs throughout the entire system, as most lakes and the river can be traveled in a relatively short amount of time (2-3 days).

3.2.6.3 Visitor Characteristics

The following data regarding visitor characteristics and preferences was developed from the 2005 Delta River Recreation User Survey (Whittaker and Shelby, 2005):

- **Group Size:** Average group size was 4 for Delta River “through trip” groups and 3 for Upper Tangles groups, motorized boating groups, and OHV groups.
- **Season of Use:** Lake users reported taking most trips during June, July and August; Delta “through trip” users primarily in July, and lower Delta River motorized boaters and OHV users in August and September. This data is consistent with overflight use data conducted by the BLM.
- **Residency:** 97 % of reported Delta River users were Alaska residents.
- **Trip Length:** The median trip length for lake and “through trip” river users was 3 days. The median trip length for lower Delta River motorized boaters was 6 days, while Top of the World OHV users reported a median trip length of 2.5 days.

Users were also asked to identify the most important activities they engaged in while on their trips. The top rated reasons for nonmotorized users were oriented towards “non-consumptive” backcountry recreation in primitive settings (areas providing naturalness and solitude). In contrast, motorized users rated fishing and hunting (“consumptive recreation”) much higher. Both groups rated “being with friends and family” very important, but the least important attribute among both groups was “meeting other river users,” which suggests that while friend and family groups are acceptable, minimizing interaction and competition between other user groups is desired.

Users were asked to compare different types of experiences that are available on various segments of the river with the type of experience that they think should be provided, using the following experience descriptions:

- **Primitive Setting:** Where one expects to find solitude, very few traces of previous use, no motorized use or OHV trails, and no development.
- **Primitive Motorized Setting:** Similar to primitive setting, but motorized use may occur and OHV trails may occasionally be visible.
- **Semiprimitive Setting:** Where one expects to meet few other groups, but solitude is still possible, particularly at camps. There is little or no motorized use or OHV trails, occasional evidence of previous use, and a few developments such as trails or outhouses.
- **Semiprimitive Motorized Setting:** Similar to a semiprimitive setting, but motorized use may occur and OHV trails may occasionally be visible.
- **Undeveloped Recreation Setting:** Where one expects to meet other groups and solitude is difficult to find. There is motorized use; OHV trails are visible at several locations, evidence of previous use at many sites, and developments such as trails and outhouses.

Results for all users surveyed are shown in Table 5. The river corridor was divided into four different segments, each representative of river settings that are present in the DWSR corridor. **Bolded** entries

indicate segments where reported experiences have higher use and development than preferred experiences (indicating a potential overuse situation):

Table 5: Available and preferred types of “experience settings” for different river segments

Non-motorized users		
Segment	Available setting (majority response)	Preferred setting (majority response)
Upper Tangle Lakes	Semiprimitive	Primitive
Lower Tangle Lakes	Primitive Motorized	Primitive
Upper Delta River	Primitive	Primitive
Lower Delta River	Primitive	Primitive
Motorized users		
Segment	Available setting (majority response)	Preferred setting (majority response)
Upper Tangle Lakes	Semiprimitive Motorized	Semiprimitive Motorized
Lower Tangle Lakes	Primitive Motorized	Primitive Motorized
Upper Delta River	Primitive Motorized	Primitive
Lower Delta River	Semiprimitive Motorized	Primitive Motorized

Major findings from this data include:

- Users generally recognize there are different opportunities provided on various segments, and that these differences are desirable.
- In general, there appears to be a continuum of opportunities from the primitive, nonmotorized end of the spectrum to the semiprimitive, motorized end.
- In general, differences between reported and preferred experiences are greater for nonmotorized users, indicating they are more sensitive to higher use densities, development, or motorized use.
- Motorized users recognized that the Upper Delta River offers nonmotorized opportunities at present, but slightly fewer prefer that situation.
- Motorized users prefer slightly more primitive settings than they reported, but they do not generally support nonmotorized versions of more primitive settings.
- The data indicates that at current use levels, users’ abilities to experience a primitive or semiprimitive river trip on certain segments are being impacted.

3.2.6.4 Visitor Use Trends

The BLM utilizes different methods to estimate visitor use levels on the Delta River. Sources include voluntary visitor registration kiosks, post use reports required from commercial permittees, river overflights on random days; traffic counters at developed facilities; supplemented by visual observations and river user surveys. Annually, the BLM submits the number of “visits” at each recreational site, trail, facility, etc. in the Recreation Management Information System (RMIS) visitor use system.

Table 6 depicts reported annual RMIS visitor use for the DWSR corridor. These numbers are the best estimates available; accurate visitor use data is difficult to obtain in remote, relatively low use areas with low compliance registration data. Each number represents total “visits” to the particular area or site, and each “visit” represents one primary activity by one person (boating, fishing, etc.) within the river area:

Table 6: Historical Visitor Use Data: Reported Number of Annual Visits

Year	Delta River	Upper Tangles Lake Use	Lower Tangles Lake Use	Tangle Lakes Campground	DNWSR Wayside
1970	100				
1972	300				
1975	457				
1976	396				
1977	450				
1978	500				
1979	449				
1980	634				
1981	240				
1982-85	no data				
1986	600				
1987	1620			15876	13392
1988	1068			12480	17755
1989	260			13213	11248
1990	858			15150	12479
1991	863			15150	12479
1992	768			18114	14008
1993	658			21000	10800
1994-96	no data			no data	no data
1997	830	2168	2343	16000	15300
1998	645	2130	2785	14834	14468
1999	737	1865	3493	17070	10989
2000	525	2349	3013	15486	9890
2001	738	2356	3592	9882	7457
2002	717	1657	2759	11761	6349
2003	706	1723	2465	11480	9350
2004	537	1764	2516	12560	9054
2005	763	1530	3128	14543	5638
2006	633	2150	2782	16427	7557
2007	659	1849	3033	15737	7440
2008	603	1677	2267	14969	7245
2009	559	1482	3223	16244	7958

The BLM believes that the original methods used to determine visitor use resulted in overestimations in earlier years. As methods used to calculate visitor use have been refined, use numbers have decreased accordingly. Use estimates for the Delta River were very high during the years 1987-88, and from 1970-97, visitor use was not split between river segments; consequently the total visits for the Upper Tangles and Lower Tangle Lakes are unknown. However, the visitor use trends do demonstrate relatively stable use patterns, with cyclical fluctuations in visitor use (most likely associated with gas prices, weather, economy, hunting opportunities and availability of game, etc).

The number of boaters and OHV users has increased statewide as watercraft and OHVs are more available and affordable today than in the past. As statewide population increases in the future, visitor use within the river corridor may increase, and more specifically, boating and OHV activities on some river segments may increase. Annual fluctuations in visitor use are often dependent on weather, gas prices, and other factors. While motorized boating and OHV use is considerably less than on the Gulkana River, it has been slowly increasing due to a change in Federal Subsistence hunting regulations that allow residents of Delta Junction to participate in the Federal Subsistence hunt. Feature stories in local publications and the internet have also drawn attention to the area.

Overflight information helps to characterize visitor use throughout the river corridor during the summer use season. This use season remains relatively constant every summer, as the ice on the lakes does not recede until early June and most all documented river use ends by late September, with the close of subsistence caribou season on September 30. Specific observations related to overflight data include:

- Visitor use is generally higher on the Lower Tangles and upper Delta River in July and August; and higher on the lower Delta River and Upper Tangles in August and early September.
- Nonmotorized boats account for more than 65% of boats on lake segments; 80% or more on the river upstream of Eureka Creek; but only 29% on the lower river below Eureka Creek.

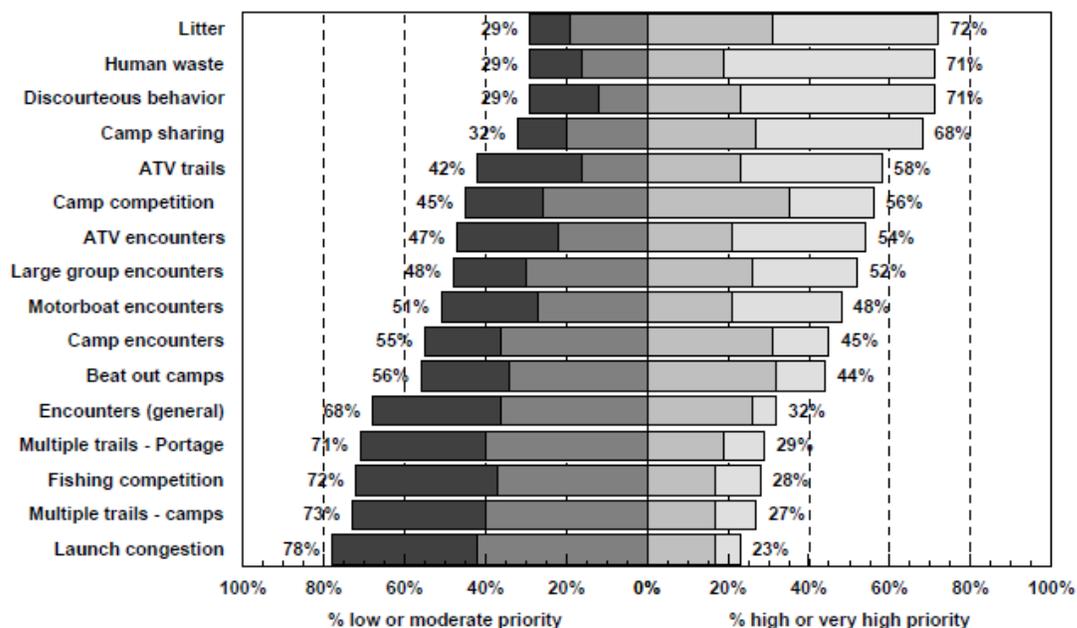
- On the lake segments, 19 to 35% of the days had no boating use, and on the main river segments this was true for 45 to 65% of the days (97% on Black Rapids segment).
- Highest use levels are on the lake segments (particularly Round Tangle Lake), with boats observed on 65% to 80% of the days when overflights occurred. In contrast, use was observed on 35% to 54% of the days on the main river segments (and only 3% on the Black Rapids segment). This is consistent with the number of respondents reporting lake vs. river use in the Delta River User Survey, as well as with RMIS use estimates.
- On the lakes, the average is 3-4 nonmotorized craft and 1-2 motorized boats per flight. On the river segments, the average is 2-5 nonmotorized boats and 1-3 motorized boats per flight. These use estimates are roughly consistent with encounter data in the river user survey, which suggested encounter rates of 2-6 groups per day.
- Nonmotorized use levels are higher in July on most segments except for the upper Delta, which is higher in August. Motorized use on the Upper Tangles and lower Delta River is higher in August and September (coinciding with the hunting season). On Round Tangle Lake, Lower Tangle Lake, and the upper Delta River, motorized use is higher in July.
- Of the 560 boats observed on overflights from 2000 to 2004, 422 or 75% were nonmotorized, and 138 or 25% were motorized.
- OHV use was observed on 6 out of 37 flights (16% of days), and the number of OHVs rarely exceeded 2 per observation. Nearly all of the observed OHVs were near the lower river (Top of the World Trail); and OHVs were never observed during June or July.

3.2.6.5 Recreation Management Concerns

The 1983 DWSR Management Plan recognized the need to determine the amount and type of use that the DWSR corridor could perpetually sustain without impairing its scenic and primitive character, or causing unacceptable change to the experience of the user. The 1983 DWSR Management Plan also discusses the need for determining a “carrying capacity” for the river. Carrying capacity has been defined as the level of use beyond which impacts exceed acceptable levels specified by standards (Shelby & Heberlein, 1986). The actions identified in Chapter 2 of this EA incorporate an adaptive management approach to address visitor use issues and carrying capacity. The alternatives identify standards for different impacts on the river and associated management actions if standards are exceeded. The following section discusses these impacts that are associated with recreational use.

In Figure 1, the 2005 Delta River User Survey rated visitor use impacts within the river corridor and their level of priority to river users.

Figure 1: 2005 Delta River User Survey: Respondents’ priorities among different impacts



These results portray the following:

- Litter and human waste were rated among the highest priorities.
- Camp competition, camp sharing, and camp encounters (camping within sight or sound) were relatively higher priorities than “beat out” camps. This may suggest that users are more concerned about getting a camp to themselves, rather than the actual conditions at camps.

3.2.6.5.1 Group Sizes

Regardless of the fluctuation in estimated visitor use figures since 1983, there is evidence of an increase in both state population and out-of-state visitation over the past two decades. Most importantly, some of the data shows that on some segments of the river, current use levels are causing unacceptable change to the experience of the user and impacting the natural and primitive character of the river (refer to Table 5 on page 63).

Large groups can impact the recreational experiences of smaller groups, and campsites cannot always sustain larger groups, causing resource damages including expansion of bare ground, vegetation trampling, creation of social trails and satellite sites, and congestion at the river portages. Data from the 2005 Delta River User Survey regarding reported and tolerable group sizes includes the following:

Figure 2: Statistics regarding largest reported and tolerable group sizes

Segment	Mean	Median	Typical range ¹	% "don't care"	Percentage reporting...	
					≤12	≤20
Reported largest group sizes	7.8	5	4 to 9	--	82	96
Largest tolerable group sizes	8.1	7	4 to 10	16%	86	98

3.2.6.5.2 Litter

Most concentrations of litter occur in the firerings at dispersed campsites, but can be found scattered at any point along the river, especially at heavily used camping areas. The BLM river crew floats the entire system three to four times per year, and each trip usually results in 2-3 garbage bags of litter. There are garbage receptacles located in all of the developed facilities and boat launches, and interpretive information is provided that includes Leave No Trace minimum impact camping information. Monitoring information compiled from river patrols from 2006-2009 show that litter was present at approximately 135 campsites of 562 campsites monitored during this time period. This equates to an average of approximately 24% of campsites having litter from 2006-2009.

3.2.6.5.3 Human Waste

Current overnight use estimates for the Delta River float trip estimate annual use at approximately 500 people per year. With trip lengths averaging about three days, and people producing approximately 0.5 pounds of solid waste per day (*Better Boater Bathrooms: A Sourcebook for River Managers*), about 750 pounds of waste is estimated to be deposited along the river each year. While methods of disposal vary (including the use of outhouses, catholes, and some portable toilet systems), much of this waste remains visible to other users. BLM river crews clean up the most obvious areas that contain human waste. Outhouses along the river can help address some of these problems if users know about and use them. Outhouses also pose a logistical and maintenance challenge on the Delta River. Given the high water table and occurrence of permafrost in the area, outhouses are very hard to install. Once installed, they also require regular maintenance (cleaning and relocation when the pit is full). Currently there is one outhouse located at the Delta River portage. There are also vault toilets at the Tangle Lakes Campground and the Delta Wayside.

River users have indicated a strong intolerance for human waste. According to the 2005 Delta River survey, this is an issue where the current level of impact exceeds the level of tolerance. Monitoring information compiled from river patrols from 2006-2009 show that human waste was present at approximately 82 campsites of 562 campsites monitored during this time period. This equates to an average of approximately 15% of campsites having human waste present from 2006-2009.

3.2.6.5.4 Fire Rings

River patrols by the BLM have documented multiple fire rings at some existing campsites. River crews dismantle all but one fire ring per site, but many times these are reconstructed in different places within the campsite. Multiple fire rings at campsites increase the amount of charcoal and unburned waste, and affect the appearance and cleanliness of the sites. The unburned waste may be swept into the river during high flow events, resulting in litter accumulation in the water column. Rocks and soils are permanently scarred, and sites with multiple fire rings are difficult to rehabilitate. Monitoring information compiled from river patrols from 2006-2009 show that multiple fire rings were present at approximately 26 campsites of 562 campsites monitored during this time period. This equates to an average of approximately 5% of campsites having multiple fire rings from 2006-2009.

3.2.6.5.5 Chainsaw Use

The use of chainsaws to cut standing trees and woody debris for firewood has become an issue within the river corridor. The use of chainsaws on the lower river is increasing, and as a result, more standing trees and large woody debris from the riverbed and campsites are being cut for firewood. The use of chainsaws also creates noise disturbances within the river corridor, detracting from a quiet, primitive experience. Restrictions on the use of chainsaws to cut firewood can reduce the volume of wood used for firewood and can result in increased woody debris in the river and bank stabilization which is important for fish habitat.

3.2.6.5.6 Recreational Shooting

The recreational discharge of weapons (i.e. target shooting or “plinking”) within the river corridor presents a safety concern to the public and may disturb users who are seeking solitude and natural quiet. In addition to the campgrounds and launch facilities where users congregate, there are numerous users along the river fishing, camping, and boating.

3.2.6.5.7 Campsite Impacts

Campsites along the river are dispersed sites and have formed over the years as use on the river has increased. There are currently 66 inventoried campsites within the river corridor. There are 27 campsites on the Upper Tangles, 19 campsites on the Lower Tangles, and 20 campsites on the upper and lower Delta River. Impacts at campsites include vegetation trampling; soil compaction; multiple fire rings; trees cut for firewood, tent poles, and meat racks; and social trails leading to satellite campsites. Of 66 campsites within the entire river corridor, about 10 are considered heavily impacted (greater than 66% bare ground disturbance). These occur at popular areas such as the outlet of Long Tangle Lake, on the lower river in the vicinity of Garrett Creek, and along the Top of the World OHV trail. Aside from the physical impacts to river resources, impacted camps can also affect a users’ ability to have primitive experiences on the river.

3.2.6.5.8 Campsite Encounters

“Encounters”, the number of contacts with other *groups* per day, has been a focus of backcountry recreation researchers for 30 years. The consistent finding has been that backcountry users prefer contact with less than about 4 to 5 other parties per day in order to have high quality “wilderness,” “primitive,” or “backcountry” experiences (Vaske et al., 1986). Recreationists have more tolerance for encounters during the day than at night when they are camping.

Several studies, including the 2005 Delta River User Survey, suggest that camping-related encounters have greater effects on user perceptions of crowding than river encounters. Accordingly, campsite encounters can be used as a crowding-related indicator (Whittaker, 1989). In relation to the number of campsites within each river segment, survey data shows that users are willing to pass up campsites approximately 20% of the time before it begins to negatively affect their recreational experience. Users on the Delta River were asked to report encounter levels for various segments, as well as their preferences and tolerances for encounter levels. Figure 3 summarizes statistics for each river segment:

Figure 3: Reported, preferred, and tolerable group encounters per day by river segment

Segment	Mean	Median	Typical range ¹
Reported encounters			
Upper Tangles	5.0	3.0	2 to 5
Lower Tangles	6.1	3.0	2 to 8
Upper Delta	2.7	1.0	0 to 3
Lower Delta	2.9	1.0	0 to 3
Preferred encounters			
Upper Tangles	3.3	2.0	0 to 4
Lower Tangles	3.8	2.0	0 to 4
Upper Delta	2.9	1.0	0 to 3
Lower Delta	2.9	1.0	0 to 3
Tolerable encounters			
Upper Tangles	10.0	6.0	4 to 10
Lower Tangles	10.7	6.0	4 to 10
Upper Delta	6.3	4.0	2 to 10
Lower Delta	5.6	3.5	2 to 6

Survey data from the 2005 Delta River User Survey shows impact levels for camp encounters at or approaching preferred levels on certain segments of the river. More specifically:

- For the lake segments, reported encounters were higher than preferred encounters. For the river segments, reported encounters were nearly equal to preferred encounters, indicating that encounters on the river segments are approaching a point that is not desirable.
- For all segments, reported encounters were significantly lower than tolerances.

3.2.6.5.9 Commercial Activities

Commercial use levels within the river corridor are very low compared to private use. The BLM currently authorizes one commercial outfitter within the river corridor under a Special Recreation Permit (SRP), and has developed mitigation measures to protect river resources from impacts caused by activities associated with commercial groups. Typically, commercial groups have larger group sizes than private groups, and SRP regulations allow the BLM to limit group sizes, trip durations, and activities of commercial groups. In the 2005 Delta River User Survey, there was support (66%) among nonmotorized users for limiting commercial use, and there was more support than opposition among motorized users.

3.2.6.5.10 Facility Development

In 2006, the DWSR Wayside was reconstructed to accommodate increased day use from Denali Highway travelers passing through the river corridor. These renovations included the development of new parking facilities, interpretive walkways and information panels, and reconstruction of the existing boat launch. In 2011, a renovation of the Tangle Lakes Campground is planned. Designated campsites, roadways, and parking facilities will be developed and interpretive panels will be installed throughout the campground.

Survey results indicate that most river users do not support substantial portage area improvements such as outhouses, trail signs, bridges, etc., although there was majority support for improving the main portage trail with native materials and for rehabilitating spur trails. River users were opposed to removing

the portage warning signs and the outhouse. Most participants in the BBM meetings supported a redesign of the Tangle Lakes Campground that preserves the rustic nature of the natural surroundings, and that it should not be overdeveloped like many other campgrounds in the state.

3.2.6.6 Recreation Opportunity Spectrum (ROS)

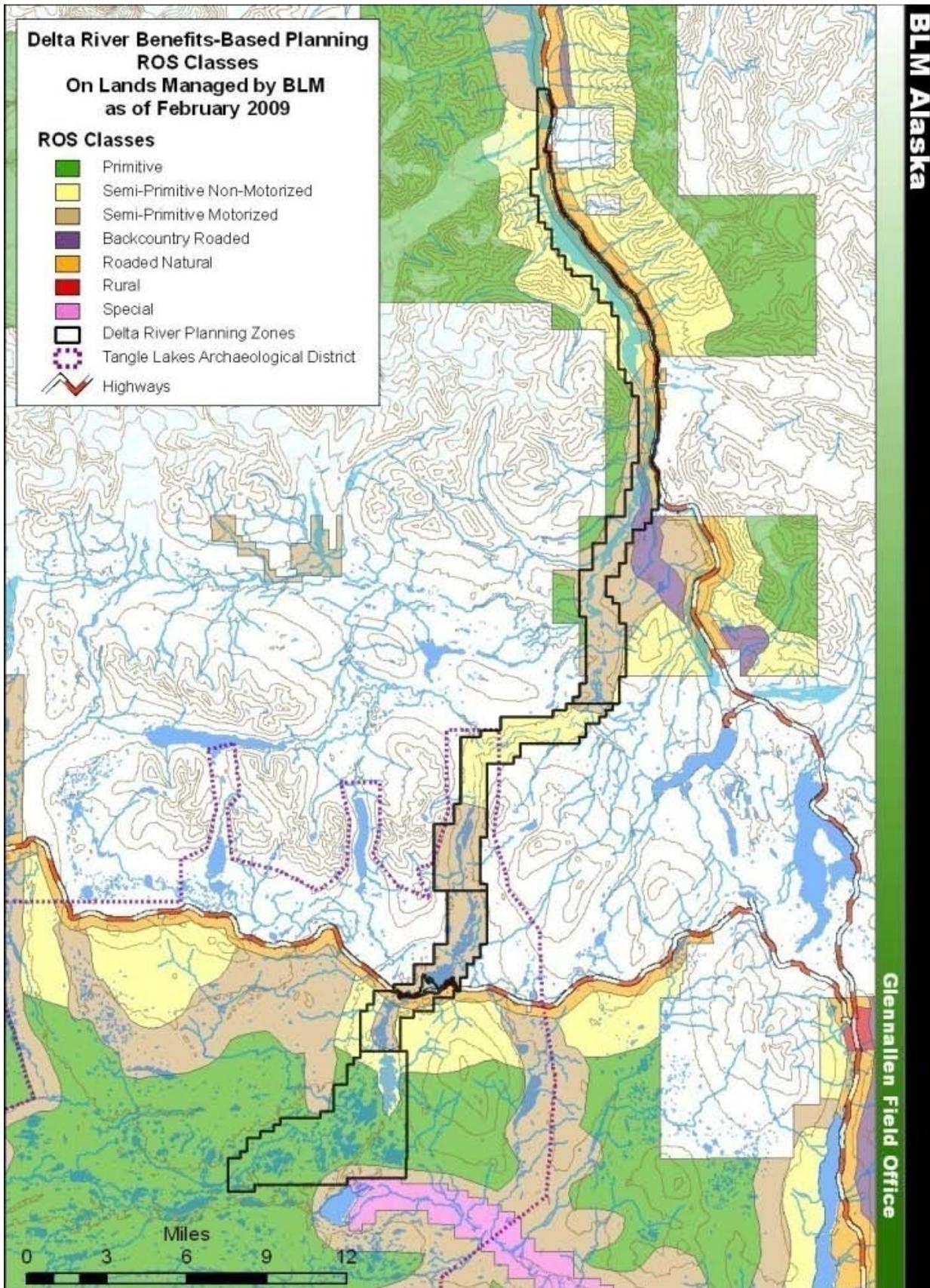
In preparation for the EARMP land use planning effort in 2003, the Glennallen Field Office conducted an inventory of existing recreational opportunities available across the district using the Recreation Opportunity Spectrum (ROS) classification system. The ROS is a framework for classifying and defining different types of outdoor recreation environments, activities, and experience opportunities. ROS classifications help define existing types of recreational opportunities, and management actions can be developed that can be used to maintain or change ROS classifications.

The EARMP designated the DWSR corridor as a SRMA, with objectives to maintain the existing recreation opportunity spectrum classes that were identified during the ROS inventory that was conducted in 2003. These ROS classes included the primitive, semiprimitive nonmotorized, semiprimitive motorized, and roaded natural ROS classes within the river corridor, with an emphasis on managing for a primitive experience in the portion of the DWSR corridor classified as “wild”. ROS classes that were identified during this inventory are depicted in Map 9.

Table 7: Selected Recreation Opportunity Spectrum (ROS) Class Descriptions

ROS Class	Description
Primitive	Area is characterized by essentially unmodified natural environment of fairly large size. Concentration of users is very low and evidence of other users is minimal. No summer motorized trails exist although seasonal motorized use occurs at a low density. Sights and sounds of the road system are nonexistent and area is remote. Human built structures are few and far between or are inconspicuous. Vegetation and soils remain in a natural state.
Semiprimitive Nonmotorized	Area is characterized by a predominantly unmodified natural environment of moderate to large size. Concentration of users is low, but there is often evidence of other users. The area is more accessible than an area in a primitive class, but is free of motorized trails and roads. Sights and sounds of the road system are more prevalent than in the primitive class, but less prevalent than in the roaded natural or backcountry roaded classes. Vegetation and soils are predominantly natural but some impacts exist.
Semiprimitive Motorized	Area is characterized by a predominantly unmodified natural environment of moderate to large size. Concentration of users is low, but there is often evidence of other users. Area is accessible to specialized OHVs but is generally not accessible to most four wheel drive vehicles. Sights and sounds of the road system may or may not be dominant. Some portions of the area may be distant from road systems, but all portions are near motorized trails. Vegetation and soils are predominantly natural but localized areas of disturbance may exist.
Roaded Natural	Area is characterized by a generally natural environment with moderate evidence of the sights and sounds of humans. Resource modification and utilization practices are evident, but harmonize with the environment. Concentration of users is low to moderate, and rustic facilities may exist for user convenience and safety. The area is accessible to conventional motorized vehicles and roads are maintained on a regular basis. Sights and sounds of the road system are evident and traffic levels may be highly variable. Areas of localized vegetation and soil impacts exist. User concentrations are low to moderate but may be high in popular recreational sites such as waysides, trailheads, and water access points.

Map 8: Recreation Opportunity Spectrum (ROS) Classes within the Delta River Corridor



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3.2.6.7 Benefits Based Management (BBM) in the EARMP

Note: For a more complete overview on the BBM planning process, including required land use allocation decisions, management actions, and processes, refer to Appendix 8.1.

The EARMP designated the DWSR corridor as a SRMA. During the preparation of the EARMP, new BBM planning process guidelines were still in development. As a result, only some of the required land use planning allocation decisions that were specified in the new BBM guidelines were implemented. The BLM identified four RMZs and developed a market strategy for the entire SRMA, but did not identify the prescribed setting character and activity planning framework. Appendix 8.1 displays the BBM decisions that were made in the EARMP for the Delta River SRMA.

After completion of the EARMP, the new planning process requirements for BBM were established in the BLM Land Use Planning Handbook, H-1601-1. As a part of this planning process, recreation planners determined that the four existing RMZs were not entirely representative of the current recreational opportunities that are available. For this planning process, focus group meetings helped determine the need for changes to existing RMZ boundaries; primary activities, experiences, and benefits for each RMZ; prescriptions that would promote the desired activities, experiences and benefits; and management actions that form the basis for the activity planning framework. As part of developing the new Delta River SRMA plan, the EARMP must be amended to make the recreation allocation (i.e., land use planning) decisions that were not made in the EARMP, and to make changes to the RMZs and management objectives that were specified in the EARMP.

3.2.7 Scenic Resources

The 1983 DWSR Management Plan describes scenic resources that are found within the DWSR corridor: "The quality of scenery in the Tangle Lakes and Delta River area can be surmised from the previous description of topography. Photographic opportunities are nearly limitless with snow, water, rock, and vegetation interspersed over rolling hills, mountains, and valleys in a manner which provides viewing pleasure equal to the best Alaska has to offer." Scenic qualities were recognized as exemplary in 1983, and a quarter century later, still remain one of the most important resource values in the river corridor. Scenic quality is an essential component of most recreation activities.

In 2003, a visual resources inventory of the DWSR corridor and adjacent lands was conducted. Through spatial analysis of overflight information using GIS software, on-the-ground observations, scenic quality ratings, distance classes, viewshed analysis, sensitivity classes, and specialist input, VRM inventory and management classes were developed. The entire DWSR corridor was specified as a Class I Visual Resource Management (VRM) viewshed, with the primary objective of retaining the existing character of the landscape. Class I VRM objectives state that "The level of change to the characteristic landscape should be low, and management activities may be seen, but should not attract the attention of the casual observer. Any changes must repeat the basic elements of form, line, color and texture that are found in the predominant natural features of the characteristic landscape".

3.2.7.1 Scenic Resources Concerns Related to Recreational Activities

The major disturbances to the viewshed in the DWSR include recreational facilities, dispersed campsites and trails. Facilities developed within the DWSR corridor since 1983 have been targeted at decreasing impacts such as visible human waste (outhouse), vegetation trampling or soil compaction (portage construction), human safety (warning signs at portage and takeout), and increased Denali Highway visitor use (DWSR wayside reconstruction). New facilities have been designed to conform to Class I VRM standards to minimize visual impacts within the river corridor.

Approximately 10 dispersed river campsites have are heavily impacted and evident to the casual observer. Visual impacts come from bare ground and river access points that are out of place with the natural vegetation cover present along most of the river. Trails leading from the riverbank to campsites can become eroded, further impacting scenic resources.

OHV trails that are visible from the river corridor include the Top of the World Trail and two unauthorized OHV trails in the Eureka creek drainage. Unauthorized spur trails have also been created by users to reach the ridge tops from the developed facilities in the vicinity of the Tangle Lakes Campground and

DWSR wayside. The proliferation of unauthorized trails can lead to unsustainable trail systems that can change the visual characteristics of the landscape. In some areas, because of wet and muddy conditions, trail braiding has reached a width of 100-300 feet.

3.2.8 Soil Resources

In the Tangle Lakes area, the DWSR corridor consists of glaciated intermountain basins dominated by porous, gravelly, glacial outwash deposits. Landforms include hills, pitted outwash plains, kettle lakes, and sinuous eskers. Surface drainage patterns are not well established, and only a few of the lakes within the area are connected by streams. Soils immediately adjacent to the Tangle Lakes, Tangle River, and upper Delta River generally consist of a thin mantle of loess over glacial outwash or till and organic materials. Along the clear water section of the river, the banks are considered stable with highly developed riparian vegetation capable of withstanding extreme winter ice events and spring and summer high water events. Once the river becomes glacial, the banks become highly susceptible to erosion due to higher river velocities, high sediment loads, gravelly bank materials, and unstable riparian vegetation.

3.2.8.1 Soil Resources Concerns Related to Recreational Activities

The primary concern related to soil properties and OHV use is the development of unauthorized OHV trails. Unauthorized OHV trails are not maintained by the BLM, and can result in additional trail proliferation and river crossings, potentially impacting soil resources through vegetation loss, soil compaction, soil erosion, and bank instability. Currently, there are four unauthorized OHV trails within the DWSR corridor. Continued use of unauthorized trails will lead to further braiding and erosion, and may contribute to increased sediment in the river. Designated OHV trails within the river corridor (Top of the World and Rainy Creek Trails) are less of a concern because they receive trail maintenance to prevent negative impacts to soil properties.

Concentrated visitor use on the river has increased the potential for vegetation trampling, soil compaction, and soil erosion, especially immediately adjacent to the river. The BLM monitors bare ground at campsites along the river. So far, trampling impacts are limited to vegetation loss and soil compaction within the campsites. Little riverbank erosion is occurring, although the potential for increased riverbank erosion is possible, especially with increased visitor use.

3.2.9 Subsistence

The DWSR corridor is a federal subsistence hunting area and provides exceptional opportunities for caribou and moose harvest. Access to subsistence hunting opportunities is primarily through boating on the river and by using both motorized and nonmotorized trails described in the *Travel Management* section. Other subsistence activities that take place within the river corridor include firewood gathering, berry picking, and trapping.

3.2.9.1 Federal Subsistence Management History

ANILCA provides the basis for federal management of subsistence uses on federal public lands in Alaska under Title VIII. Title VIII §811 states that “rural residents engaged in subsistence uses shall have reasonable access to subsistence resources on the public lands” and permits “appropriate use for subsistence purposes” of “snowmobiles, motorboats, and other means of surface transportation traditionally employed for such purposes by local residents, subject to reasonable regulation.” Subsistence management regulations for the harvest of fish and wildlife on federal public lands are codified in 50 CFR Part 100.

The 1992 Record of Decision on Subsistence Management for Federal Public Lands in Alaska formally established the federal subsistence management program in Alaska under the US Fish and Wildlife Service, Office of Subsistence Management (OSM). The BLM Glennallen Field Office (GFO) was delegated authority to manage and issue federal subsistence hunting permits within its jurisdiction. GFO administers subsistence permits to federally-qualified rural residents for Game Management Unit (GMU) 13. GMU 13 is further subdivided into four subunits. The DWSR is located in GMU 13B. Since 1992, an average of 59% of the federally harvested moose (Fig. 4) and 97% of federally harvested caribou (Fig. 5)

in GMU 13 came out of GMU 13B. In 2008, GFO issued 1124 moose permits and 2536 caribou permits, which constituted 75% of all federal subsistence permits issued in Alaska (OSM, 2009).

Figure 4: Reported harvests for federal moose hunts RM 313 and RM 314 from 1992 to 2009.

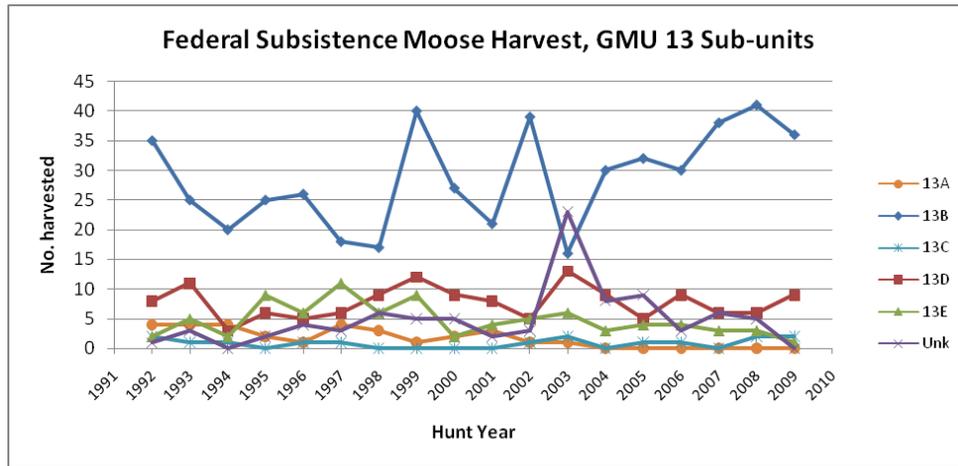
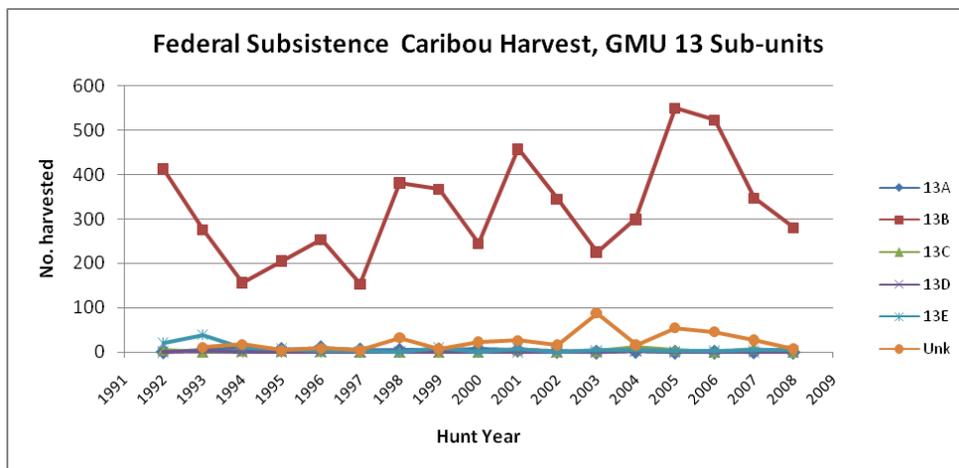


Figure 5: Reported harvests for federal caribou hunts RC513 and RC514 from 1992 to 2008.



3.2.9.2 Subsistence Management Concerns Related to Recreational Activities

Subsistence management concerns related to recreational activities generally involve OHV use and the loss of animal refugia. As technology improves and OHV users are able to reach areas that were previously inaccessible, the number of unauthorized trails may increase. Although the immediate benefit of this type of activity is easy access to the river corridor, the long term effects to subsistence resources may include increased habitat fragmentation, loss of animal refugia and degraded trail conditions.

3.2.10 Travel Management

Travel Management is a comprehensive program that addresses all types of access and transportation activities within the DWSR corridor including motorized, nonmotorized, mechanized, and animal powered modes of transportation.

3.2.10.1 History

Prior to the discovery of gold in the Valdez Creek area, access to the DWSR corridor was historically driven by subsistence activities. Trails within the river corridor provided a route for the Ahtna people to access seasonal hunting opportunities. After the discovery of gold in the Valdez Creek area, these same

trails provided overland access to miners coming from Valdez. The trail to the Maclaren River and Valdez Creek mining areas would eventually become the Denali Highway, completed in 1957. After completion of the Parks Highway in 1972, use levels on the Denali Highway dropped significantly.

The advent of the four wheeled OHV in the early 1990's changed access to the Alaska backcountry. OHVs soon replaced larger vehicles as the primary means of access to hunting, fishing, or recreational destinations throughout Alaska. In the TLAD, the designation of trails and the prohibition of cross-country OHV travel to protect archaeological resources were instituted in the early 1980s.

3.2.10.2 Motorized Trails Description

3.2.10.2.1 Rainy Creek Trail

The Rainy Creek Trail was developed in 1971 to access Federal and State mining claims on Rainy Creek, and is primarily used during the winter months by miners to haul supplies for use during the summer mining season. There has been limited use of this trail for recreational OHV or subsistence purposes, due to the difficulty of crossing the fast moving river with OHVs, which would require using a boat to ferry OHVs and equipment across the river. The Rainy Creek Trail is approximately 10 feet wide and is set back from the river, running through upland spruce vegetation and cover, making it very difficult to see from the river. The Rainy Creek trail is regularly maintained by owners of mining claims on Rainy and Eureka Creeks. Estimated visitor use on this trail in 2009 was approximately 50 OHV users, related primarily to mining access.

The 25 mile trail begins on the west side of the Delta River across from the Phelan Creek pipeline access bridge, which is located at Mile 211 on the Richardson Highway. Miners generally park on the gravel bar, transporting supplies across the river, over the ice, using large sleds pulled by heavy equipment. The trail then runs south along the river for approximately four miles, before turning west along the south side of Rainy Creek. After turning west up Rainy Creek, the trail continues along the West Fork of Rainy Creek, over the pass to the Eureka Creek drainage, and into Broxson Gulch. This portion of the trail was constructed in 1994 to avoid having to use the Top of the World/Yost Trail, which was the historic mining access route to Eureka Creek. The Rainy Creek Trail extension was made to avoid resource damage at the Top of the World/Yost Trail river crossing.

3.2.10.2.2 Top of the World/Yost Trail

The historic Yost Trail was an east-west trending trail connecting the Richardson Highway with the Eureka Creek Mining District, ending near the confluence of Specimen Creek and Eureka Creek. The BLM now calls it the Top of the World Trail. Historically, this trail was used to move mining equipment and to access mining claims, and may date to the early 1900's. In 1994, the BLM authorized the construction of an alternate route to the Eureka Creek drainage, which is now an extension of the Rainy Creek Trail. After the extension of the Rainy Creek Trail, the old Yost Trail receives only occasional use by hunting parties, primarily during subsistence hunting season.

The Top of the World Trail is the most commonly used OHV trail in the DWSR corridor. This trail begins at Mile 205 of the Richardson Highway. The trail heads west, crosses Phelan Creek over a pipeline access bridge, and follows the TAPS pipeline for approximately 2 miles. The next 1.5 miles has numerous boggy and degraded sections of trail where OHV use has created significant trail braiding and large "muckholes". After wet weather, many of these "muckholes" can be challenging to cross, and a defined main trail can be difficult to follow. At mile 3.5, the trail descends into the river corridor down a steep drainage, with numerous ruts, braids, and "muckholes" that have developed due to poor trail construction. Eventually, the trail meets the Delta River, where it abruptly turns south and improves dramatically in quality, running parallel with the river for approximately three miles, terminating at the river's edge. This portion of the trail is in generally good shape with well drained soils. At approximately 8 miles, the trail fords the Delta River.

The river crossing is difficult, and requires crossing three separate river braids, ending at a deep pond created by a beaver dam. After the beaver pond, the trail heads southwest for 0.6 miles up a steep hill with sections of severe washouts and subsequent braiding. There is a spur off of this trail that accesses a former cabin site. Occasionally, OHVs are transported upriver by jet boat and stage at this former cabin site to access the trail without having to cross the river channel. Once on the ridge top overlooking the

Delta River, the trail continues northwest outside the river corridor, and follows the historic Yost Trail, towards the Eureka Creek drainage. From this point the trail shows little signs of recent use by OHVs, presumably due to the difficult river crossing. Eventually, the trail crosses the outlet stream of Fish Lake, before arriving at Eureka Creek. High water volume in Eureka Creek presents an unlikely and dangerous OHV crossing. Total length of this trail is approximately 8 miles to the Delta River, and 25 miles to Eureka Creek. Estimated visitor use on this trail (within the DWSR corridor) in 2009 was approximately 150 OHV users.

3.2.10.2.3 Eureka Creek Trails

In 2006, two new unauthorized trails, measuring approximately 0.5 miles each within the river corridor, were discovered proceeding up the western ridge, immediately to the south of the Eureka Creek confluence with the Delta River. The only way to access these trails is to ferry OHVs upstream by boat, staging at the large gravel bar at the Eureka Creek confluence. These new trails are significantly rutted, and after an archaeological inspection, one was determined to be running directly across two archaeological sites (Jangala et al 2009). One of these sites is a rare buried site that may contain intact stratigraphic context and dateable materials. The site may be eligible for the National Register of Historic Places for its potential to contribute to knowledge about prehistoric uses of the river corridor. This trail was immediately closed to protect these archaeological sites. The combined estimated visitor use on both of these unauthorized trails in 2009 was approximately 15 OHV users.

3.2.10.2.4 Round Tangle Lake Trail

The unauthorized Round Tangle Lake Trail begins at a small paved pullout at Mile 20.8 of the Denali Highway, which is the site of the original Tangle Lakes Campground. A gravel road heads northeast to the shore of Round Tangle Lake, and becomes an OHV trail as it contours northeast around the lake, close to the lakeshore. At .6 miles the trail reconnects with the highway just across from the Tangle Lakes Inn. The trail continues along the highway shoulder for approximately 75 feet, and then continues as a foot trail to a small peninsula, ending back at the lakeshore. Total length of this trail is approximately 0.8 miles. This trail provides access to Round Tangle Lake and multiple fishing sites along the lakeshore. The initial gravel road has large potholes and deep puddles of standing water. The rest of the trail is in good condition with well drained soils, and only small sections are wet and muddy after prolonged rain. Estimated visitor use on this unauthorized trail in 2009 was approximately 50 OHV users.

3.2.10.2.5 Mile 22 Denali Highway North Trail

This unauthorized trail starts at MP 22 North on the Denali Highway. The trail begins in an old gravel pit, and narrows into a rutted and muddy OHV trail, contouring between the edge of a small lake and steep esker ridge. The trail eventually peaks out at approximately .8 miles, and was most likely developed as a hunting lookout. This unauthorized trail has been determined to be running directly across one archaeological site (Jangala et al 2009). This site is a rare buried site that may contain intact stratigraphic context and dateable materials. The site may be eligible as a contributing property for the TLAD for its potential to contribute to knowledge about prehistoric uses of the river corridor. This trail was immediately closed to protect this archaeological site. Estimated visitor use on this unauthorized trail in 2009 was approximately 15 OHV users.

3.2.10.3 Nonmotorized Trails Description

3.2.10.3.1 Lower Tangles Ridge Trail

This foot trail begins 100 feet to the west of the register stand at the entrance to the Tangle Lakes Campground. In the summer of 2008, extensive work was done on this trail to reduce the impacts of trail proliferation and tread sloughing that was occurring from user created spur trails originating from the Tangle Lakes Campground. The trail has been repaired using proper trail construction methods, and is now a distinguishable single track trail for the first 0.25 miles as it climbs the ridge above and west of Round Tangle Lake. Once on the ridge, the trail forks with one branch heading southwest, and the other to the north. The northern spur ends after approximately 1 mile. The other spur heads southwest, and ends on the Denali Highway near the DWSR Wayside. This trail is an exceptional candidate for an interpretive/nature walk with informational signage regarding the cultural/ natural/geological realms and

history of the region. Total length of this trail is approximately 1.9 miles. **Estimated visitor use on this trail in 2009 was approximately 1300 users.**

3.2.10.3.2 Rock Creek Trail

This foot trail begins at Mile 22 South of the Denali Highway, and proceeds south into the Upper Tangle Lakes area. After a steep 50 foot elevation gain, the trail levels on a ridge and continues to the south, accessing the Rock Creek drainage. It is also possible to gain access to the ridge by walking down a closed gravel road until the lake is almost reached, and then heading up a steep game trail that connects with the trail above on the ridge. The last 0.1 mile of this trail is very steep and rocky as it drops down to Rock Creek. From this point, cross country travel is a possibility as the terrain is open and offers relatively easy travel. This trail offers outstanding views of the surrounding area. It provides access to fishing or hiking near the Rock Creek inlet into the Upper Tangle Lakes. The Rock Creek Trail is in excellent condition once the initial hill is surmounted and the ridge is gained. The initial steep section of trail leading up to the ridge may benefit from tread leveling, steps, and water control features. The rest of the trail is well drained with surface types ranging from mixed fines, cobbles, and tundra mat. The steep hill near the end of the trail could be very challenging or impossible for some hikers. This trail is a candidate for improvement measures and possibly as an interpretive walk. Total length of this trail is approximately 1.3 miles. **Estimated visitor use on this trail in 2009 was approximately 500 users.**

3.2.10.3.3 Upper Tangles Ridge Trail

This foot trail begins at Mile 21 on the Denali Highway; 100 feet to the east of the Denali Highway Bridge that crosses the Tangle River. After a steep 75 foot elevation gain, the trail levels and follows the ridge south into the Upper Tangles. The first 0.25 miles of trail are somewhat overgrown and prone to sloughing, as the trail closely follows the edge of a steep bluff. Braids exist in this area as a result of hikers avoiding the brush and exposed sections. Atop a prominent hill after about 0.75 miles, the trail splits to the east and west. The eastern trail is not commonly used and ends after 0.25 miles. The western spur continues along the esker ridges above the Upper Tangle Lakes, proceeding southwest, eventually ending atop a small hill. From this point, cross country travel is a possibility as the terrain is open and offers relatively easy travel. The trail is well drained with surface types ranging from mixed fines, cobbles, and tundra mat. Sloughing of the trail sections within the first 400 yards of trail should be remediated by simply rerouting the trail to avoid the steep ridge. Double tracks and braids should be closed to minimize impacts. This trail is a candidate for improvement measures and possibly as an interpretive walk. Total length of this trail is approximately 1.5 miles. **Estimated visitor use on this trail in 2009 was approximately 150 users.**

3.2.10.4 OHV Use and Characteristics

The DWSR corridor is a federal subsistence hunting area and the primary purpose for OHV use within the river corridor is for large game hunting. Very little recreational OHV use has been documented on any of the OHV trails in the river corridor. For most subsistence and sport hunters, these trails serve as the only means of access into the area. The BLM issues federal subsistence hunting permits for both moose and caribou to local rural residents. These permits are limited to local rural residents and there is a slow upward trend based on a slowly increasing population in the Copper Basin. For example, in 1990, when the federal subsistence hunting program started, there were 593 permits issued for moose and has increased about 3% per year to 1,077 permits in 2006. The trend for caribou permits is similar.

Although current OHV use is relatively low, BLM data shows an increasing trend in motorized use across the Glennallen Field Office. In a five year period (2002-2006), overall OHV use within the TLAD increased approximately 5% per year. This is based on the five year use figures from trail counters, trail register sheets, and visual observations. Given the knowledge of increasing OHV use throughout the rest of the district, and the potential for resource damages caused by increased OHV use, OHV use characteristics were documented in the 2005 Delta River User Survey. Results indicate the following:

- Results show that most non-OHV users don't even know OHV trails exist within the corridor, and less than a third actually has had encounters with OHVs.
- Most OHV users reported using 4-wheelers (90%), while some users reported using tracked rigs (10%).

- Approximately 33% of Top of the World Trail OHV users used a motorized boat to ferry OHVs upriver.
- Average OHV group size was three people, with duration of 2.5 days trip length.
- OHV users within the river corridor reported that low and medium level OHV impacts were acceptable, but that severe impacts were unacceptable. In contrast, most non-OHV users felt that only minimal OHV impacts were acceptable.
- OHV users within the river corridor felt that no additional OHV management is necessary in the corridor, and that access is more important than reducing impacts. In contrast, most non-OHV users felt that OHV use should be intensely managed within the river corridor, even if it reduces access.
- Most current OHV users in the river corridor strongly disagree that OHV use is a “social values conflict” (the notion that actual encounters are the problem, and “some places simply should not have any motorized use”). In contrast, 8 of 10 of the non-OHV users agree with this idea.
- A majority of all users felt that the BLM should improve OHV trails to minimize places with unacceptable impacts using geoblock, planking, and water bars.
- In general, most OHV users appear to believe that potential biological impacts are the primary concern; if those are low, they do not appear to have much concern about whether OHV use changes the primitive nature of the setting. In contrast, most non-OHV users appear concerned about experiential impacts, as well as biological ones.

3.2.10.4.1 EARMF OHV Decisions

The EARMF designated the DWSR corridor as “limited” to OHVs. The EARMF directed that “OHVs would be restricted to designated trails (Top of the World Trail and Rainy Creek Trail) from May 15 to October 16, or when there is less than an average of 12 inches snow or 6 inches frost. These designated trails are existing routes, and will not limit access into the area for subsistence hunting or access to mining claims. This decision does not preclude the future consideration of the development of motorized or nonmotorized trails, if consistent with protection of the outstandingly remarkable values of the river corridor. If additional trails are considered for designation in the future, they would be located to minimize resource damage, maintain primitive and semiprimitive recreation experiences, and facilitate the maintenance of designated trails”. The EARMF also directed that each area designated as “limited” to OHVs would have an implementation level plan completed, showing a complete inventory of trails in the area, specific resource concerns or conflicts, and specific designated trails and conditions of limitations (seasonal, weight, or vehicle class, etc). These plans would describe the tools necessary for implementation (method of signing specific trails, trailhead development, education/interpretation, map production, and law enforcement) and would identify and prioritize specific maintenance needs, as well as opportunities for trail development or loops, both motorized and nonmotorized.

3.2.10.5 Motorized Boating Use and Characteristics

3.2.10.5.1 Use Characteristics

Motorized boating occurs throughout most reaches of the Delta River corridor, and is limited in certain areas by a combination of water depth and geography. In 2009, motorized boating use throughout the entire river corridor was estimated to be approximately 968 users. The vast majority of motorized boating occurs on the Tangle Lakes, adjacent to the developed facilities. These lakes receive many different types of use, ranging from smaller horsepower motors attached to canoes to large jet units, with occasional inboard units as well. For the most part, these larger boats are restricted to the lakes in the immediate vicinity of the developed facilities due to the shallow waters of Long Tangle Lake. In recent years, especially during subsistence hunting season, motorized boats have ventured up the Tangle River into the Upper Tangle Lakes. Safety concerns have surfaced with increased use of the canoe loop route since nonmotorized floaters proceeding down the Tangle River can be met by motorized boats that must maintain speed to stay on step, leading to high potential for collisions. Occasionally, motorized boaters (typically with small, detachable 5 to 15 horsepower motors) will portage their boats and motors across the first portage of the Upper Tangles to access the second lake on the other side of the portage.

Motorized boating on the Lower Tangles is also limited by geography, as shallow reaches between lakes often impede travel. The first shallow reaches beyond Round Tangle Lake can typically be navigated by motorized craft, but the shallow reach between Long Tangle Lake and Lower Tangle Lake is nearly impossible to negotiate. Documented use of motorized boats is very rare beyond this point.

Motorized boating is less common on the lower Delta River than the Tangle Lakes, primarily due to the difficulty of negotiating the shallow, braided channels of the broad Delta River floodplain. The water in this stretch is glacial water, and the river is severely channelized, making motorized possible by only very experienced operators. The geography and water levels in this section may help to naturally limit motorized boating during the summer floating season, but motorized boating still occurs during the subsistence hunting season. Motorized boats are usually launched at the Mile 212.5 Richardson Highway takeout, and travel upstream to the vicinity of Garret Creek, where dispersed campsites along the river are often occupied by motorized boating groups during hunting season. Travel upstream beyond Garrett Creek is difficult due to shallow water depths, but use has been documented by the BLM. In all cases, motorized boats cannot proceed upriver beyond the Delta River portage, due to a series of large waterfalls in the canyon. Motorized boats seldom travel downriver from the Mile 212.5 Richardson Highway takeout for many of the same reasons described above. The large, glacial delta is difficult to navigate, the highway is very close to the river on the east side, and on the west side the rugged mountains of the Alaska Range effectively limit access to most recreational opportunities.

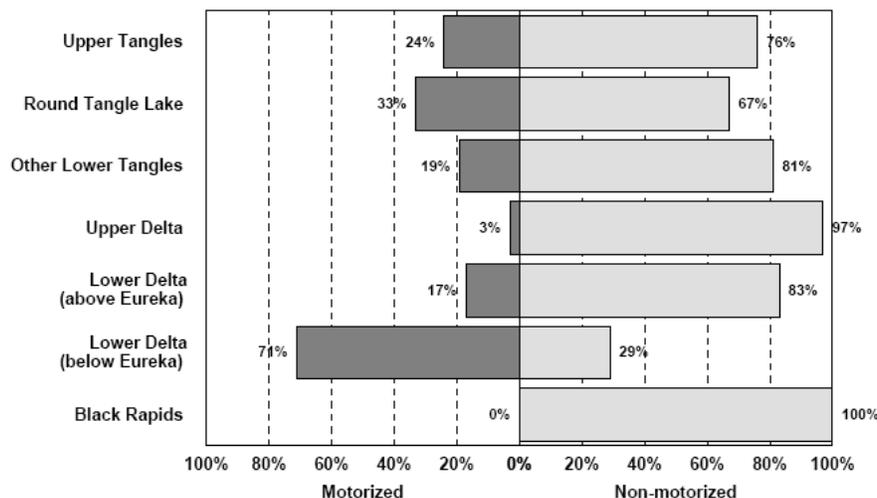
3.2.10.5.2 Management Policy and Legislative Controls

BLM policy on “wild” segments of WSRs states: “Motorized travel on land or water could be permitted, but it is generally not compatible with this river classification. Normally, motorized use will be prohibited in a wild river area.” However, Title VIII of ANILCA, § 811 allows for the “appropriate use for subsistence purposes of snowmobiles, motorboats, and other means of surface transportation traditionally employed for such purposes by local residents, subject to reasonable regulation”, and Title XI § 1110 allows for the “use of snowmachines, motorboats, airplanes, and nonmotorized surface transportation methods” within Conservation System Units for traditional activities, also subject to reasonable regulations. Title XI of ANILCA § 1110 allows for the temporary or permanent closure of such activities if the appropriate managing federal agency finds that such use would be detrimental to the resource values of the area.

3.2.10.5.3 2005 Delta River User Survey Data

In the 2005 Delta River User Survey, respondents who use motorized boats to access the Tangle Lakes or Delta River were asked to describe boat type, length, and horsepower. Of those who reported any motorized boating use, 33% use jet boats, 31% use propeller driven boats, 23% use kickers on rafts or canoes, 3% use air boats, and 10% use other types of motorized boats. On the Lower Delta, jet boat use is most common (83%) although 17% use propeller driven boats. Boats typically ranged from 14 to 22 feet long, with a median length of 18 feet. Horsepower ranged from 20 to 350, with a median of 115 horsepower. On the Upper Tangles, 39% of respondents use kickers on canoes or rafts, 32% use propeller driven powerboats and 14% use jet boats. On the Lower Tangles, 27% use kickers on canoes or rafts, 45% use propeller driven powerboats, 27% use jet boats, and the rest were classified as “other.” Most lake motorized boats were less than 18 feet long (median length was 15 feet) and 57% were less than 15 horsepower (the current recommended BLM limit). However, other boats had as much as 115 horsepower. Relative proportions by segment (Figure 6) show that 67% to 100% of boats were nonmotorized, except for the Lower Delta below Eureka Creek.

Figure 6: Proportion of motorized and nonmotorized craft by segment, 2000-2004



Additional river user survey data related to motorized and nonmotorized boating from the 2005 Delta River User Survey indicates the following:

- A majority of motorized users (59%) supported restrictions on the use of personal watercraft (jetski and hovercraft), while 91% of nonmotorized users supported this restriction.
- Motorized users were generally united in opposing total motorized prohibitions, but some motorized users believed that larger motorboats may not be necessary on some lakes, or that not all lakes may be appropriate for motorized use. Small proportions (15%) of motorized users support motorized restrictions below the shallow reach downstream of Long Tangle Lake, while 37% supported a 15 horsepower restriction below Round Tangle Lake.
- Regarding the relative ranking of specific reasons for motorized boating restrictions, motorized users rated discourteous behavior at the top of their list. Safety and potential biophysical impacts were also rated highly for motorized users.
- Nonmotorized users, in contrast, rated noise, the notion that motors are inappropriate in some places, and ensuring the availability of nonmotorized experiences as their most important reasons to limit motorized use.
- Temporal zoning options (e.g. no motorized use outside of hunting season) and spatial zoning options (e.g. no motorized use on the Upper Delta), were strongly opposed by most motorized users.

3.2.10.5.4 Overflight Observations

The BLM uses river overflights as one source of estimating visitor use on the Delta River. The resulting information is accurate enough to gauge use trends for different segments through use seasons and over several years. The BLM flew the DWSR corridor on 37 occasions from 2000 through 2004, spacing overflights relatively evenly from June through early September. Observers counted the number of boats of various types (motorboats, driftboats, canoes, kayaks, rafts, personal watercraft, etc.) for each segment. This technique provides an accurate count of boats, but it does not attempt to count groups or the numbers of people. Of the 560 boats observed on overflights from 2000 to 2004, 422 or 75% were nonmotorized and 138 or 25% were motorized. Figure 7 displays the average number of boats per river segment (on days that any were observed) on overflights from 2000 to 2004:

Figure 7: Average number of boats per river segment (on days that any were observed)

	Upper Tangles	Round Tangle	Other Lower Tangles	Upper Delta	Lower Delta (above Eureka)	Lower Delta (below Eureka)	Black Rapids
Non-motorized boats	3.8	3.6	4.3	4.5	1.7	2.0	1.0
Motorized boats	1.9	2.1	1.9	2.0	3.4	1.7	--

3.2.10.6 Nonmotorized Boating Use and Characteristics

Nonmotorized boating occurs throughout the entire system, as most lakes and the river can be traveled in a relatively short amount of time (2-3 days). In 2009, nonmotorized boating use within the DWSR was estimated to be approximately 2904 visitors. There are essentially three different boating options available on the Delta River:

1. Upper Tangle Lakes:

Boat launch facilities at the DWSR wayside provide access to the Upper Tangle Lakes system. Motorized boaters are primarily confined to the first lake of the Upper Tangles, unless they carry their boat and motor across the first portage to the second lake. Occasionally, motorized boats travel up the shallow Tangle River to Mud Lake. Nonmotorized craft typically travel through the first lake, then portage to the second lake. At the southern end of the second lake, another portage provides access to a third lake (Mud Lake). From here boaters generally travel northwest into the Tangle River or south to Dickey Lake.

2. Delta River:

Boat launch facilities at the Tangle Lakes Campground provide access to the Lower Tangle Lakes and Delta River. Round Tangle Lake, adjacent to the campground and boat launch, is primarily used for day use activities, by motorized and nonmotorized boaters. Those wishing to access the upper Delta River can continue north through the Lower Tangle Lakes. The first nine miles of this trip cross through three of the Lower Tangle Lakes, which are all connected by shallow channels of slow moving water. Motorized boats generally do not proceed beyond the shallow constriction of Long Tangle Lake. Eventually, the river begins to flow north out of Lower Tangle Lake, carving its way through the Amphitheater Mountains and the foothills of the Alaska Range. It is 20 miles from the outlet of Lower Tangle Lake to the takeout point located at Mile 212.5 on the Richardson Highway.

The first few river miles are shallow and rocky, Class I-II water. Following this first section, there is a portage around a series of waterfalls on the east side of the river. The river portage is marked with yellow caution signs on both sides of the river. Below the falls and portage, the river narrows and the velocity increases significantly for the next two miles of Class II rapids. The next 12 river miles are slow, meandering, Class I water. At the confluence of Eureka Creek, the river changes from clear water to silty glacial water. The last 7 river miles are often shallow and braided, with numerous channels and gravel bars. The water is swift and generally Class II. Motorized boats use this section of the river, and generally travel between Phalen and Garrett Creeks. Almost all floaters take out just below Phalen Creek at Mile 212.5 on the Richardson Highway. The exact takeout location varies from year to year due to changes in the river channel. Parking is available adjacent to the river, and the takeout is marked with a large yellow caution sign. The vehicle shuttle from the Tangle Lakes Campground launch point to the river takeout is 49 miles on the Richardson and Denali Highways.

3. Lower Delta River:

The Richardson Highway parallels the Delta River from Phalen Creek to the northern river corridor boundary, which terminates just downstream of Black Rapids Glacier near the confluence of One Mile Creek. Experienced boaters sometimes continue approximately 18 river miles downstream, past the Black Rapids Glacier. The river becomes very swift with typical glacial river characteristics and is rated Class III-IV. There are no designated takeout points for this portion of the DWSR, but the Richardson Highway parallels the river in numerous locations.

3.2.10.7 Aviation

The use of airplanes within the DWSR corridor is limited because there are no existing airstrips. Airplane landings in the developed facilities (RMZ 3) have never been observed by the BLM, likely due to the lack of suitable landing areas. Occasionally, floatplanes will land on the larger lakes within the river corridor for the purpose of transporting fishermen and hunters. In the Upper Tangles there are numerous lakes, both inside and outside the river corridor, that provide opportunities for float plane landings. In 2009, it was estimated that approximately 2-4 airplane landings occurred in the Upper Tangles. Dickey Lake, located adjacent to both the Delta and Gulkana WSR corridors, provides access to the headwaters of both river systems. Occasionally, float planes also land on the Lower Tangle Lakes. In 2009, it was estimated that approximately 4-6 airplane landings occurred in the Lower Tangle Lakes. Float planes seldom, if ever, land on the narrow river column, due to shallow water conditions and lack of large gravel bars. The BLM uses fixed wing aircraft to monitor visitor use along the river corridor. Approximately 8 flights occur each summer. In addition, trumpeter swan and bald eagle productivity studies are conducted using fixed wing aircraft.

Helicopters are occasionally used by State agencies and the BLM for logistical support in various resource projects. Helicopter use related to mining activities located adjacent to the river corridor has been increasing in recent years. The BLM has worked with these mining companies in the past to limit the occurrence of helicopters flying parallel to the river corridor, and has requested that these flights cross the river corridor quickly and as seldom as possible.

In 1997, the Federal Aviation Administration and United States Air Force, after conducting an Environmental Impact Statement, issued a Record of Decision that, in part, modified the boundaries of

the Fox Military Operations Area (MOA) to exclude the DWSR corridor. A MOA is a Special Use Airspace designated for non-hazardous military flight activities such as air combat tactics, transition, formation training, and aerobatics. The new boundaries of the FOX MOA were situated on the western boundary of the Delta River, and include portions of the Denali Highway to the west of the river corridor. The average daily military aircraft operations in the Fox MOA is estimated to be 16 aircraft operations per day in a routine flying day and up to 80 aircraft operations per day during specialized training. The Air to Ground Level (AGL) for the FOX MOA is 5000 feet.

In January 2011, the scoping period for a new Environmental Impact Statement was initiated by the United States Air Force to expand the FOX MOA and to create a new Paxson MOA that would encompass the entire DWSR corridor and lands to east and west of the river corridor, with a reduced AGL of 500 feet and additional sorties per day. The BLM has and will continue to work with the FAA and United States Air Force to discuss the potential effects to recreational users by low level overflights within and/or adjacent to the river corridor.

3.2.10.8 Winter Use

The DWSR corridor is used during the winter months for trapping and late season subsistence hunting, as well as recreational use. Winter use within the DWSR corridor is relatively low, primarily consisting of snowmachining, snowshoeing, dog mushing, and cross-country skiing. In 2009, it was estimated that approximately 100 users participated in snowshoeing, dog mushing, and cross-country skiing within the river corridor. 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. In 2009, it was estimated that approximately 500 users participated in snowmachining within the river corridor; primarily pass through users on the Denali Highway. Respondents at the BBM meetings indicated that they had not seen a noticeable increase in wintertime use. They identified “more regulation” or “loss of access” as the biggest potential threat to wintertime use in the DWSR corridor. The EARMP directed that snowmachines may be temporarily limited to designated trails to minimize disturbances to heavy concentrations of wintering moose within the river corridor, but limits have not been implemented.

3.2.10.9 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. During the BBM meetings held in 2007, there were some participants who said they used horses and pack stock in the Garrett Creek drainage and throughout the lower river corridor. The BLM has never visually observed horses or pack stock being used in the backcountry within the river corridor, but on a few occasions groups have camped at the Tangle Lakes Campground with horses and pack stock. These groups usually tow their horse trailers to the campground, set up a temporary corral, distribute hay within the campsite, and ride their horses throughout the developed facilities and along the Denali Highway. In 2009, it was estimated that approximately 10 users participated in animal powered recreation within the river corridor. The primary concerns associated with animal powered recreation in the DWSR corridor is the possibility of introducing invasive and/or noxious weeds in hay used for horse fodder, as well as straw used to bed down sled dogs during the winter, and animal feces left behind in the developed facilities.

3.2.10.10 Mechanized Travel

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 never been documented in the uplands or backcountry areas. In 2009, it was estimated that approximately 100 users participated in mechanized travel within the developed facilities. 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.

3.2.11 Vegetation

Within the DWSR corridor, vegetation reflects differences in slope, aspect, soils, elevation, moisture availability, and the presence or absence of permafrost. Vegetation cover types range from herbaceous

and scrub communities (Alaska Vegetation Classifications IIC and IIIA; Viereck 1992) in the upper Tangle Lakes area to needleleaf forests and woodlands, and mixed forests (Alaska Vegetation Classification IA, and IC, Viereck 1992) in the lower reaches of the river. Vegetation in the Tangle Lakes area includes low shrub birch/lichen, mesic shrub tundra, tussock tundra and open taiga. Permafrost occupied sites are commonly represented by cottongrass tussock and dwarf birch-ericaceous scrub vegetation. Alpine communities are interspersed with patches of lichen. Sparse patches of trees are found at elevations below 3,100 feet including white and black spruce, balsam poplar and alder. Many people travel to the Tangle Lakes area to pick blueberries. Other berries found in the area include crowberry, alpine bearberry, low bush cranberry, high bush cranberry, and red currant.

The abundant shrubs cover types in the river corridor are dominated by dwarf birch, willows and alder. A number of herbs, grasses, mosses, and sedges are also found throughout the area. Plant communities along the mid and lower sections of the river corridor include riparian scrub on flood plains with open spruce-poplar-alder forests occupying higher floodplains and lowland sites along the river, and some mid slopes of hillsides adjacent to the river. Understory plants are varied and abundant. Grasses are the dominant herbaceous species. Fireweed, bistort, alpine azalea, rose, horsetails, ferns, mosses, lichens, Labrador tea, cassiope, mountain-avens, burnet, and shrubby cinquefoil are among the many other plants found in this area.

Currently the vegetation cover types along the Delta River provide diversity to fulfill healthy habitat needs for fish and wildlife along the river. Forestry practices are allowed within Special Recreation Management Areas. Within the DWSR commercial logging is not permitted, and minimally permitted firewood gathering occurs on a personal use basis. Wildfires have a limited affect on landscapes and plant communities of the Delta River Area. Evidence of fire, such as charcoal, is rarely observed in area soils. Based on preliminary findings of a 2009 rare plants inventory conducted on the Upper Tangles and Delta River by the Alaska Natural Heritage Program (Carlson 2006), no rare plants or BLM Sensitive Status Species of plants were found or documented at sites visited.

3.2.11.1 Invasive, Non-native Plant Species

The introduction and spread of non-native invasive plants (weeds) in Alaska has become a concern. Invasive plant species are more prevalent in urbanized areas and along travel corridors where vehicles transport seeds throughout Alaska. Weed control efforts to date have been primarily concentrated on increasing public awareness and prevention. There are currently 14 plant species on the State of Alaska Restricted Noxious Weeds lists, of which none are found within the DWSR. An inventory of non-native invasive plants within the Delta River corridor was conducted during the summer of 2008 by the University of Alaska Anchorage Natural Heritage Program (Cortez-Burns 2009). This assessment found the river corridor relatively free from non-native invasive plants. Only the BLM Tangle Lakes Wayside boat launch was found to hosts small infestations of invasive plants, all of which rank low for aggressiveness and are listed below:

- common plantain, *Plantago major*
- annual bluegrass, *Poa annua*
- chickweed, *Stellaria media*
- pineapple weed, *Matricaria discoidea*
- common dandelion, *Paraxacum officinale*

None of these species were present in percent covers greater than 20% and none are considered to be capable of invading undisturbed native vegetation in Alaska, except for the common dandelion, which is widespread across the state and possibly hybridizes with native dandelion. These infestations are prioritized for control and eradication.

3.2.11.2 Vegetation Management Concerns Related to Recreational Activities

The primary management concerns related to vegetation resources and recreational use are the development of unauthorized OHV trails, vegetation trampling at river campsites, and the introduction of invasive weeds. Unauthorized OHV trails are not maintained and can result in additional trail proliferation, potentially impacting vegetative resources through vegetation loss and compaction. Visitor use along the river has resulted in the development of dispersed campsites. Vegetation trampling is evident at almost all of the campsites along the river, ranging from slight trampling to the removal of all

vegetation cover and soil compaction, resulting in bare ground. Vegetation impacts also include cutting of live trees for firewood, game poles, or tent poles. Noxious and invasive weeds may be more prevalent near settled areas, but their populations are suspected to be increasing in remote areas as well. OHV use (especially summer and fall use), communication sites, right-of-way development, hiking and climbing, trail construction, nonmotorized recreational activities, and utility systems or other development activities could result in increased infestations of noxious or invasive plant species (CNIPM 2001).

3.2.12 Water Quality

The DWSR can be characterized as a free-flowing river with excellent water quality. There are numerous examples of pristine natural conditions, including cascading waterfalls, seasonally continuous rapids, meandering river oxbows, and an active flood regime. Largely intact hydrologic processes create a diversity of exceptional hydrologic features, and contribute to the integrity of river-related ecosystems. The DWSR is a clear water river from the headwaters near Dickey Lake to the confluence with Eureka Creek. From Eureka Creek to the end of the corridor boundary, the river becomes heavily laden with glacial sediment. The free-flowing nature of the river, adequate volume, and relatively protected watershed generally provides superior water quality.

Information from the U.S. Geological Survey, the Environmental Protection Agency, the University of Alaska and the State of Alaska does not indicate that there are any system-wide concerns at the present with water quality in the Delta River. BLM water quality monitoring on the Delta has been minimal and has consisted of samples taken with uncalibrated BLM water quality instruments at various clear water locations between 2000 and 2003. Measurements of dissolved oxygen, turbidity, pH, temperature, and specific conductivity indicate water quality is within state standards and well within the ability to sustain healthy fisheries as indicated by a recent ADF&G Arctic grayling study.

Turbidity on the Delta River clear water system is somewhat influenced by natural processes. The upper portion of the corridor is a wide valley with a highly interconnected and stable low gradient lake and river system. The stream channel is stable due to the presence of cohesive bank materials and developed riparian vegetation. Once below the falls, where the Delta River crosses the Denali fault, the river valley is more constricted on both sides by a mountain lined valley, resulting in gradient and water velocity increases. The river occasionally splits into two or more braids, but the channel is stable and the riparian vegetation is well developed. The valley gradually opens up and the clear water system slows and meanders. Within the clear water section, the sediment supply and bed load contributions during high water events is relatively low. Once below Eureka Creek (the first glacial tributary), the Delta river becomes turbid and braided with the intrusion of glacial sediment from tributary glacier creeks and high mountain snow melt. Major glacial tributaries include: Eureka Creek, Rainy Creek, Phalen Creek, and Black Rapids Glacier.

3.2.12.1 Water Quality Concerns Related to Recreational Activities

Water quality concerns are related to human waste disposal, petroleum hydrocarbons from boat motors, OHV use and campsite use. Human waste is disposed of in a variety of manners, dependent on river users, outdoor skills and river ethics. Increased use and improper human waste disposal methods could potentially impact water quality. Although there has been no water quality testing done for fecal coliform on the Delta River, the BLM assumes the levels for fecal coliform would conform to State water quality standards. The State of Alaska currently has regulations prohibiting the disposal of human waste within 100 feet of the ordinary high water mark of a lake or river.

Some amount of the fuel that enters into boat motors is discharged into the water unburned. 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). 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 dispersed. (The Effects of Motorized Watercraft on Aquatic Ecosystems, Asplund, 2000). The current federal water quality standard adopted by the State of Alaska for petroleum hydrocarbons, oils, and grease in waterbodies is: "Total aqueous hydrocarbons in the water column may not exceed 15 ug/l. Total aromatic hydrocarbons in the water column may not exceed 10 ug/l. There may be no concentrations of petroleum hydrocarbons, animal fats, or vegetable oils in shoreline or bottom sediments that cause

deleterious effects to aquatic life. Surface waters and adjoining shorelines must be virtually free from floating oil, film, sheen, or discoloration.”

The Top of the World Trail is the only designated OHV trail that crosses the clear water section of the river corridor, a few miles above the Eureka Creek confluence; erosion is highly evident on both the eastern and western hillsides adjacent to the Top of the World Trail. Unmanaged trails and river crossings in this clear water section has the potential to impact water quality by contributing sediment to the river. Visitor use on the river has increased the concern for potential bank erosion and increased sedimentation caused by bank trampling. The BLM monitors bare ground at campsite access points along the river. So far, trampling impacts are primarily limited to vegetation and soil compaction, although some erosion is occurring at popular campsite areas.

3.2.13 Wilderness Characteristics

There are no designated wilderness areas or wilderness study areas within the planning area, but there are areas that possess the sufficient size requirements (at least 5000 acres), outstanding opportunities for solitude or a primitive and unconfined recreation experience, and high levels of naturalness; attributes commonly referred to as wilderness characteristics. Areas having wilderness characteristics are most often present in primitive and semiprimitive nonmotorized ROS classification areas. ROS classification areas for the DWSR corridor are discussed in Chapter 3.2.6.6.

The BLM maintains an inventory of all lands under its jurisdiction, pursuant to Section 201 (a) of the Federal Land Policy and Management Act of 1976 (FLPMA):

Sec. 201. [43 U.S.C. 1711] (a) The Secretary shall prepare and maintain on a continuing basis an inventory of all public lands and their resource and other values (including, but not limited to, outdoor recreation and scenic values), giving priority to areas of critical environmental concern. This inventory shall be kept current so as to reflect changes in conditions and to identify new and emerging resource and other values. The preparation and maintenance of such inventory or the identification of such areas shall not, of itself, change or prevent change of the management or use of public lands.

As required by law, the BLM must maintain inventories of lands under its jurisdiction, including lands with wilderness characteristics. Also, consistent with FLPMA Section 202 and other applicable authorities, the BLM must consider the wilderness characteristics of public lands when undertaking its multiple use land use planning and when making project-level decisions.

In accordance with FLPMA Sections 201 and 202, an inventory for the presence of wilderness characteristics has been completed to determine if the DWSR corridor possesses wilderness characteristics. This inventory is incorporated by reference and can be found in the Administrative Record located at the BLM Glennallen Field Office. Through this inventory process, Tangle Lakes Zone 1 and Delta River Zone 4 were found to possess wilderness characteristics.

Tangle Lakes Zone 1 was found to possess wilderness characteristics because it was determined to provide the necessary size requirement, outstanding opportunities for solitude or a primitive and unconfined recreation experience, and high levels of naturalness. Tangle Lakes Zone 1 appears natural and is affected primarily by the forces of nature. Any work of human beings is substantially unnoticeable. Vegetative screening, topography and distance between designated campsites offer seclusion and reduce the presence of the sights, sounds and evidence of other people in the area. The predominant recreational activities in this area include nonmotorized lake boating and hiking. There is little evidence of motorized use, except for the use of small kicker motors that are used to travel on the lakes within the zone. There are no BLM developed facilities located within the zone. The absence of facilities within this zone is a characteristic that makes this zone unique, providing solitude in a natural, primitive surrounding.

Tangle Lakes Zone 2 was not found to possess wilderness characteristics because it was determined to lack outstanding opportunities for solitude or a primitive and unconfined recreation experience. The use of motorized watercraft occurs frequently throughout the summer within this zone, with use increasing substantially during the Fourth of July season and subsistence hunting season (August 1-September 30). Nonmotorized users sometimes find themselves competing for space and solitude with other motorized users, or vice versa, and social conflict issues between motorized and nonmotorized users are present within this zone. Developed hiking trails within the zone have concentrated users to specific routes that

help to protect natural resources, but also reduce solitude and the feeling of being unconfined in a trail-less environment. The Denali Highway is almost always in view, and the larger lakes within the zone do not offer much vegetative and topographic screening that would provide the seclusion needed to reduce the presence of sights, sounds and evidence of other people in the area.

Tangle Lakes Developed Zone 3 was not found to possess wilderness characteristics because it was determined to lack the size requirement and outstanding opportunities for solitude or a primitive and unconfined recreation experience. At only 248 acres, Tangle Lakes Developed Zone 3 has been highly modified by gravel roads and recreational facilities. The work of human beings is substantially noticeable, as roadways, developed campsites, boat launches, interpretive panels, and outhouses are located within the zone. Vegetation and soils within the zone have been greatly altered, with large areas of impacted vegetation and bare ground disturbance commonly associated with high use recreational facilities. Solitude is difficult to find in the developed facilities due to the presence of highway vehicles, recreational vehicles, generators, and large groups that are situated relatively close together.

Delta River Zone 4 was found to possess wilderness characteristics because it was determined to provide the necessary size requirement, outstanding opportunities for solitude or a primitive and unconfined recreation experience, and high levels of naturalness. Delta River Zone 4 is characterized by an essentially unmodified natural environment. There is little or no evidence of motorized use, including OHV trails. Sights and sounds of the road system are nonexistent; vegetative screening, topography and distance between designated campsites offer seclusion and reduce the presence of the sights, sounds and evidence of other people in the area. The prevailing recreational use is nonmotorized boating, with associated hiking, hunting, and wildlife viewing activities. There is little evidence of motorized use, as shallow water and topography limit the occurrence of motorized boats entering the zone. Aside from the rustic facilities located at portage area, there are no other BLM facilities within the zone. The absence of facilities within this zone is a characteristic that makes this zone unique, providing solitude in a natural, primitive surrounding.

Delta River Zone 5 was not found to possess wilderness characteristics because it was determined to lack outstanding opportunities for solitude or a primitive and unconfined recreation experience. Mining access occurs throughout the year; it is not uncommon to experience heavy machinery either crossing directly through the river corridor or travelling on the Rainy Creek Trail. In the northern portion of the zone, the Richardson Highway and Trans Alaska Pipeline System are almost always in view, lacking vegetative and topographic screening that would provide the seclusion needed to reduce the presence of sights, sounds and evidence of other people in the area. The use of motorized watercraft and OHVs occur within this zone throughout the summer season, increasing during subsistence hunting season (August 1-September 30). Nonmotorized users sometimes find themselves competing for space and solitude with these motorized users, and care must be taken in the narrow, braided portion of the zone to reduce the potential for swamping or collisions with passing motorboats.

3.2.14 Wildlife

The DWSR corridor supports large and small mammals and furbearers, birds and waterfowl, numerous insects, and an amphibian. Wildlife composition and density vary by season and by habitat type along the river. Large mammals that may be encountered within the DWSR corridor include moose (*Alces alces*), caribou (*Rangifer tarandus*), and bears (*Ursus americanus* and *U. arctos*). Since the DWSR corridor is also a federal subsistence hunting area, these large mammals are hunted by qualified residents for food and other traditional uses. Moose taken along the Delta River constituted approximately 29% of successful federal subsistence moose hunts in GMU 13 in 2008. Moose populations are monitored closely by the Alaska Department of Fish and Game (ADF&G) in several count areas. Count area 5 includes portions of the Delta River and averaged 1393 moose within 846 square miles between 1990 and 2007 (ADF&G), and is generally stable.

Caribou from the Nelchina Caribou Herd (NCH) migrate in large numbers in the spring and fall as they travel to and from winter and summer grounds, often crossing the Delta River near the foothills of the Alaska Range. The NCH population is below the target set by ADF&G of 35,000 animals as of 2008. However, active management efforts by the ADF&G are in place to facilitate an increase in the moose and caribou population. Caribou move in large numbers across the DWSR corridor, and these sightings

provide recreationists and hunters a spectacular close-up view of one of North America's greatest natural animal movements.

Small mammals and furbearers also utilize the DWSR corridor and are of interest to local trappers, subsistence users, and other carnivores including resident raptors. Harvest efforts for furbearers including wolves (*Canis lupus*), marten (*Martes americana*), and lynx (*Lynx canadensis*) typically follow the price of fur. Resident raptors depend on small mammals for food in the winter. The population of small mammals and furbearers is generally stable in the DWSR corridor.

Migratory birds and waterfowl can be seen on the river and lakes within the DWSR corridor. Spring migration brings approximately 130 species of birds into Alaska, a portion of which likely cross the DWSR corridor and may even stopover in nearby lakes. The DWSR corridor provides nesting and rearing habitat for numerous waterfowl and other migratory birds. Some songbirds take advantage of the abundant supply of insects that emerge in the spring. These insects not only provide essential forage for birds, but are also important food sources for fish. Fish, in turn, become essential food for bears and bald eagles.

There are no birds or mammal species within the Delta River watershed that are listed by the U.S. Fish and Wildlife Service as threatened or endangered. The presence of six species of birds and one species of mammal that BLM Alaska considers sensitive species are suspected to occur within the Delta River watershed, but are undocumented.

3.2.14.1 Wildlife Management Concerns Related to Recreational Activities

There are three major concerns related to recreational activities in the DWSR corridor. These concerns are OHV use, motorized boating, and human-bear interactions. Human activity along the DWSR corridor is likely to increase as recreational demands grow and technology advances. Impacts from increased OHV use by hunters and recreationists may further fragment moose and caribou habitat. Increased human visitation may also affect migratory birds and waterfowl that nest along the river and lakes of the DWSR corridor. Areas that were previously inaccessible to boaters may become accessible using shallow-drive boats. Motorized boats and airplane landings in these areas may cause harassment to nesting waterfowl and other wildlife. Increased human traffic can interfere with nesting waterfowl and may cause wildlife to expend energy in avoidance or stress-induced behavior. Another concern resulting from increased human activity in the DWSR corridor is bear-human interactions. Current levels of bear encounters appear to be low, although documentation of such encounters is sporadic and not well recorded. However, with increased human presence, the likelihood of human-bear interactions in the future may increase.